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THE FIRST RECORDED OCCURRENCE OF *HIRUDO VERBANA* CARENA, 1820 (HIRUDINEA: ARHYNCHOBDELLIDA: HIRUDINIDAE) IN ROMANIA

ADRIAN GAGIU

Abstract. In 2005, a *Hirudo verbana* specimen was observed in Stracoș Valley, within the Tășad Reserve (Bihor county, north-western Romania). Since the coloration pattern of this once forgotten species matches its genetic differentiation, the identification of the specimen as belonging to the south-eastern European *H. verbana* appears plausible. The species was previously cited in southern, central and eastern Europe, but not in Romania. Therefore, the present observation might be its first recognized occurrence in the country. As recently pointed out, *H. verbana* is one of the three species commonly known as the European medicinal leech and the most abundant as such. Most international and national conservation legislation containing only *H. medicinalis* (including IUCN, CITES, Berne Convention) needs completion, according to the new taxonomy.

Résumé. Un spécimen d'*Hirudo verbana* a été observé en 2005 dans la vallée Stracoș de la réserve naturelle Tășad (Bihor, dans le nord-ouest de la Roumanie). Lorsque le modèle de la coloration de cette espèce récemment révalidée correspond à sa caractérisation génétique, l'identification du spécimen observé est plausible. L'aire connue d'*Hirudo verbana* comprend le sud, le centre et l'est de l'Europe, mais pas la Roumanie, donc cette observation est la première occurrence documentée dans ce pays. Récemment a été démontré que *H. verbana* est une des trois espèces de sangsues médicinales européennes et la plus utilisée. En conséquence, la plupart des législations internationales et nationales mentionnant seulement *H. medicinalis* (y compris IUCN, CITES, Convention de Berne) nécessitent des compléments en accord avec la nouvelle taxonomie du genre *Hirudo*.

Key words: *Hirudo verbana*, first recorded occurrence, Romania, conservation.

INTRODUCTION

Since the ancient times, the hematophagous European leeches were used in medicine for bloodletting as a panacea. Nowadays, their anticoagulant and anti-inflammatory substances are of medical and pharmaceutical attention, and the direct therapeutic application of the now commercially bred leeches is revived, e. g. for restoring blood circulation and ameliorating congestion after reconstructive surgery (Siddall et al., 2007; Sket & Trontelj, 2008). Only recently it was proved that most commercially available leeches are not *Hirudo medicinalis* Linnaeus, 1758, but the long-neglected, more colourful and thermophilic *H. verbana* Carena, 1820, or sometimes *H. orientalis* Utevsky & Trontelj, 2005 (Trontelj et al., 2004; Trontelj & Utevsky, 2005; Kutschera, 2006; Siddall et al., 2007).

The distribution for *H. verbana* known from recent data includes southern, central and eastern European countries (Utevsky et al., 2010), though for Romania it was not cited, yet. The available literature on Romanian Hirudinidae is very sparse, and even a synthetic study on Romanian Hirudinea mentioned only *H. medicinalis*, listing for that species some of the distribution areas and morphological characters of *H. verbana* (Cristea & Manoleli, 1977).

MATERIAL AND METHODS

During a field trip within the ROSCI0240 “Natura 2000” site near Tășad (Bihor county, north-western Romania) in April, 2005, a colourful leech was observed and photographed in a small pond near Stracoș Valley, close to the reserve limit (46°55'28,20"N, 22°08'46,34"E, in Stereo 70). The pond had muddy bottom on a clay substrate, no other fauna and nearly no aquatic vegetation, but dried stems of grass. In summer it is being used for bathing by the livestock of local people while grazing on the pastures nearby. During further trips in the area, no other leeches were observed in the pond.

RESULTS

The animal had a strikingly more colourful appearance than common *H. medicinalis* individuals, due to its broader orange, longitudinal dorsal stripes (Fig. 1). The ventral side was not examined, since at that time the distinctive morphological characters and the validity of *H. verbana* were not known to us yet, but a black marginal stripe seemed apparent.

DISCUSSIONS

The *H. verbana* specimen observed in the pond near Stracoș Valley may have been introduced in the Tășad area by cattle, since “*H. medicinalis*” *sensu lato* prefers the proximity of pastures with livestock and, being an ectoparasite, it dispersing itself by staying attached to mobile vectors like mammals for a considerable time (Trontelj & Utevsky, 2005). Since semiaquatic leeches do not tolerate low oxygen levels, as it may be the case in a small pond with no aquatic vegetation, the observed animal may have migrated then from the site and therefore no other leeches were found there afterwards.

The coloration morphs of the European medicinal leech have been considered a morphological variety of *H. medicinalis* or a mere case of intraspecific variability for a long time, though geographically localized to a considerable extent. Only in 1999, the species status was re-established for the forgotten *H. verbana* (Nesemann & Neubert, 1999), which corresponds morphologically to the south-eastern *H. medicinalis* f. *officinalis*, yet that view was not generally accepted. By means of the random amplified polymorphic DNA technique and the analysis of nuclear and mitochondrial gene sequences and nuclear microsatellites, *H. verbana* was proved to be a distinct species from *H. medicinalis* (Trontelj et al., 2004; Trontelj & Utevsky, 2005; DeSalle et al., 2005; Siddall et al., 2007). The two species interbreed in captivity, but some degree of reproductive isolation has been found (Petrauskienė et al., 2009). Therefore, pigmentation is not at all misleading as in other cases, but on the contrary, it is the most useful character in identifying *Hirudo* species in the field, *H. verbana* having two characteristic broad, diffuse, pale orange paramedian stripes and a unicoloured, greenish to yellow venter, with a pair of black ventrolateral stripes (Utevsky & Trontelj, 2005).

The distribution of *H. verbana*, recognized as such or inferred from literature citing the coloration types and forms of “*H. medicinalis*”, includes southern and central Europe (Italy, Switzerland, Germany, Austria, „rare” in Hungary), the eastern Mediterranean region (Turkey), the Balkans (Slovenia, Croatia, FYR Macedonia, Serbia, Montenegro, Greece), Ukraine, the Republic of Moldova, the Krasnodar Territory in south-western European Russia, Armenia and Uzbekistan,



Fig. 1 - *Hirudo verbana* individual observed in Stracoș Valley, Tășad Reserve, Bihor county, Romania (Photos: M. Venczel).

while *H. medicinalis* is distributed from Britain and southern Norway to the southern Urals and probably as far as the Altai Mountains (Jueg, 1999; Moog et al., 2001; Juhász et al., 2002, 2006, 2008; Nieuwenhuis, 2005; Utevsky & Trontelj, 2005; Kutschera, 2006; Minelli, 2007; Utevsky et al., 2010). The new find of *H. verbana* confirms to the species range inferred by Utevsky et al. (2010). Most of Romania's territory seems to be within the range of *H. verbana*.

Because of heavy collecting for medical purposes especially during the 19th century, but also in present day Turkey and other south-eastern European countries, and because of the general decreasing, fragmentation and pollution of wetland habitats, the populations of European medicinal leeches suffered a decline in all their geographic range. Both *H. medicinalis* and *H. verbana* are considered Near Threatened (Utevsky et al., 2010), but only the first species is listed in nature conservation international conventions (IUCN, CITES Appendix II, Berne Convention) and national legislations. Little is known about the distinct distribution, ecology and endangerment of the two species and about the anthropic influence on them respectively, yet the "*H. medicinalis*" samples from the southern Balkan Peninsula and Turkey, cited in literature, and the majority of commercially, exploited medicinal leeches from the same regions were actually *H. verbana* (Trontelj et al., 2004; Trontelj & Utevsky, 2005; Siddall et al., 2007; Laufer et al., 2008). Accordingly, appropriate taxonomic correction of international and national conservation conventions and legislation is a necessity.

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PRIMA SEMNALARE A PREZENȚEI SPECIEI *HIRUDO VERBANA* CARENA, 1820 (HIRUDINEA: ARHYNCHOBDELLIDA: HIRUDINIDAE) ÎN ROMÂNIA

REZUMAT

Un exemplar de *Hirudo verbana* Carena, 1820 a fost observat și fotografiat în 2005 în valea Stracoș (rezervația de la Tășad, jud. Bihor). Colorația acestei specii recent revalidată în literatură (propusă în 1999 și confirmată pe baze genetice în 2004 și 2005) corespunde cu caracterizarea ei genetică față de celelalte specii ale genului, astfel că identificarea ulterioară a exemplarului observat apare ca fiind plauzibilă. Specia a fost citată anterior în sudul, centrul și estul Europei, inclusiv în Ungaria și Ucraina, dar nu și în România. *H. verbana* e una dintre cele trei specii cunoscute în Europa drept lipitoarea medicinală, fiind cel mai intens folosită ca atare. De aceea, datele faunistice privind România, precum și legislațiile și reglementările de mediu internaționale și naționale, care se referă doar la *H. medicinalis* (IUCN, CITES, Convenția de la Berna), necesită corecții și completări conform taxonomiei actualizate a genului *Hirudo*.

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MORPHOMETRIC ANALYSIS OF SOME POPULATIONS OF LYMNOCARDIID SPECIES (MOLLUSCA: BIVALVIA) FROM RAZELM LAKE COMPLEX (ROMANIA)

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Abstract. In this paper we report the morphometric analysis of some populations of Lymnocardiid species from the lakes Razelm and Golovița. We used three measurements ratios to perform a discriminant analysis and a multivariate analysis of variance (MANOVA), in order to compare the species *Hypanis colorata* vs. *Hypanis angusticostata* in the two lakes, *H. colorata* in Razelm vs. Golovița, and *H. angusticostata* in Razelm vs. Golovița. From this analysis we concluded that the multivariate means of the morphological variables used in this study were highly significantly different ($p=3.2e-05$) between the two species. Concerning the geographical variability, in both species, the analysis showed no significant difference between the populations in the two investigated lakes. We also determined from a fitting curve analysis, that the growth pattern of both species shows length-height isometry and width-length and width-height negative allometry.

Résumé. Les auteurs présentent l'analyse morphométrique de quelques populations de Lymnocardiidae des lacs Razelm et Golovița. Dans cette étude on a mesuré la longueur, l'hauteur et l'épaisseur des valves, les rapports de ces valeurs étant utilisés afin de réaliser l'analyse discriminante et l'analyse multivariée de la variance pour comparer ces populations. Les résultats ont montré l'existence d'une différence statistique significative ($p=3.2e-05$) entre les moyennes multivariées des populations de *Hypanis colorata*, en comparaison avec celles de l'espèce *Hypanis angusticostata*. Dans le cas de la comparaison des populations conspécifiques des deux espèces provenant des deux lacs étudiés, on n'a constaté aucune variabilité des paramètres morphologiques analysés. On a déterminé aussi le modèle de croissance des deux espèces comme étant isométrique en ce qui regarde la relation longueur- hauteur, respectivement négatif allométrique en ce qui concerne les relations épaisseur-longueur et épaisseur-hauteur.

Key words: *Hypanis colorata*, *Hypanis angusticostata*, *Monodacna*, isometry, allometry, growth pattern, geographic variability.

INTRODUCTION

The bivalves subfamily Lymnocardiinae (Bivalvia: Cardiidae) includes several fossil genera and two extant genera, *Hypanis* and *Didacna*. In the former genus there are two described subgenera, *Monodacna* and *Adacna*. The subgenus *Monodacna* comprises about 20 living species and/or subspecies distributed in the Black, Azov and Caspian Seas as well as in the connected brackish lakes (Nabozhenko, 2005).

In the Romanian fauna there are five species described in the genus *Hypanis*: *H. fragilis* (Milaschewitsch, 1908), *H. plicata* (Eichwald, 1829), *H. colorata* (Eichwald, 1829), *H. angusticostata* (Borcea, 1926) and *H. pontica* (Eichwald, 1829). The variability occurred within this subfamily is considered an adaptation to the brackish water and/or their living substrate, changes appearing to different direction, either concerning the shell thickness, the ribs or the dentition structure, in the siphon or the pallial sinus elongation (Grossu, 1962). The morphological criteria used in the species identification rise confusions and uncertainties (Borcea, 1926).

In Romania, the subfamily Lymnocyrtidae was studied by Grossu (1962, 1973), Tudorancea (1972), Negrea & Negrea (1975) and Sarkany-Kiss (1995). Also, at the international level, the studies concerning the Lymnocyrtidae species are scarce. Taxonomic studies based exclusively on morphological features were performed mainly in Ukraine (Munasyrova-Motyash, 2006; Yurishinets & Kornushin, 2001; Yurishinets et al., 2002).

In this study we measured the morphological variability of the two species of the genus *Hypanis* in the Razelm-Sinoe Lake Complex, *Hypanis colorata* and *Hypanis angusticostata*.

MATERIAL AND METHODS

Samples were collected from the Romania Lagoons of the Black Sea, the Razelm Golovița Lake Complex. Figure 1 depicts the distribution of the collecting points for the Lymnocyrtidae species presented in table 1. Specimens used in this study were collected with a Băcescu dredge.

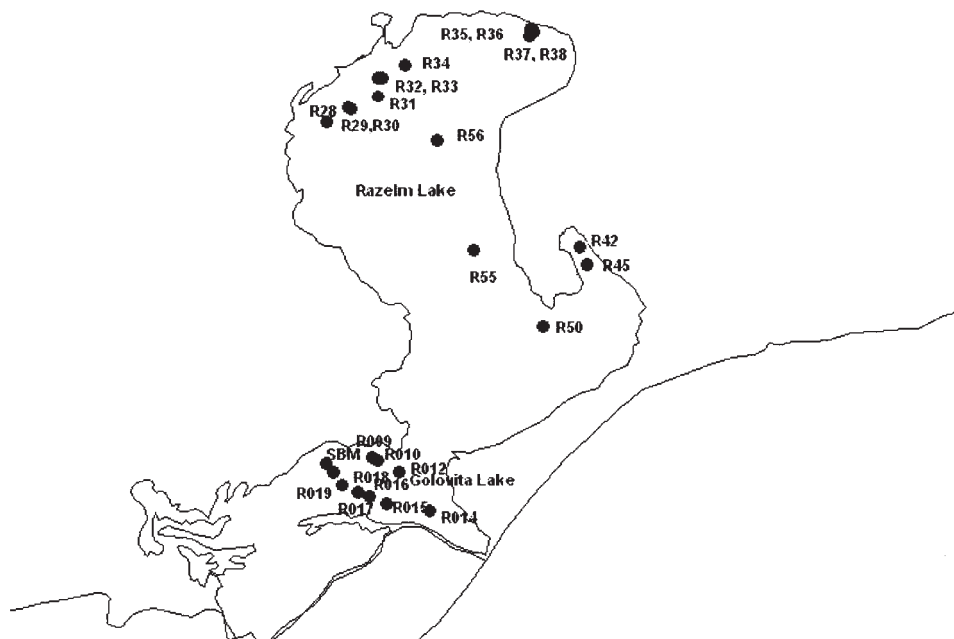


Fig. 1- Distribution map of the collecting points.

Morphological identification of the collected individuals was performed according to criteria such as the shape of the ribs (higher or more flattened), how dense these are, the dentition of the cardinal platform and the thickness of the valves, according to Munasyrova-Motyash (2006), Logvinenko & Starobogatov (1968) and Zhadin (1952). The distinguishing of the species *H. colorata* and *H. angusticostata* was made according to the shape of the ribs, with narrow, sharp ribs in *H. angusticostata*, and flattened ribs in *H. colorata*.

The following species/population pairs were analysed: *H. colorata* vs. *H. angusticostata*, *H. colorata* from Golovița Lake vs. Razelm Lake, and *H. angusticostata* in Golovița Lake vs. Razelm Lake. The following three

Table 1

Collecting points of the analyzed Lymnocyprinae samples.

WAYPOINT	LATITUDE	LONGITUDE	NO OF. INDIV	LOCALITY OF COLLECTION	COLL. DATE
R028	44.95568	28.87551	5	Razelm Lake	July 2009
R029	44.96349	28.89404	2		
R030	44.96283	28.89654	1		
R031	44.98213	28.94826	6		
R032	44.98203	28.94833	2		
R033	44.98206	28.94652	2		
R034	44.98219	28.94505	1		
R036	44.98027	29.09231	2		
R037	44.97949	29.0933	5		
R038	44.97823	29.09411	1		
R039	44.97814	29.09394	5		
R040	44.97553	29.09102	1		
R042	44.85952	29.10623	6		
R045	44.84797	29.11141	1		
R050	44.84942	29.03362	2		
R055	44.97038	28.94425	15		
R056	44.97848	28.97514	7		
R09A	44.74603	28.91976	12	Golovița Lake	August 2009
R010	44.74413	28.92408	1		
R012	44.71823	28.95958	5		
R014	44.69475	28.98316	3		
R015	44.69985	28.94775	13		
R016	44.70453	28.93269	7		
R017	44.70744	28.92326	1		
R018	44.72065	28.90324	2		
R019	44.7264	28.89792	6		
Total			114		

morphometric variables were measured: shell length (SL), the maximum antero-posterior dimension of the shell, shell width (SW), the maximum left-right dimension with both valves appressed and shell height (SH), the maximum dorsal-ventral dimension of the shell measured perpendicular to the length. The shells were measured with a digital calliper, to the nearest 0.1 mm. The measured shell length (SL), shell width (SW) and shell height (SH) were used to compute the SW/SL, SH/SL and SW/SH ratios. The multivariate normality was checked by computing Mardia's multivariate skewness and kurtosis, with tests based on chi-squared (skewness) and normal distributions (kurtosis). A powerful omnibus (overall) test (Doornik and Hansen) was also performed. A MANOVA analysis was performed with the species/location designation as independent variables and the three mentioned ratios as dependent variables. A Discriminant Analysis (DA) was performed to test the efficiency of the selected ratios to predict different group locations. At the same time, we performed the Hotelling's t^2 test for equality of multivariate means between our groups.

We also performed a curve fitting analysis in order to identify the growing pattern of the studied species (allometric growth or isometric growth). For this purpose we analyzed shell length vs. shell height (SL-SH), shell width vs. shell length (SW-SL) and shell width vs. shell height (SW-SH). The growth patterns were considered to be isometric if the slope (a) of the regression line was 1, negative allometric if $a < 1$, and positive allometric if $a > 1$. All analyzes were performed with the software package PAST (Hammer et al., 2001).

RESULTS

We collected and measured several hundred bivalve specimens belonging to the Lymnocardinae subfamily. Among the specimens with a length larger than 20 mm (to ensure a correct identification), we identified 79 specimens of *Hypanis colorata* and 35 *Hypanis angusticostata* specimens. The multivariate normality of the samples was checked by Mardia's kurtosis test ($p_{\text{normal}} = 0.89$) and with the Doornik and Hansen omnibus test ($p_{\text{normal}} = 0.97$). The assumption of homogeneity of variance covariance matrices was tested with Box's M test ($p_{\text{equal}} = 0.07$).

H. colorata vs. *H. angusticostata*

The discriminant analysis shows quite unsatisfactory separation of the two groups (68.42% of the samples were correctly reclassified with the computed discrimination function), while the Hotelling's t^2 test indicates a highly significant difference between them ($p_{\text{same}} = 3.2e-05$). The same result was revealed by the MANOVA analysis who rejected the hypothesis of equality of the means for the two species, both in Wilks's lambda test ($p_{\text{same}} = 8.8e-09$) and the Pillai trace test ($p_{\text{same}} = 3.8e-09$).

H. colorata from Golovița Lake vs. *H. colorata* from Razelm Lake

We analyzed 46 *H. colorata* specimens from Golovița Lake and 33 specimens from Razelm Lake. Both the discriminant analysis (54.43% of the samples were correctly reclassified) and the Hotelling's t^2 test ($p_{\text{same}} = 0.72$) indicates there is no significant difference between the two analyzed populations of *H. colorata*. The same result was revealed by the MANOVA analysis which could not reject the hypothesis of equality of the means for the two species populations, both in Wilks's lambda test ($p_{\text{same}} = 0.21$) and the Pillai trace test ($p_{\text{same}} = 0.20$).

H. angusticostata from Golovița Lake vs. *H. angusticostata* from Razelm Lake

We analyzed 26 specimens of *H. angusticostata* from Golovița Lake and 9 specimens from Razelm Lake. As in the other species, both the discriminant analysis (68.57% of the samples were correctly reclassified) and the Hotelling's t^2 test ($p_{\text{same}} = 0.53$) indicates that there is no significant difference between the two analyzed populations of *H. angusticostata*. The same result was revealed by the MANOVA analysis who could not reject the hypothesis of equality of the means for the two species populations, both in Wilks's lambda test ($p_{\text{same}} = 0.06$) and the Pillai trace test ($p_{\text{same}} = 0.06$) (Tab. 2).

Table 2

Discriminant analysis and MANOVA (Multivariate Analysis of Variance).

Discriminant Analysis		
Compared populations	Percent correctly classified	Hotelling's t^2 p (same)
<i>H. colorata</i> vs. <i>H. angusticostata</i>	68.42	3.2E-05
<i>H. colorata</i> Golovița vs. Razelm	54.43	0.72
<i>H. angusticostata</i> Golovița vs. Razelm	68.57	0.53
MANOVA		
Compared populations	Wilk's lambda p (same)	Pillai trace p (same)
<i>H. colorata</i> vs. <i>H. angusticostata</i>	8.8E-09	3.8E-09
<i>H. colorata</i> Golovița vs. Razelm	0.21	0.20
<i>H. angusticostata</i> Golovița vs. Razelm	0.06	0.06

Curve fitting and growth pattern

We used linear regression for fitting the data points to an exponential curve for the two species. This was done simply by fitting a straight line to the logarithms of the values of all three pairs constructed with the measured variables (shell length vs. shell height, shell length vs. shell width and shell width vs. shell length). When analysing shell length vs. shell height (SL-SH), in *H. angusticostata*, the slope (a) was found to be 1.01 ($p = 0.94$). The same analysis performed in *H. colorata*, revealed a slope (a) of 0.99 ($p = 0.83$). Both these situation correspond to an isometric growth pattern of the two species. When analysing the shell width vs. shell length (SW-SL) and the shell width vs. the shell height (SW-SH), in both species the growing pattern proved to be positive allometric (Tab. 3).

Table 3

Curve fitting analysis and growth patterns of the two species.

Species	SL-SH isometry	SW-SL allometry	SW-SH allometry
<i>H. colorata</i>	Slope (a):0.99 p($a=1$): 0.83	Slope (a):0.79 p($a=1$): 1.1E-05	Slope (a):0.78 p($a=1$): 9.7E-06
<i>H. angusticostata</i>	Slope (a):1.01 p($a=1$): 0.94	Slope (a):0.51 p($a=1$): 7.1E-09	Slope (a):0.52 p($a=1$): 5.4E-08

DISCUSSIONS

Although subtle, the morphological differences between *H. colorata* and *H. angusticostata* appear to be highly statistically significant when we performed a multivariate analysis of our samples. From a practical point of view, the only character distinguishing the two species is the shape of the shell ribs, with sharp, thin ribs in *H. angusticostata* and more flat ribs in *H. colorata*. This character could be explained as an adaptation to different living substrates of the two species. According to Munasypova-Motyash (2006), *H. colorata* lives on the surface of the substrate, while *H. angusticostata* borrow shallowly in the substrate. Savazzi and Sälgeback (2004) performed a comparative analysis of the shell shape of two cardiid bivalves species, *Cardium* and *Budmania*, and found that the sharp ribs offer

strength to the shell under the pressure of the surrounding sediment, while also providing a larger shell area in contact with the sediment, which ensures a better anchoring of the animal in the substrate (in our case, *H. angusticostata*). On the other hand, the flat ribs ensure an even weight distribution preventing sinking for bivalve species living on the surface of substrate (in our case, *H. colorata*).

The growth model of the two species support also the same assertions. The negative SW-SL and SW-SH allometry is higher in *H. angusticostata* ($a=0.51-0.52$) than in *H. colorata* ($a=0.78-0.79$). These results indicate that for *H. colorata* the width increase over the height and length increase is superior to that of *H. angusticostata*. According to Eagar (1978), Gaspar et al. (2002) and Hinch & Bailey (1988), bivalve species shells become wider during growth in order to counter involuntary dislodgement by turbulence and currents. These environment effects are much likely to occur in a species living on the substrate (*H. colorata*) than in a species living borrowed in the substrate (*H. angusticostata*).

We also analysed two different populations, one in Golovița Lake, the other in Razelm Lake, for the two species of the genus *Hypanis*. In this case the analysis showed no differentiation between the two pairs of investigated populations. This finding could be explained by the fact that both lakes are part of the same system (the Razelm-Sinoe Lake Complex), and the salinity conditions are quite similar between Razelm and Golovița (0.4-0.6 g/l), according to Brețcan et al. (2009). In conclusion, we analysed some morphological variables in the two species of the subfamily Lymnocyrtidae which are present in the Romanian fauna. The analysis showed the species *Hypanis angusticostata* and *Hypanis colorata* are different statistical populations. No differentiation could be observed for the populations of the two species of the genus *Hypanis* in the Lakes Razelm, respectively Golovița. Considering that a clear separation of both taxa on the basis of morphological characteristics is made difficult by a high degree of intra- and interpopulational variability, other characteristics, such as those provided by molecular analysis, should be taken into account for a more comprehensive interpretation of their taxonomic status.

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ANALIZE MORFOMETRICE REALIZATE ASUPRA UNOR POPULAȚII DE LYMNOCARDIIDAE (MOLLUSCA: BIVALVIA) DIN COMPLEXUL LACUSTRU RAZELM-SINOE (ROMÂNIA)

REZUMAT

În lucrare autorii prezintă analiza morfometrică a populațiilor a două specii de Lymnocyrtidae din lacurile Razelm și Golovița. În studiu s-a măsurat lungimea, înălțimea și grosimea valvelor, iar rapoartele acestor valori au fost utilizate pentru a se realiza analiza discriminantă și analiza multivariată a varianței pentru compararea populațiilor analizate. Rezultatele au arătat existența unei diferențe semnificative statistic ($p=3.2e-05$) între mediile multivariate ale populațiilor de *Hypanis colorata*, în comparație cu populații ale speciei *Hypanis angusticostata*. În cazul comparării populațiilor conspecifice ale celor două specii, provenind din cele două lacuri studiate, nu s-a constatat nici o variabilitate a parametrilor morfologici analizați. De asemenea, a fost determinat modelul de creștere al celor două specii ca fiind izometric în ceea ce privește relația lungime-înălțime, respectiv alometric negativ, în ceea ce privește relațiile grosime-lungime și grosime-înălțime.

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THE FRESHWATER MOLLUSCA FAUNA FROM BANAT (ROMANIA)

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Abstract. The freshwater molluscs fauna from Banat comprises 61 species (41 of gastropods and 20 of bivalves). 10 species were newly identified in this area by the authors. This paper's aim is to establish the systematical and chorological catalogue of this fauna, to highlight the most characteristic and significant elements, the threats represented by human impact on the area's waters and their molluscs communities.

Résumé. La faune des mollusques aquatiques de Banat contient 61 espèces (41 escargots et 20 coquillages bivalves). 10 espèces ont été identifiées pour la première fois en cette région par les auteurs. L'objectif de ce travail est d'établir un catalogue systématique et chorologique de cette faune, de souligner les plus importants de ses éléments et les menaces représentées par l'impact humain pour les habitats et les communautés aquatiques de la région.

Key words: freshwater snails, bivalves, systematical catalogue, chorology, alien invasive species, human impact.

INTRODUCTION

The Banat is the South-western province of Romania, bordered by the river Mureş in the North, the Danube in the South and the Southern Carpathian Mountains in the East. Some scattered material and information regarding the freshwater Mollusca from Banat date back to the 19th century. They were provided mainly by the naturalists from the Transylvanian Society for Nature Sciences in Sibiu, their collections being kept mainly in the museum from the same town. Most malacologists studied terrestrial molluscs, especially from mountain areas, the aquatic species being seldomly quoted. In the few mentions usually there are given no exact toponimes. However, some data are available from the collections of E. A. Bielz, M. v. Kimakowicz, I. P. Licherdopol, A. V. Grossu and others. These collections are preserved in the Museum of Natural History in Sibiu and the „Grigore Antipa“ National Museum of Natural History in Bucharest. Some published historical data are available from Bielz (1867), Clessin (1887), Kimakowicz (1883-1884). In the 20th century the faunistical data become more numerous. Most papers concerning the freshwater molluscs belong to A.V. Grossu. In 1942 he describes the mollusc fauna from Timișoara surroundings, in 1945-1946 it follows a paper concerning the prosobranch *Holandriana holandrii*, in 1946 *Bythinella dacica* is described as a new species to science, in 1955 a malacological paper concerning the Miniș Valley is published. Later several other papers are synthesized in the tome concerning the bivalves (1962) and the gastropods (1986, 1987) from Romania, as well as the catalogue of the molluscs published in 1993. Most papers contain mainly faunistical and systematical information and data on the autecology of the species. Some data on community ecology were published by Grossu in 1972 and 1974, and together with Doina Grossu, in 1968. Tudorancea & Gruia (1968) studied some ecological parameters of the *Unio crassus* population

from the Nera River. Maybe the most distinctive malacological feature of the Banat area are the highly abundant prosobranch communities from the Nera and Caraș rivers. The former were studied by Botoșăneanu & Negrea (1969), Bănărescu & Opreșcu (1971), Botoșăneanu & Negrea (1976), the latter by Bănărescu & Arion-Prunescu (1981, 1982, 1983). Several papers mentioned before referred also to the mollusc fauna from the Poștile de Fier area [the Iron Gates]. To these, several other references have to be added, like those published by Băcescu (1948), Popescu & Prunescu-Arion (1961), Bușniță et al. (1970) and Brezeanu et al. (1986). Some other papers deal with the taxonomy and distribution of the aquatic gastropods along the Danube's Romanian sector, published by Negrea & Popescu-Marinescu (1992), Negrea (1994) or, concerning also the bivalves, the volume written by Frank et al. (1990), the last being an inconsistent synthesis regarding the fauna of Romania. In this century, several studies on alien invasive species were carried out. Some concern species which live also in Banat, namely those published by Sárkány-Kiss et al. (2000), Bij De Vaate & Hulea (2000), Skolka & Gomoiu (2001), Popa & Popa (2006 a, b), Popa et al. (2007), Popa (2008).

Beginning with 1998, the authors of the present paper organized several sampling trips in the Romanian Banat in order to assess the systematics, distribution, chorology, population and community ecology of the freshwater molluscs from this area. Several papers were published, concerning the prosobranchs and naiads (Unionidae) communities from the Nera and Caraș rivers (Sîrbu & Sîrbu, 1998), a study concerning the morphologic and biometric variability of *Holandriana holandrii* (Sîrbu, 1998), distribution of the *Pisidium* species in Banat (Sîrbu, 2002; Sîrbu & Benedek, 2004), the Mollusca fauna from Timiș River (Sîrbu, 2004 a), the molluscs communities structure from the Danube's sector from Banat (Sîrbu, 2004 b), some papers concerning distribution and ecology of several groups from the regional mollusc fauna (Bănărescu & Sîrbu, 2002; Sîrbu & Benedek, 2005; Sîrbu, 2006; Sîrbu et al., 2006; Glöer & Sîrbu, 2006).

Up to present no publication deals with the whole region and several rivers and taxonomic mollusc groups are without references, a gap which the authors intend to fill in this paper, aiming to establish a malacological exhaustive systematical and chorological catalogue based on all available information, to highlight the present state and dangers faced by several significant species and communities.

STUDY AREA AND METHODS

The freshwater molluscs' systematical and chorological catalogue from Banat (Romanian territory) is based on all available references and collections, as well as on the authors' research accomplished since 1998.

The Banat region is drained by five large rivers and many small ones. Two of the large rivers (Bega and Timiș) flow through the North of the province and the three others (Caraș, Nera, and Cerna) drain its southern part. The sampling stations were established along the main rivers, in order to assess the longitudinal and altitudinal distribution of the mollusc communities, but also in other freshwater habitats: springs, brooks and rivulets, flood areas, pools, ponds, dam lakes, channels, ditches, and marshes. The sampling sites were selected according to geomorphologic and hydrologic features, but also to the human impact. The malacological investigations were carried out in the following rivers and basins: Mureș River in its lower sector from northern Banat, Aranca, Bega, Timiș, Caraș,

Nera, Cerna and the Danube's sector from Banat. Some material from Caraş and Nera rivers was donated by Dr. P. M. Bănărescu, in 1999.

The molluscs were sampled by hand, by sieves, using bottom Surber or dredges. The systematical catalogue is given according to Grossu (1993), Glöer & Meier-Brook (2003), Glöer & Sîrbu (2006), and to Fauna Europaea v. 2.2, namely the lists compiled by Bank (2010) for gastropods, and by R. Araujo (2010) for bivalves. However, the data for Romanian Mollusca given in the Fauna Europaea correspond to the Checklist of Romanian Fauna; terrestrial and freshwater species (2007), which contains many errors, being highly unreliable.

Following abbreviations were used in order to present the chorologic catalogue in a brief and synthetic way: * = species identified for the first time in the area of reference by the authors; col. = collection; leg. = sampled by; NHMS = Natural History Museum in Sibiu and „Grigore Antipa“ NMNH = collections from the „Grigore Antipa“ National Museum of Natural History in Bucharest.

RESULTS

In the Banat region, 61 freshwater mollusc species (41 of snails and 20 of bivalves) were identified up to present. They belong to 7 orders and 14 families. Among the gastropods 17 species are prosobranchs, while 24 are pulmonates. Considering the bivalves, all the seven species of naiads (Unionidae) which live in Romania are encountered in the waters from Banat, sometimes in high densities. 13 species are veneroids. The complete list of taxa and their known chorology are presented in the following.

The systematical and chorological catalogue of the freshwater molluscs from Banat (Romania)

Classis Gastropoda Cuvier, 1795
Ordo Neritopsina Cox & Knight, 1960
Familia Neritidae Lamarck, 1809

1. *Theodoxus transversalis* (C. Pfeiffer, 1828)

(col. Kimakowicz and col. Bielz in NHMS): the Danube Gorges (Cazanele Dunării) and Orşova; (col. Licherdopol at „Grigore Antipa“ NMNH): the Danube at Vârciorova; (col. Grossu in „Grigore Antipa“ NMNH): the Danube at Orşova (leg. Grossu, 1958) and in the Coronini - Turnu Severin sector (leg. Grossu, 1962); (Băcescu, 1948) – the Danube Gorges; (Grossu & Grossu, 1968) – the Danube at km 1042, km 1005, km 967 - 968 and others; (Grossu, 1972) – the Danube in the Porțile de Fier (Iron Gates); (Grossu, 1974) - Nera at Sasca Montană and outflow of the Cerna River; (Buşniță et al., 1970) – the Danube in the Porțile de Fier area (km 943 - 1055); (Negrea, 1994) the Danube, confluence with the Cerna River (leg. 1975, 1989), and quoted from different sources at Pescari, km 1005, Mraconia, the Danube Gorges and Svinița. The species was also quoted from the lower Mureş River on Hungarian territory, until the second half of the last century, the last samples being taken by K. Bába (1958, ap. Sárkány-Kiss, 1995) between Makó and Szeged, and Richnovszki & Pintér (1979, ap. Sárkány-Kiss, 2003) from Szeged. In the Mureş River lower sector it has disappeared during the late 80's, and is also most likely extinct in Banat, as well as in Transylvania (Sîrbu & Benedek, 2005). It was also not found again along the Danube, between Calafat and Oltenița localities (Popa, 2005).

The authors of the present paper searched for it, without success, in the summer of 2008 along the Danube, until Giurgiu, but in 2009 we found a spot, in the Danube Delta, where this species still lives. Thus, although highly endangered and extinct from the main part of its range, *T. transversalis* still lives in Romania having a highly patchy distribution, its future being uncertain.

2. *Theodoxus fluviatilis* (Linnaeus, 1758)

(M. Băcescu, 1948 and others): sporadically in the Danube Gorges; (Negrea & Popescu-Marinescu, 1992; Negrea, 1994): the Danube at Svinîța.

Original data: the Danube at Baziaș, sampled by deep dredging between km 1070 - 1071, from sandy substratum; near the river's bank at Divici and in the Cazanele Mici.

3. *Theodoxus danubialis* (C. Pfeiffer, 1828)

(col. Kimakowicz in NHMS): the Danube upstream of Orșova; (col. I. P. Licherdopol in „Grigore Antipa“ NMNH): Vârciorova; (Soós, 1943): „from Nera at Sasca Montană; quoted by Kormos also from Caraș“; (Grossu, 1942): Bega River at Timișoara; Nera at Sasca Montană; 1956 – the Danube at Vârciorova; 1962 - the Danube at Coronini (km 1042) - Turnu Severin sector; 1966, 1972, 1974 - Nera, Bârzava, Caraș, Danube and some small rivers, ponds from the Danube's flood area; the Danube Gorges; Orșova - Porțile de Fier sector; (Botoșăneanu & Negrea, 1976): Nera Gorges (Cheile Nerei); (Bănărescu & Arion-Prunescu, 1981, 1982): Caraș River, between Grădinari and Vrani; (Negrea, 1994): the Danube at Moldova Veche (leg. Zinevici in 1975, leg. Negrea in 1993), at Mraconia (leg. 1975, 1982) and Bahna (leg. 1975);

Original data: Caraș River at Grădinari; Nera Gorges from upstream Lacul Dracului (the Devil's Lake) downstream to Naidăș; in the Danube from Baziaș to the Cazanele Mici, sampled by dredging and from stones close to the banks. It went extinct in the Bega River, due to pollution and habitats' debasement (Sîrbu & Benedek, 2005), and became scarce, being highly endangered in the lower Caraș and Nera rivers.

Ordo Architaenioglossa Haller, 1890

Familia Viviparidae J. E. Gray, 1847 (1883)

4. *Viviparus contectus* (Millet, 1813)

(Grossu, 1986): Timișoara; (Sárkány-Kiss, 1983): a dead branch near the Mureș River at Pecica.

5. *Viviparus acerosus* (Bourguignat, 1862)

(Clessin, 1887): in the Danube, quoted „probably as far as Banat“; (Soós, 1943): mentioned that it was identified by Kobelt at Baziaș, and described as var. *banatici*; (Grossu, 1942): marshes full of aquatic and paludal vegetation from Timișoara; 1956 – ponds close to Timișoara; 1972 – the Danube's flood area at the Porțile de Fier; (Bușniță et al., 1970): the Danube in the Porțile de Fier area (km 943 - 1055); (Negrea & Popescu-Marinescu, 1992; Negrea, 1994): in the Danube's Defile.

Original data: Mureș River Basin in Bezdin Lake; Aranca River in the Munar - Periam Port sector; empty shells in the Bega Veche River at Cenei; Timiș River at

Grăniceri; Caraș at Vrani; alive in the Nera River (the „Dead Nera“ or „Nera Moartă“ in Romanian) downstream Socol. In the whole Danube's sector from Banat, from Baziaș to Orșova, in the whole riverbed and on all substratum types, being often the dominant species within the benthic communities.

Ordo Neotaenioglossa Haller, 1892
Familia Melanopsidae H. & A. Adams, 1854

6. *Fagotia (Fagotia) esperi* (Férussac, 1823) (syn. *Esperiana esperi*)

(Clessin, 1887): „from Banat“; (Grossu, 1942): „in the Danube, seldom also in tributaries from Banat, at Vârciorova“; 1956 – Nera and Caraș rivers; 1972 - Nera River at Sasca Montană (col. Grossu in „Grigore Antipa“ NMNH); 1972 – Cazanele Mici; (Botoșăneanu & Negrea, 1976): Nera Gorges; (Bănărescu & Prunescu-Arion, 1981): Caraș at Grădinari and Vrani.

Original data: Nera Gorges from upstream Dracului Lake down to Naidăș; in the Danube Gorges and downstream especially close to the banks on hard substrata.

7. *Fagotia (Microcolpia) daudebartii acicularis* (Férussac, 1823) (syn. *Esperiana daudebartii acicularis*)

(Soós, 1943): Caraș River; (Grossu, 1942, 1972): the Danube between Coronini and Turnu Severin; in the Porțile de Fier area, from the Gorges to Orșova; 1972 - in col. „Grigore Antipa“ NMNH from Sasca Montană, Nera River; (Bușniță et al., 1970): the Danube in the Porțile de Fier area (km 943 - 1055); (Botoșăneanu & Negrea, 1976): Nera Gorges; (Bănărescu & Prunescu-Arion, 1981, 1982): Caraș at Grădinari and Vrani; (Negrea & Popescu-Marinescu, 1992; Negrea, 1994): the Danube at Moldova Veche.

Original data: Nera River from the gorges downstream to Naidăș; in the Danube Gorges and downstream; empty shells in the Caraș River.

8. *Holandriana holandrii* (C. Pfeiffer, 1828) (syn. *Amphimelania holandrii*)

(Clessin, 1887): „Banat“; (Soós, 1943): „quoted by Kormos from Caraș“; (col. Grossu in „Grigore Antipa“ NMNH, leg. 1941, 1972): Nera from Sasca Montană; 1979 - Caraș from Grădinari; (Bănărescu & Arion-Prunescu, 1981): Caraș from Grădinari and Vrani; (Botoșăneanu & Negrea, 1976): Nera Gorges.

Original data: Caraș River at Goruia, Grădinari, Mercina, Vrani; Nera River from the Gorges down to Naidăș.

Familia Bithyniidae Troschel, 1857

9. *Bithynia tentaculata* (Linnaeus, 1758)

(Grossu, 1942): Timișoara; 1972 - puddles in the Danube's flood area at the Porțile de Fier; (Bușniță et al., 1970): the Danube in the Porțile de Fier area, ponds at km 960, km 1000, km 1032; (Negrea, 1994): the Danube in Baziaș - Gura Văii sector, Moldova Veche, Mraconia (leg. 1975-1982), Cerna and Bahna; (Negrea & Popescu-Marinescu, 1992): gulfs and small lakes from km 1032-1015, at Cozla and km 961, at Ieșelnița.

Original data: near the Mureș River in the Bezdin Lake; Aranca River in Munar - Periam sector; Caraș at Vrani; Nera River downstream Socol; very

abundant in the whole Danube's sector from Banat, sampled from all riverbed's substrata.

10. *Bithynia troschelii* (Paasch, 1842)

(Grossu, 1942) - ponds near Timișoara.

Original data: Bega canal at Pustiniș (Glöer & Sîrbu, 2006).

Familia Hydrobiidae Troschel, 1857

11. * *Potamopyrgus antipodarum* (J. E. Gray, 1843)

An alien species, known in Romania until recently only from the Razim-Sinoie lagoonar system (Grossu, 1986, 1993), under the name *Potamopyrgus jenkinsi*.

Original data: beginning with 2002 it was found several times by the authors on Cerna River in a sector from Băile Herculane downstream. The species probably inhabits the river course down to its flow. It lives downstream the thermal spring outflows, as it happens in other European countries, on and under boulders close to the banks, in slow flow.

12. *Lithoglyphus naticoides* (C. Pfeiffer, 1828)

(col. Bielz and col. Kimakowicz in NHMS): the Cazanele Mici and Orșova; (col. I. P. Licherdopol in „Grigore Antipa“ NMNH): the Danube at Ada Kaleh and Vârciorova (from here quoted as var. *aperta*) and Bega River at Timișoara; (Soós, 1943): along the Danube down to Orșova and in the Caraș; (Grossu, 1942): Bega canal at the entrance in Timișoara (also in col. „Grigore Antipa“ NMNH, leg. 1948); 1972 - Porțile de Fier - Orșova; (leg. 1961): from Nera at Sasca Montană; (Grossu, 1962): the Danube in Coronini - Turnu Severin sector; (Bușniță et al., 1970): the Danube in the Porțile de Fier area (km 943 - 1055); (Bănărescu & Arion-Prunescu, 1981): Caraș at Grădinari; Bănărescu leg. from Timiș at Peciu Nou and Bega at Timișoara (during the 1970s); (Negrea, 1994): the Danube in Baziaș - Gura Văii sector, from Moldova Veche, Svinița, Mraconia, Cerna, Bahna, Pescari and Orșova.

Original data: Bega River at Chizătău, Topolovățu Nou and Timișoara; Timiș River at Hitiaș, Șag and Grăniceri; Caraș River at Grădinari and Vrani; Nera Gorges and downstream Socol; in the Danube at Divici, Gornea, Cozla and Cazanele Mici.

13. *Lithoglyphus apertus* (Küster, 1852)

It is a controversial species; some authors consider it a subspecies or even a morph of *Lithoglyphus naticoides*, while others, among them A. V. Grossu (1987) and R. Bank (in Fauna Europaea) stand for its validity. It was quoted by Negrea & Popescu-Marinescu (1992) also from the Banat's Danube sector (between km. 1055 to 943).

14. *Bythinella dacica* Grossu, 1946

The validity of this endemic species was recently proved by both anatomical and molecular methods (Falniowski et al., 2009 a, b).

(col. Kimakowicz in NHMS): Anina precipice (these specimens were labeled by Kimakowicz as *B. austriaca*, but the most recent studies showed that this species is not present in Romania and that the only species of *Bythinella* living in the area is

B. dacica. Thus, we have strong evidence to assume the affiliation of these specimens to *B. dacica*.; (Grossu, 1974, 1986, 1999): from cold springs and rivulets close to 7 Izvoare („Seven Springs“), at Băile Herculane (Băile Herculane; leg. 1945, in col. „Grigore Antipa“ NMNH), from the Cerna Valley, Semenice and Țarcu Mountains, Timiș springs (at 1400 m).

Original data: rivulets tributaries of the Bega River at Valea lui Liman; brook flowing into Surduc Lake; along Cerna Valley in springs and rivulets, from Băile Herculane 20 km upstream.

Ordo Ectobranchia P. Fischer, 1884

Familia Valvatidae J. E. Gray, 1840

15. *Valvata cristata* O. F. Müller, 1774

(col. I. P. Licherdopol in „Grigore Antipa“ NMNH): from Ada Kaleh; (Negrea, 1994): the Danube in Baziaș - Gura Văii sector; (Grossu, 1974): unspecified puddles and ponds in the Bega basin.

16. *Valvata macrostoma* (Mörch, 1864)

A species with an uncertain status in the area. Possibly some samples quoted as *Valvata pulchella* by Negrea (1994) from the whole Danube, and some puddles or ponds by Grossu (1974), belong to this species.

17. *Valvata piscinalis* (O. F. Müller, 1774)

(Grossu, 1962): the Danube in the Coronini - Turnu Severin sector; (Grossu & Grossu, 1968): the Danube at Coronini, km 1042, Orșova; (Grossu, 1972): puddles in the Danube's flood area in the Porțile de Fier; 1974 - ponds and puddles, such as Țariga or Satchinez; 1986 - Freidorf pond near Timișoara; (Bușniță et al., 1970): the Danube in the Porțile de Fier area (km 943-1055); (Negrea, 1994): the Danube in the Baziaș - Gura Văii sector: Mraconia, Cerna, Bahna, Pescari and Orșova.

Original data: Bega canal at Pustiniș, downstream Timișoara; canal close to the Timiș River at Hitiaș; Nera downstream Socol; along the whole Danube's sector, more frequent in the banks' area; at Divici, Cazanele Mici, Cerna flow, Orșova.

Ordo Pulmonata Cuvier in Blainville, 1814

Familia Acroloxidae Thiele, 1931

18. *Acroloxus lacustris* (Linnaeus, 1758)

(Grossu, 1942): from the Bega River, puddles and marshes with much vegetation near Timișoara and Buhui Lake; 1956 – Țariga pond.

Original data: Bega River Valley at Sintești, in puddles from the flood area; Ochiul Beilui Lake, Nera River Basin.

Familia Lymnaeidae Lamarck, 1812

19. *Galba truncatula* (O. F. Müller, 1774)

(Negrea, 1966): Caraș River Basin; (Grossu, 1942): permanent marshes with aquatic vegetation at Timișoara.

Original data: Bega River at Chizătău; Timiș - Bega canal downstream Coșteiu; Caraș River at Goruia, Grădinari, Mercina and Vrani; the Danube Gorges;

it usually lives in the very neighbourhood of the banks, sometimes above the waterlevel, on all types of substratum.

20. *Stagnicola palustris* (O. F. Müller, 1774)

(Buşniţă et al., 1970): the Danube in the Porţile de Fier area, at Ieşelniţa, ponds at km 960 and 1000; (Grossu, 1942): permanent marshes at Timişoara; 1972 – the Danube at the Porţile de Fier, between the Gorges and Orşova, in the flood area; 1974 - puddles and ponds like Țariga or Satchinez; (Negrea, 1994): small lakes in the Danube's valley at km 1032 and 1000; (Negrea & Popescu-Marinescu, 1992; Negrea, 1994): Ieşelniţa.

Original data: Bega River at Sinteşti.

21.* *Stagnicola turricola* (Held, 1836)

Original data: found in 2002 and 2004 at the Cerna flow, at the entrance in Orşova (based on anatomical evidence, confirmed by P. Glöer).

22. *Radix auricularia* (Linnaeus, 1758)

(Grossu, 1942): marshes at Ronaţ, Blaşcovici, Kunst, Freidorf, Țariga, Timişoara.

Original data: Surduc Lake; Bega River at Chizătău and Pustiniş; Bega Veche River at Beregsău and Cenei; Caraş at Grădinari and Vrani; Nera downstream Socol; along the whole Danube's sector from Banat, especially near the banks and in the tributaries' outlets.

23.* *Radix ampla* (Hartmann, 1821)

Original data: in the Cerna River, inhabiting from upstream Băile Herculane to downstream Topleţ, identified on the basis of anatomical evidence by Glöer & Sîrbu (2006).

24. *Radix labiata* (Rossmässler, 1835)

(col. I. P. Licherdopol in „Grigore Antipa“ NMNH): Moldova Veche; (Grossu, 1955): Miniş Valley; 1967 - in col. „Grigore Antipa“ NMNH from Miniş at Bozovici; (Negrea, 1966): Comarnic Cave, entrance of Poncova, leg. 1965; Caraş River and Miniş River basins; (Buşniţă et al., 1970): the Danube in the Porţile de Fier area, Alibeg, Liuborajdea, Oraviţa, Mraconia; ponds at km 972, 1000, 1015, 1032; spring in Mraconia Valley; (Negrea, 1994): the Danube's Defile at km 1034, 1031, 1023, 1018 and Mraconia; small lakes at Cozla and Dubova (Negrea & Popescu-Marinescu, 1992).

Original data: puddles in the flood area of the Bega River downstream Luncaii de Sus; brook at Valea lui Liman; Timiş River valley, in the riverbed and tributaries, from upstream Teregova down to Armeniş; Nera River at Bozovici and along its gorges; brooks in the upper Cerna Valley downstream to Băile Herculane.

25. *Radix balthica* (Linnaeus, 1758) (syn. *Radix ovata*)

Some of the next quotations have to be regarded as uncertain, because there are no anatomical evidence of the identified specimens. (Buşniţă et al., 1970): the Danube in the Porţile de Fier area, Alibeg, Cruşoviţa; puddles at km 960, 976, 1000; (Negrea, 1994; Negrea & Popescu-Marinescu, 1992): small lakes near the Danube at

km 1000 and 976, Mraconia, Ieşelniţa; (Grossu, 1972): ponds in the Danube's flood area in the Gorges - Orşova reach; 1974 - ponds and puddles at Țariga and Satchinez.

26. *Lymnaea stagnalis* (Linnaeus, 1758)

(col. Kimakowicz in NHMS): Bega River (leg. Traxler, 1890); (Grossu, 1942) - marshes from Timișoara, Ronaț, Blășcovici, Kunst, Freidorf, Țariga; 1972 - puddles in the Danube's flood area at Porțile de Fier.

Original data: Bega River at Topolovățu Nou; lateral canal of the Timiș River at Hitiaș; the Timișul Mort („the Dead Timiș“) at Jebel; Nera downstream of Socol; in the Danube, close to the banks at Baziaș.

Familia Physidae Fitzinger, 1833

27. *Physa fontinalis* (Linnaeus, 1758)

(Bușniță et al., 1970): the Danube in the Porțile de Fier area, Liuborajdea tributary, pond at km 1015, Cozla; (Grossu, 1974): ponds and puddles at Țariga and Satchinez; (Negrea, 1994): the Danube's Defile between km 1054–1031; (Negrea & Popescu-Marinescu, 1992): small lake at Cozla.

Original data: Nera River downstream Socol.

28. *Physella acuta* (Draparnaud, 1805)

(Bușniță et al., 1970): the Danube River in the Porțile de Fier area and the tributaries Bozneățca, Camenița and Mraconia; (Negrea, 1994): Mraconia (leg. 1972, 1974); (Negrea & Popescu-Marinescu, 1992; Negrea, 1994): Porțile de Fier dam lake, the Danube at km 1054, 1025, 1018.

Original data: the Mureș River banks between Săvărsin and Periam Port, and probably the whole river's lower sector; Bega River Valley in a pond at Valea lui Liman; Bega Veche („the Old Bega“) at Beregsău and Cenei; brook at Hitiaș (close to the Timiș River); Caraș River at Vrani; Cerna River along its banks on all substratum types, from downstream Băile Herculane to its flow into the Danube; in the whole Danube's sector from Banat.

Familia Planorbidae Rafinesque, 1815

29. *Planorbarius corneus* (Linnaeus, 1758)

(Ciessin, 1887): „in Banat“; the Danube at Moldova Veche and Ada Kaleh, also from Timiș (col. in „Grigore Antipa“ NMNH); (Grossu, 1942): marshes at Timișoara and surroundings; 1972 - ponds in the Danube's flood area at the Porțile de Fier area; (Bușniță et al., 1970): the Danube in the Porțile de Fier area and ponds at km 960, Ieşelniţa; (Sárkány-Kiss, 1983): Mureș River at Săvărsin, Băluța, upstream and downstream of Chelmac; (Negrea, 1994; Negrea & Popescu-Marinescu, 1992): small lakes in the Danube's Valley at km 1032, 1025 (Camenița), km 1015 (Cozla), km 1000 and 961 (Ieşelnița).

Original data: Bezdin Lake, close to the Mureș River, Aranca River's sector between Bezdin and Periam; Bega River at Remetea and Pustiniș; „Dead Timiș“ River at Jebel; Nera downstream Socol; sporadically along the whole Danube's sector from Banat, especially close to the banks and in gulfs with vegetation.

30. *Planorbis planorbis* (Linnaeus, 1758)

(col. „Grigore Antipa“ NMNH): Vârciorova; (Grossu, 1942, 1955): Bega canal at Timișoara, among plants close to the bank and in permanent marshes; 1972 – the Danube’s ponds and flood area in the Porțile de Fier area (between the Cazanele Mici and Orșova); (Bușniță et al. 1970): the Danube in the Porțile de Fier area; ponds at km 960 at Ieșelnița, km 1000, km 1015 (Cozla), km 1025 (Cămenița), km 1032; (Sárkány-Kiss, 1983): Mureș River at Săvârșin, Băluța, at Chelmac and downstream; (Negrea & Popescu-Marinescu, 1992; Negrea, 1994): the Danube in the Porțile de Fier first damlake; small lakes at km 1032, km 1025 at Cămenița, km 1015 at Cozla, km 1000 and km 961 at Ieșelnița. Although Grossu (1942) reported also *Planorbis carinatus* O. F. Müller, 1774 from marshes close to Timișoara, there is some evidence that it was a morph of *P. planorbis*. Up to present there is no reliable proof of *P. carinatus*’ presence in Banat.

Original data: Bezdin Lake; Aranca River in Munar – Periam sector; lateral canal and brook at Hitiaș in the Timiș River Valley; „Dead Timiș” at Jebel; in the Danube at the Cerna River flow and at Orșova, in fluvial bays.

31. *Anisus spirorbis* (Linnaeus, 1758)

(col. Blz. in NHMS, and Bielz, 1867): Bistra River close to the Transylvanian Iron Gate (upstream of Bucova, Timiș River Basin); (Grossu, 1974): ponds and puddles from Banat, like Ronaț, Blășcovici and Kunst; (Negrea, 1994): the Danube at Berzasca (Negrea & Popescu-Marinescu, 1992).

Original data: Cerna River flood area, in puddles covered with aquatic and paludal flora, 4 km upstream Topleț.

32. *Anisus calculiformis* (Sandberger, 1874)

(Grossu, 1942): Bega canal at Timișoara, among plants close to the bank; 1974 - ponds and puddles from Banat. Probably the individuals found by Grossu in marshes at Timișoara, and quoted as *Anisus rotundatus* are in fact *Anisus calculiformis*. Despite the fact that *A. rotundatus* was later usually ascribed to *Anisus leucostoma* (Millet, 1813) it is questionable if the latter is able to survive at such low altitudes (up to the present it was reported in Romania only from mountain or hilly regions). Anyhow, in 1955, Grossu quoted „*Anisus leucostomus*” from Timișoara, but he revised his opinion, and did not include this species in the Banat fauna. It is still a matter of question, to be solved in the future.

33.* *Anisus vortex* (Linnaeus, 1758)

Original data: „Dead Timiș” at Jebel; Nera River downstream Socol („the Dead Nera”); empty shells close to the Danube’s River bank near Divici.

34. *Anisus vorticulus* (Troschel, 1834)

(Grossu, 1942): permanent marshes covered by vegetation at Timișoara; Bega canal, among vegetation near the bank; 1972 - puddles from the Danube’s flood area in the Porțile de Fier area, between the Gorges and Orșova; (in col. „Grigore Antipa” NMNH): Freidorf pond at Timișoara, leg. Grossu, 1946.

35. *Gyraulus albus* (O. F. Müller, 1774)

(Grossu, 1942): Timișoara, in Țariga pond and Bega canal; 1972 - the Danube’s puddles and flood area between the Gorges and Orșova; (Bușniță et al., 1970): the Danube in the Porțile de Fier area, ponds at km 960 (Ieșelnița), km 972

(Dubova), km 1015 (Cozla); (Negrea, 1994): the Danube at Ieşelniţa and Bahna, small lakes at Cozla, Dubova and Ieşelniţa.

Original data: the Bega Veche (Old Bega) at Cenei; lateral canal of the Timiş River at Hitiaş; in the Danube's fluvial bay at the entrance in the Mraconia Valley, especially among aquatic vegetation; the same habitat type at the Cerna River flow at Orşova.

36. *Gyraulus laevis* (Alder, 1838)

(Soós, 1943): Arad; (Buşniţă et al., 1970): the Danube in the Porţile de Fier area (km 943-1055); (Grossu, 1987): Timişoara, ponds close to the Bega River; (Negrea, 1994): the Danube, in the Porţile de Fier first dam lake, and between km 1055-943 (Negrea & Popescu-Marinescu, 1992).

Original data: Cerna River 4 km upstream of Topleţ; the Danube downstream the Gorges from shallow water with aquatic vegetation; the Mala tributary flow; the Cerna flow fluvial bay at Orşova.

37. *Gyraulus (Armiger) crista* (Linnaeus, 1758)

(Grossu, 1942, 1955, 1974, 1987): Țariga and Freidorf ponds at Timişoara, and also from the Aranca River.

38. *Hippeutis complanatus* (Linnaeus, 1758)

(Grossu, 1942): permanent marshes covered with aquatic vegetation at Timişoara; (col. „Grigore Antipa“ NMNH): Freidorf pond, leg. Grossu, 1946; 1987 - Lacul Dracului (The Devil's Lake) in the Nera Gorges.

Original data: the Danube Valley in the Mraconia fluvial bay, close to the bank, among vegetation.

39. *Segmentina nitida* (O. F. Müller, 1774)

(col. „Grigore Antipa“ NMNH): Satchinez, leg. Grossu, 1965.

40. *Ferrissia wautieri* (Mirolli, 1960) (syn. *Ferrissia (Pettancylus) clessiniana* (Jickeli, 1882))

(Grossu, 1987): Freidorf pond at Timişoara; Buhui Lake.

Original data: Bezdin Lake in Mureş River Basin; Bega River at Chizătău (empty shells) and at Pustiniş, on plants; Mraconia fluvial bay in the Danube's Valley.

41. *Ancylus fluviatilis* O. F. Müller, 1774

(col. Bielz in NHMS): Cerna River at Mehadia; (Grossu, 1942): „in Banat“; 1955 - Miniş Valley, Băile Herculane, Nera, Beiu Sec, Caraş rivers, in the surroundings of Timişoara; (col. „Grigore Antipa“ NMNH): leg. Grossu, 1956 from the Cerna River at Băile Herculane; (Grossu, 1972): Porţile de Fier, outflow of some Danube's tributaries; 1974 - „all mountain waters with stony substratum from Banat“; (Buşniţă et al., 1970): the Danube in the Porţile de Fier area - the tributaries Plavişevita, Mraconia, Ieşelniţa, Cerna and Vodiţa; ponds at km 960 (Ieşelniţa), km 1000, km 1015 (Cozla), km 1025 (Camenita); (Botoşaneanu & Negrea, 1976): Nera Gorges; (Negrea & Popescu - Marinescu, 1992; Negrea, 1994): the Danube confluence with Mraconia tributary (leg. 1974 and 1975); confluence with the tributaries Plavişevita (km 976), Ieşelniţa (km 961), Cerna (km 954) and Vodiţa (km 953); small lakes at Camenita (km 1025), Cozla (km 1015), Ieşelniţa (km 961).

Original data: along the Bega River from Luncanii de Sus to Sintești; Timiș River from the springs area to Petroșnița (upstream Caransebeș); Caraș River from the Gorges to Grădinari; Nera River from Pătaș to Naidăș; the Cerna River from 20 km upstream Băile Herculane down to its flow into the Danube, in its tributary Belareca. In most small tributaries of the Danube, occasionally around their flow: Liubotina, Mraconia, Ogralena, Mala.

Classis Bivalvia Linnaeus, 1758
Ordo Unionoida Stoliczka, 1871
Familia Unionidae Rafinesque, 1820

42. *Unio pictorum* (Linnaeus, 1758)

(Grossu, 1962): Niarad pond at Timișoara (leg. 1943); the Danube in the Coronini - Turnu Severin reach and ponds in the flood area; (Bușniță et al., 1970): the Danube in the Porțile de Fier sector (km 943-1055); (Sárkány-Kiss, 1983): the Mureș River at Chelmac.

Original data: along the Timiș River between Hitiaș and Șag; Caraș River at Vrani; empty shells in the Bega at Chizătău and in the Old Bega at Beregsău; in the whole riverbed of the Danube at Baziaș, close to the bank downstream of Moldova Veche, at the Cornea tributary outflow, and at Cozla.

43. *Unio tumidus* Philipsson, 1788

(Grossu, 1962; Grossu & Grossu, 1968): the Danube in the Coronini and Turnu Severin sector; (Bușniță et al., 1970): the Danube in the Porțile de Fier area (km 943 - 1055); (Sárkány-Kiss, 1983): Mureș River at Chelmac; 1989 - the lower sector of the Mureș River.

Original data: Timiș - Bega canal at Coșteiu, empty shells at Chizătău; Timiș River at Șag; Caraș River at Vrani; Nera at Socol; in the Danube from Baziaș, Divici, Cozla, Moldova Veche, Cazanele Mici.

44. *Unio crassus* Lamarck, 1819

(Kobelt & Haas, 1911, ap. Grossu, 1962): Mureș River at Arad; (Grossu, 1962): in Bega close to Timișoara and surroundings, Timiș River at Lugoj, Mureș at Arad; (Bușniță et al., 1970): the Danube in the Porțile de Fier area (km 943-1055); (Botoșăneanu & Negrea, 1976): Nera Gorges; (Popescu & Prunescu-Arion, 1961; Grossu, 1962): in the Danube in Coronini - Turnu Severin sector; (Sárkány-Kiss, 1983): Mureș River at Chelmac.

Original data: Bega between Sintești and Chizătău; Timiș-Bega canal at Coșteiu; Timiș River at Găvoajdia, Hitiaș and Șag; Caraș from Goruia, down to Grădinari, Mercina and Vrani; Nera between Bozovici and Naidăș; only empty shells from the Danube at Cozla; probably extinct in the lower Mureș River. Because of the dams built at the Porțile de Fier it became most likely extinct from this Danube's sector.

45. *Anodonta cygnaea* (Linnaeus, 1758)

(Sárkány-Kiss, 1983): Mureș River at Chelmac.

Original data: Mureș River upstream of Arad (leg. Doru Bănăduc); Bega River at Topolovațu Nou; Timiș-Bega canal at Coșteiu; Timiș River at Hitiaș and

Şag; Caraş River at Vrani; Nera at Socol; in the Danube at Baziaş, Divici, Moldova Veche, Cozla, Cazanele Mici and Mraconia bay (surely the whole Danube's sector from Banat).

46. *Anodonta anatina* (Linnaeus, 1758)

(Buşniţă et al., 1970) quoted as *A. piscinalis* from the Danube in the Porţile de Fier area.

Original data: Bega River Valley in a pond at Valea lui Liman; Surduc Lake; Bega River at Chizătău; Timiş River at Găvojdia, Hitiaş and Şag; Timiş-Bega canal at Coşteiu; Caraş River at Grădinari; in the Danube at Baziaş; empty shells downstream the Gornea flow.

47. *Sinanodonta woodiana* (Lea, 1834)

In the lower Mureş River at Pecica (Sárkány-Kiss, *in verbis*, 2001).

Original data: Bega River at Chizătău; Timiş River at Hitiaş and Şag; Caraş River at Vrani (first sampled from Banat in 1998 by the authors) and Mercina; in the Danube at Baziaş (close to the bank, thousands of young individuals), at Divici, downstream of Gornea flow, Mraconia bay in the Cazanele Mici, Cerna fluvialile bay at Orşova.

48. *Pseudanodonta complanata* (Rossmässler, 1835)

(Grossu, 1942): Bega at Timişoara, from a canal with sandy substratum; 1962 - from the Danube at Moldova Nouă; (Sárkány-Kiss, 1983): Mureş River at Chelmac.

Original data: Timiş River at Hitiaş and Şag; along the Danube only empty shells found in sediments.

Ordo Veneroida H. & A. Adams, 1856

Familia Corbiculidae J. E. Gray, 1874

49. *Corbicula fluminea* (O. F. Müller, 1774)

This species was first sampled in Romania from the Danube in the Porţile de Fier sector, at Berzasca and Moldova Nouă, in 1997 (Skolka & Gomoiu, 2001) and in 1999 from Vadu Oii, by Bij De Vaate & Hulea (2000). As yet, it lives along the whole Romanian Danube's course and in the Danube Delta.

Original data: sampled along the whole Danube's sector from Banat, between Baziaş and Turnu Severin.

Familia Sphaeriidae Deshayes, 1855 (1820)

50. *Sphaerium corneum* (Linnaeus, 1758)

(Sárkány-Kiss, 1988): Mureş River at Pecica.

Original data: Bega River at Topolovăţu Nou.

51. *Sphaerium rivicola* (Lamarck, 1818)

(Grossu, 1962): along the Danube.

Original data: along the whole Danube's sector from Banat, between Baziaş and the Gorges.

52. *Musculium lacustre* (O. F. Müller, 1774)

(Sárkány-Kiss, 1989): sporadic in the lower Mureş Valley, in the flood area, in shallow waters, muddy ditches, puddles and dead branches.

Original data: canals in the Bezdin area (Aranca Valley); in the Cazanele Mici and Mraconia fluviatile bay, at the flow of Cerna River at Orşova.

53.* *Pisidium amnicum* (O. F. Müller, 1774)

Original data: Bega River at Chizătău and Topolovăţu Nou; Timiş River at Şag; Caraş River at Grădinari; Nera River in the Gorges and at Naidăş; Cerna River at its entrance in the Timiş-Cerna corridor; the Danube Gorges and rivulet tributary of the Danube, upstream Divici.

54.* *Pisidium casertanum* (Poli, 1791)

Original data: Timiş River basin in rivulets at Teregova and upstream, ponds at Petroşniţa; Nera River along the Gorges downstream to Socol; Bega River Basin in puddles close to the river at Luncanii de Sus; rivulet tributary to the Danube River at Coronini, Cerna River flow in the Danube, close to Orşova.

55. *Pisidium personatum* Malm, 1855

(col. Grossu in „Grigore Antipa“ NMNH, leg. 1955): spring at Sasca Montană, from the Nera River Basin.

Original data: springs at Surduc Lake (Bega River Basin); rivulet close to Teregova (Timiş River Basin); Cerna River Valley, brooks and springs in the 7 Izvoare area, and in the Cerna River at its entrance in the Timiş-Cerna corridor; in the Danube Valley, rivulet upstream of Coronini and in the Mala tributary close to its flow into the Danube.

56.* *Pisidium henslowanum* (Sheppard, 1823)

Original data: Bega River at Topolovăţu Nou; the Danube River upstream of Divici, close to the banks; in the Cazanele Mici area.

57.* *Pisidium milium* Held, 1836

Original data: small canal covered with vegetation near the Timiş River at Hitiaş.

58.* *Pisidium subtruncatum* Malm, 1855

Original data: Bega River at Topolovăţu Nou; Timiş Basin, Trei Ape Lake, rivulets in the Timiş - Cerna corridor at Teregova, puddles along the riverbank at Petroşniţa (upstream of Caransebeş); Caraş River at Grădinari; Nera River from the Gorges downstream to Socol; Cerna River downstream Toplet, in fine sediments close to the riverbanks; the Cazanele Mici and in the Mraconia fluviatile bay.

59.* *Pisidium moitessierianum* (Paladilhe, 1866)

Original data: Bega River at Chizătău.

Familia Dreissenidae J. E. Gray, 1840

60. *Dreissena polymorpha* (Pallas, 1771)

(Grossu, 1962): the Danube in the Coronini - Turnu Severin sector; (Grossu & Grossu, 1968): Coronini, km 1042 and Orşova; (Buşniţa et al., 1970): the Danube in

the Porțile de Fier area (km 943-1055); and many other sources quoted it from the same sector.

Original data: the whole Danube's sector from Banat, from Baziaș downstream to Orșova, sampled from all depths, mainly from solid substratum (stones, wood, concrete, other species' shells, etc.).

61. *Dreissena bugensis* (Andrusov, 1897)

Although up to the present this alien invasive species was not sampled in the Banat Danube's sector, it is almost impossible that it does not populate this stretch, being first sampled from the Danube at Cernavodă (Micu & Telembici, 2004), than it was found in 2005 close to the Banat's sector downstream edge, at Drobeta Turnu Severin (Popa & Popa, 2006 a, b). Soon afterwards Molloy et al. (2007) quoted it from The Netherlands and Imo et al. (2010) from Germany. All sources point out that its expansion in Europe occurred from East towards West, by means of the Danube - Main - Rhine canals. Therefore, finding this species in Banat is just a matter of time, thus we include it in this catalogue.

DISCUSSION

Among the 61 freshwater mollusc species identified up to the present in Banat, 10 are reported for the first time by the authors of the present paper, while 10 species have not been found again after 1998, but their presence is still highly likely in this area. Probably the single taxa that went extinct is *Theodoxus transversalis*, due to environmental debasement and pollution, like it happened also in other areas, like Transylvania, Crișana, and the rest of the Danube's sector from Romania and other countries from Central Europe. A synthesis regarding the total number of species encountered in the researched rivers' basins from Banat is given in table 1 and plotted in figure 1.

Table 1

The freshwater mollusc species identified in Banat (past and present-day data).

Hydrographic basin Species	Danube's sector from Banat	Cerna River Basin	Nera River Basin	Caraș River Basin	Timiș River Basin	Bega River Basin	Mureș sector from Banat
1. <i>Theodoxus transversalis</i>	•		•				•
2. <i>Theodoxus fluviatilis</i>	▲						
3. <i>Theodoxus danubialis</i>	▲		▲	▲		•	
4. <i>Viviparus contectus</i>						•	•
5. <i>Viviparus acerosus</i>	▲		▲	⊕	⊕	⊕	▲
6. <i>Fagotia esperi</i>	▲		▲	⊕	•		
7. <i>Fagotia d. acicularis</i>	▲		▲	⊕	•		
8. <i>Holandriana holandrii</i>			▲	▲	•		
9. <i>Bithynia tentaculata</i>	▲		▲	▲		•	▲
10. <i>Bithynia troschelii</i>						▲	•
11. <i>Potamopyrgus antipodarum</i>		▲					

Table 1 (continued)

Hydrographic basin Species	Danube's sector from Banat		Cerna River Basin		Nera River Basin		Caraș River Basin		Timiș River Basin		Bega River Basin		Mureș sector from Banat	
52. <i>Musculium lacustre</i>	▲												▲	●
53. <i>Pisidium amnicum</i>	▲		▲		▲		▲		▲		▲			
54. <i>Pisidium casertanum</i>	▲				▲				▲		▲			
55. <i>Pisidium personatum</i>	▲		▲			●			▲		▲			
56. <i>Pisidium henslowanum</i>	▲										▲			
57. <i>Pisidium milium</i>									▲					
58. <i>Pisidium subtruncatum</i>	▲		▲		▲		▲		▲		▲			
59. <i>Pisidium moitessierianum</i>											▲			
60. <i>Dreissena polymorpha</i>	▲	●												
61. <i>Dreissena bugensis</i>		?	●											
Total by column	37	34	11	2	22	11	19	9	24	5	29	32	9	14
TOTAL BY BASIN	48		11		25		21		25		45		18	
New identified in the river basin	13		9		14		12		21		13		4	

Used codes: ▲ - identified by the authors, beginning with 1998 up to the present; ● - reported by other authors before 1998 or present in older collections from Sibiu and Bucharest; ? - doubtful status or report; ⊕ - only empty shells have been found by the authors.

Among the rivers' basins from Banat the highest number of species (48, among them 37 recently found by the authors) is sheltered by the Danube's River sector, followed by the Bega River Valley, while in the Cerna River the lowest range of taxa was encountered. The rest of the researched basins are characterized by intermediate aquatic Mollusca fauna richness. Diversity of the fauna is linked to the basin's surface, range of altitudes and habitats' categories and heterogeneity, environmental state and degree of pollution.

Regarding the uncertain systematical status, we highlight that of *Lithoglyphus apertus*, which has to be solved in the future. Some subspecific taxa were critically discussed in the literature, like it happened with the *Holandriana holandrii* subspecies considered by Grossu (1986, 1993), but put under question by Sîrbu (1998), being most likely morphs or ecological forms, without systematical significance. The status of the endemic *Bythinella dacica* Grossu, 1946 was confirmed by recent molecular studies (Falniowski et al., 2009 a, b), while the presence in Romania of *Bythinella austriaca* (reported from Banat, Crișana, Transylvania and Maramureș) was invalidated, i.e. the spring-snails sampled from these areas were assigned to other 6 species, among them four being new to science (idem). In Banat the most distinctive freshwater mollusc communities are the extremely abundant prosobranchs from Nera and Caraș rivers (belonging to *Holandriana*, *Fagotia* and *Theodoxus* genera). These communities are unique in Romania and one of the very seldom encountered in Europe as well. A recent molecular phylogeny research concerning some Melanopsidae, including *Fagotia acicularis* from Răbăgani (the species living also in Banat) and *Melanopsis parreyssii* from Ochiul Mare, Băile 1 Mai [1 May Resort] (both in Bihor county,

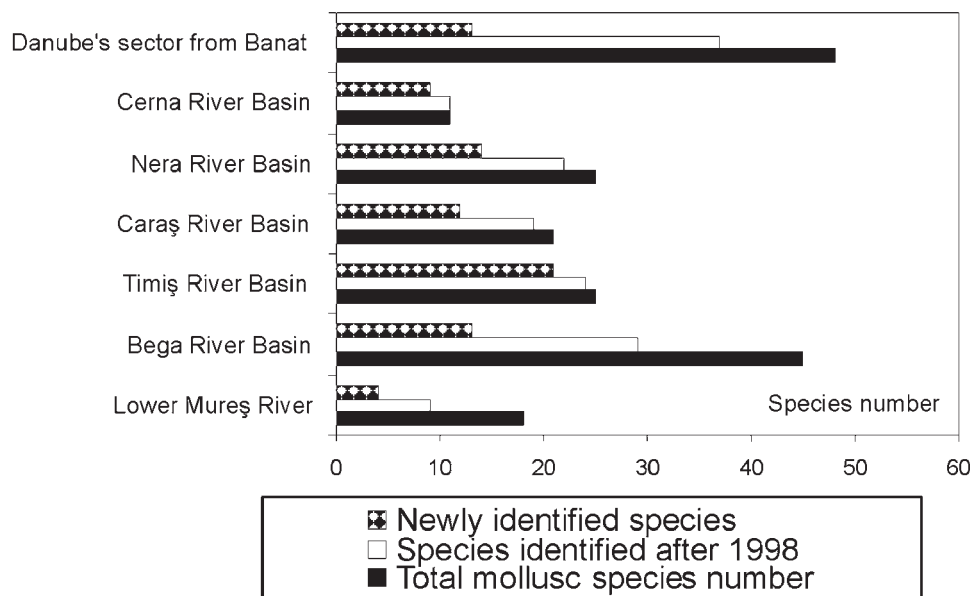


Fig. 1 - Distribution of freshwater mollusc species in the researched rivers' basins from Banat.

Crișana region, Romania) was published by Smoleń & Falniowski (2009). According to the maximum likelihood trees based on sequences of ribosomal 18S confirm the placement of the Melanopsidae within the Cerithioidea, as well as the monophyly of the latter group, while the sequences of mitochondrial COI-based tree confirms the placement of the Melanopsidae within the Cerithioidea, but does not confirm the monophyly of either Melanopsidae or Cerithioidea. The results suggest that *Fagotia* should be synonymised with *Melanopsis*, while *Holandriana* is a distinct genus. The application of molecular clock, with one point calibration for COI for the Hydrobiidae, estimated the times of divergence as 2.53 ± 0.56 Mya for *M. parreyssii* and *F. acicularis*, 9.49 ± 1.67 Mya for *M. parreyssii* and *H. holandrii*, and 10.71 ± 1.88 Mya for *F. acicularis* and *H. holandrii*. 2.5 Mya coincides with the beginning of the glacial period in Europe, and 8–12 Mya was the time when the Pannonian Lake covered the largest area.

Questions have to be raised also for the Unionidae. Along the time, several subspecies, varieties or forms have been described or recognized by several authors (Kobelt & Haas, 1911; Grossu, 1962 etc.) which we consider today morphs or ecological forms, without systematic status. The hystorical data, regarding the problematic discrimination between *Anodonta cygnaea* and *Anodonta antina*, are also doubtful until further evidence.

Besides the systematic uncertainties, there are also some species for which we do not have the evidence of their presence, yet, like *Anisus leucostoma* and *Dreissena bugensis*.

The quagga mussel *Dreissena rostriformis bugensis*, native to the Dnieper and the northern Black Sea, has become a major invasive species both in the Volga River and the North American Great Lakes since the early 1990's (Popa, 2008; Imo et al., 2010). Most likely it already inhabits scattered sectors along the Danube, Main and Rhine rivers, as several sources indicate (Micu & Telembici, 2004; Popa

& Popa, 2006 a, b; Molloy et al., 2007; Popa, 2008; Imo et al., 2010). Its East towards West expansion occurred through the Danube - Main canal, a pathway that is becoming increasingly recognized as a southern corridor for the potential movement of non-indigenous aquatic species between Eastern and Western Europe (Molloy et al., 2007). In the present, its alien range in Central and Eastern Europe includes the Rhine river and the Delta (idem), the Main and the Main-Danube canal in Germany (Imo et al., 2010). Several genetic analysis were made, pointing the high population diversity, the lack of funder effect, the low differentiation between the German, North American and the Southeast Danube populations (Popa & Popa, 2006 a, b; Popa et al., 2007; Popa, 2008; Imo et al., 2010). According to Imo et al. (2010) the genetic data suggest that the invasive populations from Germany derive from a common and rapidly expanding source. Based on the non-continuous distribution and shell size differences of Rhine harbour and Main populations, their results indicate that expansion in Germany involved at least two independent settling events, one of which happened before 2005, and most likely was caused by jump dispersal (idem).

Corbicula fluminea, also an alien invasive species, used the same way (Rhine - Main - Danube), but vice-versa, namely from West towards East (Popa, 2008). In Romania it was first encountered at Berzasca, in the Porțile de Fier area in 1997 (Skolka & Gomoiu, 2001), two years later it was found downstream, at Vadu Oii (Bij De Vaate & Hulea, 2000). In the present, it inhabits the whole length of the Danube. Other non-indigenous species, which invaded during the last decades the waters from Banat, are *Sinanodonta woodiana* (its dispersal history was established in several papers, like Sîrbu & Sîrbu, 1998; Sárkány-Kiss et al., 2000; Sîrbu et al., 2006; Popa, 2008 etc.), *Potamopyrgus antipodarum*, found in Cerna River downstream Băile Herculane, being confined to the natural thermal water outflows, and *Physella acuta*.

Concerning the ecological characteristics and categories, Bănărescu & Sîrbu (2002) classified the species from Banat in 5 categories, namely: (1) inhabitants of small mountain brooks, (2) rheo-oxyphilic species, inhabiting flowing waters, (3) species inhabiting mainly lowland rivers, on soft (sandy and muddy) substratum, (4) species inhabiting stagnant or slow-flowing waters, pools, ponds or marshes, being found mainly on plants, sometimes on muddy or sandy substratum and (5) ubiquitous euribiont species, inhabiting all kind of waters, prevailing in eutrophised habitats. The peculiar features of the Banat Mollusca fauna are the evenness of these categories, which are all well represented, and the extremely abundant and widely distributed prosobranchs, which in the rest of the country are scarce, scattered, with a low number of species per site. The Nera Gorges appear to be still one of the last river sectors with pristine conditions, close to the natural state, but these conditions become increasingly altered downstream.

Once there were encountered rich prosobranch communities both in lower sectors of the Nera and Caraș rivers, as was stated by Bănărescu & Oprescu (1971), Bănărescu & Arion-Prunescu (1981, 1982, 1983). In the present, the former communities are almost absent or severely damaged because of organic pollution (especially discharges of household wastewaters), but also from local industries and hydrotechnical plants. For instance during the last years in the Nera River close to Latina and downstream of Naidăș, as well as in the Caraș River upstream of Mercina towards Vrani, there have been found only scattered individuals of some few

prosobranchs, instead of the former rich and abundant community, quoted by several sources in the 20th century. These sectors show a high load of organic matter.

Riverbanks damming and other hydro technical works are extremely aggressive along the Timiș River's course and on the Bega, especially in the last decades. The Bârzava River is the most polluted because of industrial wastewater discharges.

Thus, although rich and in some areas very abundant, the freshwater mollusca fauna from Banat is increasingly endangered because of anthropogenic environmental changes, desiccation and draining of wetlands, sediments' exploitation, debasement of the flood areas and both industrial and - during the last decade especially raised - household pollution. To all these threats the invasion of alien species has to be added.

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MOLUȘTELE ACVATICE DULCICOLE DIN BANAT (ROMÂNIA)

REZUMAT

Fauna moluștelor acvatice din Banat cuprinde 61 de specii (dintre care 41 de gastropode și 20 specii de bivalve). 10 specii sunt nou identificate în această arie de către autori. Această lucrare prezintă catalogul sistematic și chorologic al malacofaunei dulcicole, evidențierea elementelor cele mai caracteristice și semnificative, a amenințărilor reprezentate de impactul antropic asupra apelor din zonă și a comunităților de moluște din acestea.

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SOME REMARKS ON THE FAMILY TANZANAPSEUDIDAE, WITH THE DESCRIPTION OF THREE NEW SPECIES AND THE VALIDATION OF THE GENUS *ACANTHAPSEUDES* ROMAN, 1976 (CRUSTACEA: TANAIDACEA: APSEUDOMORPHA)

MODEST GUȚU

Abstract. Two new species of the genus *Tanzanapseudes* Băcescu, 1975 (*T. bacescui* n. sp. and *T. mirificus* n. sp.) and one belonging to the genus *Acanthapseudes* Roman, 1976 (*A. hansgeorgmuelleri* n. sp.) from the islands Sri Lanka and Mauritius (Indian Ocean) are described and illustrated, as a result of the synonymization and invalidation of the genus *Acanthapseudes* with *Tanzanapseudes*. At the same time, some morphological data on a doubtful species of the genus *Tanzanapseudes* (from Mozambique Channel) are presented, and manca I and II stages in *T. mirificus* n. sp. and manca I in *A. hansgeorgmuelleri* n. sp. are described, unknown in tanzanapseudids up to now. Also, new diagnoses (of the family Tanzanapseudidae and of the two genera), as well as the identification key of the genera and species of the above-mentioned family are presented.

Résumé. On décrit deux nouvelles espèces du genre *Tanzanapseudes* Băcescu, 1975 (*T. bacescui* n. sp. and *T. mirificus* n. sp.) et une espèce appartenant au genre *Acanthapseudes* Roman, 1976 (*A. hansgeorgmuelleri* n. sp.) des îles Sri Lanka et Mauritius (Océan Indien). A cette occasion on a invalidé la synonymisation du second genre avec le premier. On présente aussi quelques données morphologiques d'une espèce incertaine du genre *Tanzanapseudes* (collectée dans le canal Mozambique) et on décrit les stades manca I et II de *T. mirificus* n. sp. et manca I chez *A. hansgeorgmuelleri* n. sp., stades décrits pour la première fois chez les Tanzanapseudides. On présente aussi de nouvelles diagnoses, amendées, pour la fam. Tanzanapseudidae et ses deux genres, ainsi qu'une clé commune d'identification des genres et des espèces de cette famille.

Key words: Tanzanapseudidae, *Acanthapseudes*, *A. hansgeorgmuelleri* n. sp., *Tanzanapseudes*, *T. bacescui* n. sp., *T. mirificus* n. sp.

Băcescu (1975) described a very interesting tanaidacean genus, *Tanzanapseudes* (with two species, *T. langi* and *T. longiseta*), included by him in a new family, Tanzanapseudidae, from the Western Indian Ocean (Coasts of Tanzania).

Roman (1976), without knowing the Băcescu's paper (op. cit.), described a similar species to *Tanzanapseudes*, classified by her in other new genus, *Acanthapseudes* (family Metapseudidae in Roman's opinion), from the same geographical area (near the Madagascar Island). It is about the species *A. elegans* Roman, 1976. Three years later, Kudinova-Pasternak (1979) synonymized the Roman's genus to *Tanzanapseudes*, this synonymy being agreed by all specialists.

Müller (1992) described a new tanzanapseudid species (*T. polynesiensis*) from the French Polynesia (Bora Bora Island), and, recently, Stepien & Blazewicz-Paszkowycz (2009) described other two species (*Tanzanapseudes levis* and *T. nieli*), from the Western Australia, raising to six the number of the species classified in the genus *Tanzanapseudes*.

Studying several specimens from the North-western Indian Ocean, sent by the late Dr. Hans-Georg Müller and by Prof. Dr. Marie-Louise Roman, I discovered the presence of other three new tanzanapseudid species. At the same time, I was

surprised observing that one of the species has the body setae different from those of the other *Tanzanapseudes* species, but resembling to those of the type-species of the genus *Acanthapseudes* Roman, 1976, this thing making me to consider the genus described by Roman (op. cit.) valid.

Further on, I shall present new diagnoses for the family Tanzanapseudidae and genera *Acanthapseudes* and *Tanzanapseudes*, as well as the descriptions of the three new species (from the islands Sri Lanka and Mauritius), belonging to the mentioned genera. At the same time, I present some morphological data on a doubtful species of the genus *Tanzanapseudes* (collected during the French Expedition „Benthedî”, 1977, from the Mozambique Channel), whose identity I haven’t established, because of the bad conservation conditions. Also, I describe the manca I and II stages of the two genera (unknown up to now in tanzanapseudids), and, in the final part of the paper, I present the identification key of genera and species included in the already mentioned family.

Remarks on terminology. Being consistent with the terminology used by me in my previous papers (Guțu, 1981, 1996, 2006, etc.), as well as of the other specialists (Băcescu, op. cit.; Roman, op. cit.; Kudinova-Pasternak, 1978, etc.), pereopods II-VII correspond now to the pereopods I-VI (Larsen, 2003; Müller, op. cit.; Stepien & Blazewicz-Paszkowycz, op. cit., etc.).

Family Tanzanapseudidae Băcescu, 1975

Although, initially, family Tanzanapseudidae was considered valid (Kudinova-Pasternak, 1978; Sieg & Winn, 1978; Guțu, 1981), later, some tanaidologists (Sieg, 1980, 1983 a, b, 1984; Müller, op. cit.) considered it a subfamily of the family Metapseudidae, a family in which Roman (op. cit.) classified the genus *Acanthapseudes*, described by her (genus synonymised by Kudinova-Pasternak, 1979, as I have mentioned above, with *Tanzanapseudes*). In a brief comment on Metapseudidae, Guțu (1996: 85-86) pleads for the validation of the family Tanzanapseudidae, opinion agreed by all specialists now.

As a result of the analysis of the morphological features, characteristic to the known species, I considered necessary to work out a new diagnosis of the family Tanzanapseudidae (as well as of the two genera), for eliminating all present confusions.

New diagnosis (modified after Guțu and Sieg, 1999).

Body short (at most 2.2 mm long) and broad (about 1.4 times as long as wide), oval in dorsal view, strongly dorsoventrally flattened, with 31 great triangular prolongations around (each of them having small denticles on both margins, and some, simple or plumose, setae), giving it an aspect of a star. Carapace large, shorter than wide, with an anteromedian great and acute rostrum (denticulated on sides and with some, simple or plumose, setae) and two prolongations (denticulated or not, but without setae) situated on sides of rostrum; each lateral margin of carapace with four long expansions (denticulated and with simple or plumose setae); ocular lobes well defined, with pigmented visual elements. Pereon with six short but wide pereonites, each of them having great epimeres (denticulated and with simple or plumose setae, similar to lateral prolongations of carapace), excepting the pereonites three and four which have, in addition, two long simple setae on the anterior and posterior margins, respectively. Pleon, narrower caudally (having the pleonites and pleotelson fused in a single segment), with six lateral (three on each side) and two caudal prolongations

(pleotelson), similar to those of carapace or pereonite epimeres. Antennule with a long three-articulated peduncle; first article great, having some spiniform processes on both sides; outer and inner flagella uni-articulated, the outer one much greater than the inner flagellum. Antenna, seven-articulated, without squama. Mandible and maxillule with three- and two-articulated palp, respectively. Labium palp (terminal lobe) ovate, ended in a long spine. Maxilliped with a very short coxa; basis broad (about two times shorter than wide), with some long plumose setae on the inner margin; palp, four-articulated, each of the last two articles being only a little smaller than the second one; endite larger than the second palp article; caudodistal inner seta simple (not leaf-shaped). Epignath cup-shaped, with a well developed spine. Cheliped dimorphic (stronger in males), without exopodite. Pereopod II of embracing-type, with exopodite, is characterized by a relatively small basis (shorter than propodus), a great ischium (only a little smaller than carpus), a well developed merus (greater than carpus), a thick dactylus (with a strong claw), and the presence of some robust sternal spines only on propodus. Pereopods III and IV similar to pereopod II, excepting the presence of exopodite. Pereopods V-VII, also of embracing-type, differs from the first three ones by the length of merus, which is shorter than carpus. Pleopods, in three pairs, biramous, the basal article being longer than the longest branch. Uropod, biramous; exopodite two-articulated; endopodite, usually, four-articulated.

Composition (2 genera with 9 species): *Acanthapseudes* Roman, 1976 and *Tanzanapseudes* Băcescu, 1975.

Geographical distribution: Indian Ocean and Southern Pacific.

Remarks. As it results from the description of the adults of the family Tanzanapseudidae nine species (including the three new species described in this paper), the setae from the rostrum level and of the lateral prolongations of the body can be simple (in *Acanthapseudes hansgeorgmuelleri* n. sp., fig. 9, and *A. elegans*, cf. Roman, op. cit.: 156 and fig. 1) or plumose (in the other seven species, considered to belong to the genus *Tanzanapseudes*, by me, figs 1, 7; Băcescu, op. cit.: 83 and fig. 1 A; Müller, op. cit.: 102 and fig. 1; Stepien & Blazewicz-Paszkowycz, op. cit.: figs 1, 4). As regards the species with plumose setae, the pereonites 3 and 4 have two simple long setae each, on the posterior margin and, respectively, the anterior margin of the epimere (Fig. 1; Băcescu, op. cit.: fig. 1 A; Müller, op. cit.: 102). Although in the species *Tanzanapseudes levis* and *T. nieli* these setae are plumose, as it results from the illustration presented by Stepien & Blazewicz-Paszkowycz (op. cit.: figs 1, 4), in the description, the two authors do not refer to their aspect. I presume that they are simple, as in the other species. Also, the rostrum configuration is not known in *T. levis* (cf. Stepien & Blazewicz-Paszkowycz, op. cit.: 47 and fig. 4).

As regards appendages of the adults, they are not too different for permitting the delimitation the two systematic “groups”, *Acanthapseudes* and *Tanzanapseudes* (Figs 2-4, 7, 10; Băcescu, op. cit.; Roman, op. cit.; Müller, op. cit.; Stepien & Blazewicz-Paszkowycz, op. cit.).

It is interesting that the difference between the setae of the adults (simple in *Acanthapseudes*, fig. 9, and plumose in *Tanzanapseudes*, figs 1, 7) doesn't occur in manca stages. Therefore, manca I in *A. hansgeorgmuelleri* n. sp. does not have simple setae as adults but plumose (Figs 9, 10 H, I), as manca stages and the adults of *T. mirificus* n. sp. (Figs 1, 5, 6).

In spite of this, I consider that the different configuration of setae which characterizes the adults suggests the presence of two evolutionary lines within family Tanzanapseudidae, in different levels, the species of the genus *Acanthapseudes* (with simple setae in adults and plumose in manca stages) being superior, in my opinion, to those of the genus *Tanzanapseudes* (with plumose setae both in adults and in manca stages).

I think I am not wrong asserting that the importance of these setae is that of creating water currents which assure a good oxygenation. The change of the seta structure in the species of the “group” *Acanthapseudes* (from plumose, in manca stages, in simple, in adults) probably is due to the different environment conditions in which they lived, in comparison with the adults of the *Tanzanapseudes* species, which kept the plumose structure in the manca stages (which gave them a larger surface and, in conclusion, a greater water flow and a better oxygenation). Therefore, by the synonymization invalidation of the two genera I only want to point out the presence of the two evolutionary lines, whose common ancestor had plumose setae (as in the present manca stages), structure which was “lost” in the adults of *Acanthapseudes*.

Although the difference between the adults of the two “groups” might be considered insignificant (and, finally, exaggerated for their consideration as valid genera), I think that in the case of the families with “extreme” adaptations (very specialized) as Tanzanapseudidae, intrageneric differences (and more than that the intraspecific ones) are less obvious (generating great difficulties in the identification of these taxa) than in genera (and in the species) belonging to the families with less “specialized” adaptations. That’s just I think that, under these circumstances, some morphologic features, apparently minor, have not to be ignored. In this respect, I take into consideration the difficulty of the species identification of other taxa, extremely “specialized” (this time I refer to the genus level), as in the case of the genus *Synapseudes* Miller, 1940. Besides, it is possible that the male chelipeds of the genus *Acanthapseudes* (unknown up to now) to have some morphologic characteristics different to those of the genus *Tanzanapseudes*, as in the case of the genera *Mesokalliapseudes* Lang, 1956 and *Alokalliapseudes* Guțu, 2006 (recently confirmed by the molecular studies, cf. Drumm & Heard, 2010: 30), whose females have similar chelipeds, while males have them slightly different (Guțu, 2006: 159).

Genus *Tanzanapseudes* Băcescu, 1975

New diagnosis. Rostrum and all lateral denticulated prolongations of the body with plumose setae, excepting those which are situated on posterior and anterior margins of pereonites three and four, respectively (which are simple). Uropod endopodite with four articles. Male cheliped dimorphic (larger than in female).

Remarks. The morphological features from the present diagnosis do not coincide totally with the descriptions or illustrations presented by Stepien & Blazewicz-Paszkowycz (op. cit.) in the species *T. levis* and *T. nieli* (see my above comments).

Composition (7 species): *Tanzanapseudes bacescui* n. sp., *T. langi* Băcescu, 1975, *T. levis* Stepien & Blazewicz-Paszkowycz, 2009, *T. longiseta* Băcescu, 1975, *T. mirificus* n. sp., *T. nieli* Stepien & Blazewicz-Paszkowycz, 2009 and *T. polynesiensis* Müller, 1992.

Tanzanapseudes mirificus n. sp.
(Figs 1-6)

Material: 25 specimens (1 female with embryos, 6 females with oostegites, 4 adult males, 2 subadult males, 8 juveniles and 4 manca I and II), Indian Ocean, Mauritius Island, Flic en Flac, Station MAU-1, collected in reef flat, mainly from dead corals, 0.5-2 m deep; 15-30 March, 2006. Leg. Dr. Hans-Georg Müller.

Remarks. In the above reckoning, a female with oostegites (destroyed by dissection) and a subadult male (in a bad conservation stages) were not taken into consideration, for making only some observations, at the level of the chelipeds.

Holotype, female with embryos, preserved in the Collections of the „Grigore Antipa” National Museum of Natural History from Bucharest (Romania), No. 250438;

Allotype, adult male, in the same collection, No. 250439;

Paratypes, 23 specimens (6 females, 3 adult males, 2 subadult males, 8 juveniles, 1 manca I and 3 manca II), preserved as follows:

- 15 specimens (3 females with oostegites, No. 250440; 2 adult and 2 subadult males, No. 250441; 4 juveniles, No. 250442; 1 manca I and 3 manca II, No. 250443) in the Collections of the „Grigore Antipa” National Museum of Natural History from Bucharest (Romania);

- 8 specimens (3 females with oostegites, 1 adult male and 4 juveniles), preserved in the Collections of the Zoological State Museum of Munich (Germany).

Description of the female with oostegites (paratype)

Body (Fig. 1) short (2.12 mm) and broad (1.54 mm), about 1.37 times longer than wide, dorsoventrally strongly flattened, oval in dorsal view, with 31 radial prolongations, around, each of them having denticulate margins and some long plumose (and simple, in two pereonites) setae.

Carapace large, approximately 2 times wider than long (including the rostrum) and 2 times shorter than the length of pereon and pleon (measured together); dorsally with some very small tubercles or spines. Anterior margin with a median rostrum (four or five-denticulated on sides and with eight plumose setae around) and two prolongations similar to rostrum, but with more denticles and without setae. Each side with four great prolongations, having 10-15 unequal denticles, around, and 7-9 plumose setae, as follows: the first prolongation with nine plumose setae around and the followings three ones with seven or eight plumose setae, situated only distally and on the posterior (caudal) margins. Ocular lobes well defined, with pigmented visual elements.

Pereon, 1.5 times longer than the carapace (measured with rostrum), with six short but wide pereonites, each of them having great epimeres (relatively similar to the lateral prolongation of carapace) with denticulate margins and plumose or simple setae; epimeres of the first two pereonites with seven plumose setae, situated distally and on the posterior margins; third pereonite (a little longer than the previous one, having more denticles on the caudal margin than the other epimeres), with three plumose and two simple setae on the distal side and posterior margin, respectively; fourth pereonite, about as long as the second one, with three or four plumose and two simple setae on the distal end and the anterior margin, respectively; fifth and sixth pereonites, unequal, shorter and narrower than the previous ones, with eight plumose setae on the anterior margin and distally.

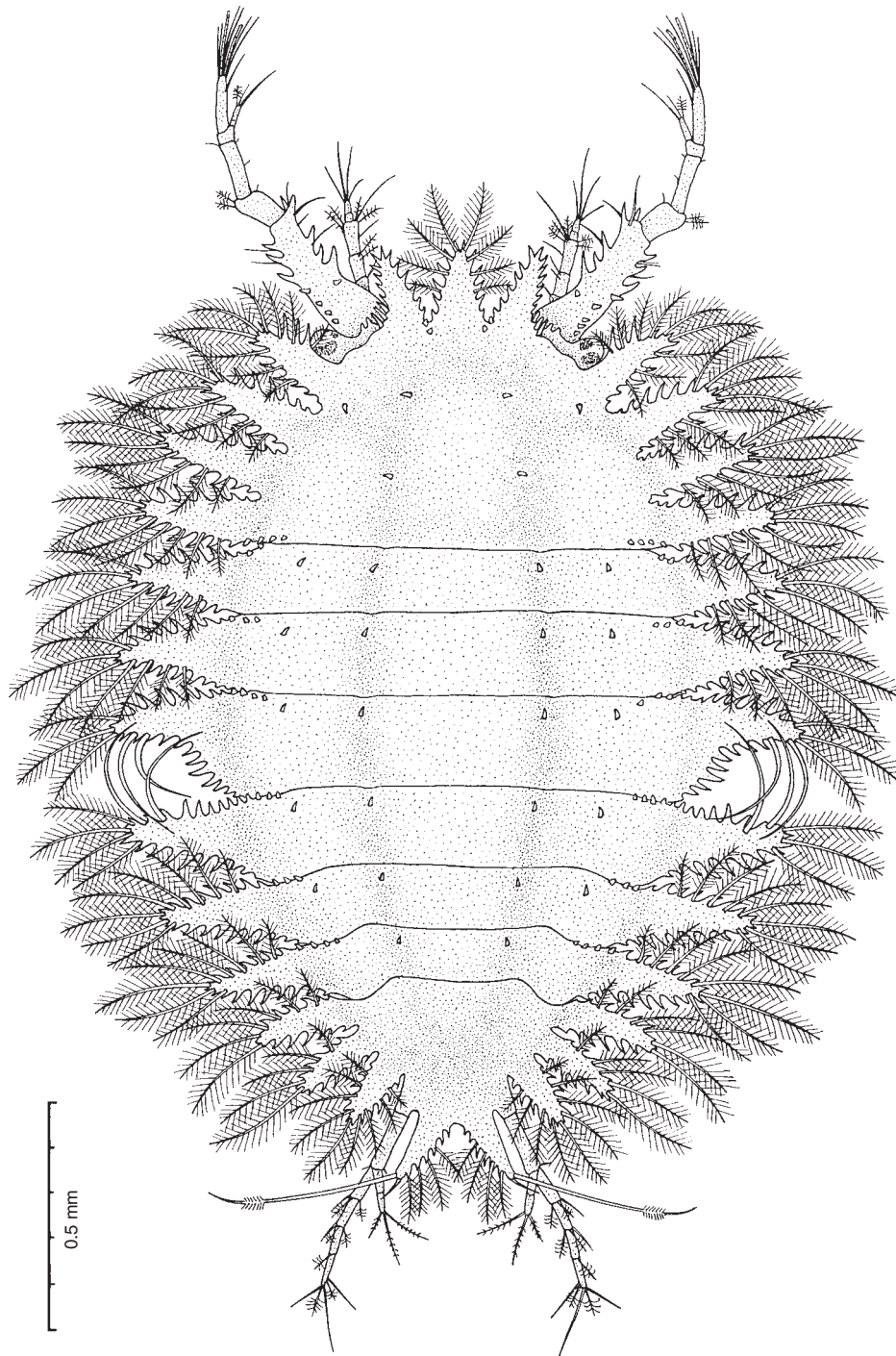


Fig. 1 - *Tanzanapseudes mirificus* n. sp., female, paratype: body (dorsal view).

Pleon, narrower caudally, with pleonites and pleotelson fused in a single segment, has three prolongations on each side (similar to the last epimere of pereon, but smaller than that) and other two caudal, corresponding to pleotelson; first two lateral prolongations with five or six plumose setae on the anterior and distal margins; third lateral prolongation with eight or nine plumose setae, around. The two caudal prolongations (pleotelson) have the inner margins with some denticles and four plumose setae; the outer sides smooth; terminally with two unequal simple setae, one of them being very long.

Antennule (Fig. 2 A) with a long three-articulated peduncle; first article large, about four times longer than the median thickness, with four or five small tuberculiform spines in the first outer half, and four great spines and some broom setae in the second outer half; inner margin with four or five stout spines and three setae, the two distal being plumose; second article, four times shorter than the first one, with around six distal broom setae; third peduncular article thin and long, about 1.4 times longer than the second one. Fourth article (common to the two flagella) very short. Outer flagellum with only one great article (as long as third peduncular article), having one midinner simple seta, and six, also simple, and two aesthetascs situated distally. Inner flagellum, thin, two times shorter than the outer one, ended in one broom and two simple setae.

Antenna (Fig. 2 B), as long as the first peduncular article of antennule, without squama. Peduncle, five-articulated; second article short, as long as the first one, with one distoexternal simple seta; third article, shortest, with one long simple seta in the distoinner corner; fourth article, a little shorter than the second one, with two distal broom setae; last peduncular article, a little shorter than the previous two ones (measured together), with two simple and five broom setae. Flagellum with two small articles, ended in four simple setae.

Mandibles (Fig. 2 C, D) without special features. Palp three-articulated; first article, 1.5 times shorter than the second one, apparently with one long plumose seta; second article with about seven setae on the distoinner margin; third article, as long as the second one, with one very long and about 12 short setae on the distoinner margin, and other two, ciliate, on the outer margin. Pars incisiva of both mandibles four-denticulated; lacinia mobilis of left mandible, three-denticulated. Setiferous lobes with three or four furcate setae. Pars molaris relatively thin and long.

Labium (Fig. 2 E) with some very short setae and three small spines in the distoexternal corner of basal lobe. Palp ovate, longer than wide, ended in a long setiform spin; both margins with fine setae.

Maxillule (Fig. 2 F) with biarticulated palp, ended in three unequal setae. Outer endite, apparently, with nine denticles. Inner endite with three ciliate setae.

Maxilla, unstudied.

Maxilliped (Fig. 2 G) with a very short but wide coxa. Basis, about two times wider than long, with seven very long plumose setae on the inner margin. Palp, well developed, four-articulated; first article, shortest, with a distoexternal small spine, and one distoinner very long, apparently simple, seta; second article, relatively small (only a little larger than the following one), with about 16 unequal simple setae (four of them being very long) on the inner margin, and one distoexternal setiform spine; third article with five thick, and four fine, simple setae; fourth palp article large, approximately equal to the third one, and only a little smaller than the second article, with one small and nine strong and long simple setae. Endite large, with two

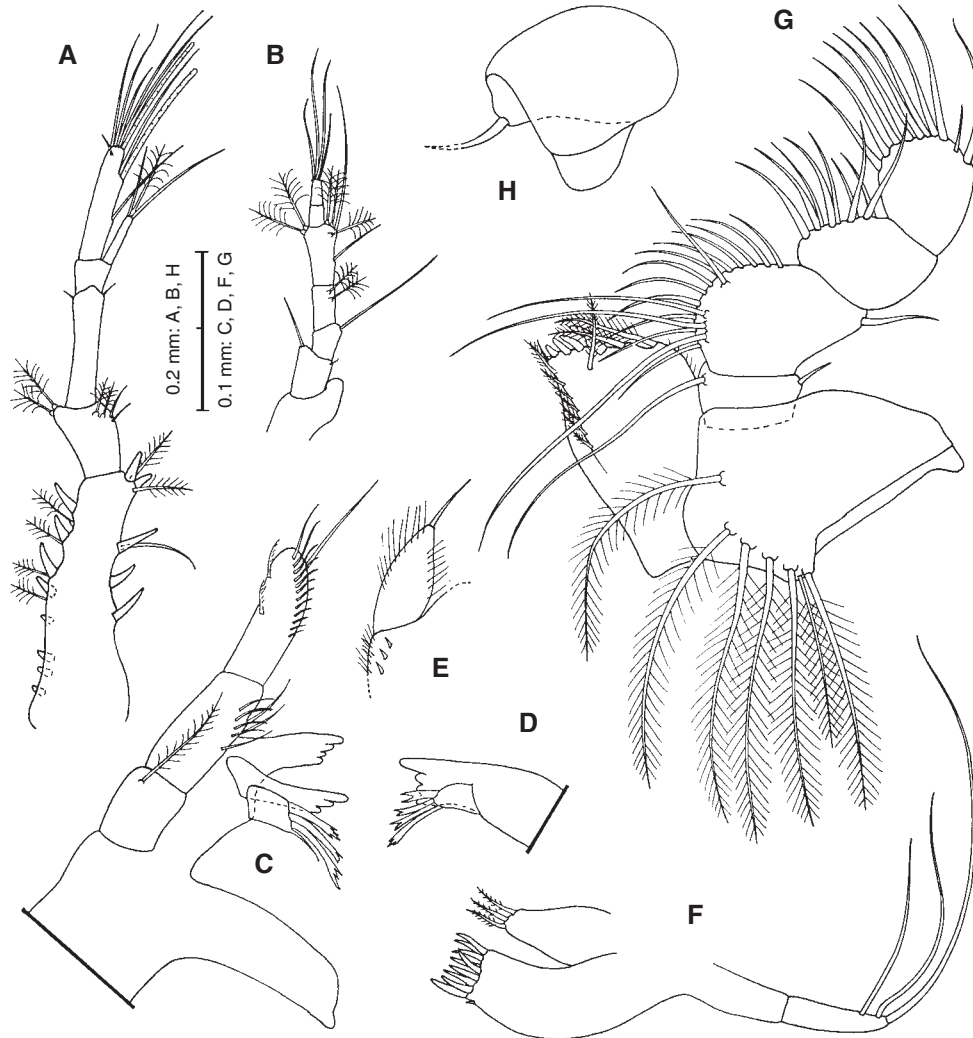


Fig. 2 - *Tanzanapseudes mirificus* n. sp., female, paratype: A, antennule; B, antenna; C, left mandible (distal part); D, pars incisiva and setiferous lobe of right mandible; E, labium (schematic); F, maxillule; G, maxilliped; H, epignath.

plumose setae and four short but thick spiniform formations on the distal margin; distoinner seta, plumose; inner margin with seven short plumose setae.

Epignath (Fig. 2 H) cup-shaped, with a well developed spine.

Cheliped (Fig. 3 A) without exopodite. Basis relatively small, approximately 2 times longer than wide, with two short plumose setae on sternal margin. Merus only a little shorter than basis, with one sternal long circumplumose seta. Carpus, longer than basis, and about 2.5 times narrower than its thickness, with four long and one short simple setae on the sternal margin, and two or three distosternal denticles. Propodus (together with the fixed finger) as long as carpus, but wider than that;

fixed finger, with about 32 long simple setae around and other two ones near the dactylus joint; inner margin with six rounded denticles; claw well developed, curved. Dactylus curved, with three distal simple setae; inner margin with five small denticles and five short ciliate setae; claw stout, longer than the propodal one.

Pereopod II (Fig. 3 B) with a small, three-articulated, exopodite, ended in two plumose setae. Basis, wider distally, relatively short; midsternally with one long and distosternally with one short simple seta; tergally with one broom and one small simple seta. Ischium great, only three times shorter than basis length, with one small distosternal seta. Merus, approximately as long as basis, with one sternal and one tergal small simple seta, and one ciliate spine in distotergal corner. Carpus, as long as wide, and about 1.5 times shorter than merus, with two small distosternal simple setae; distotergally with one robust ciliate spine and four unequal ciliate spiniform setae. Propodus, approximately as long as basis and ischium or merus and carpus (measured together), with one proximal ciliate spine, one median broom and two

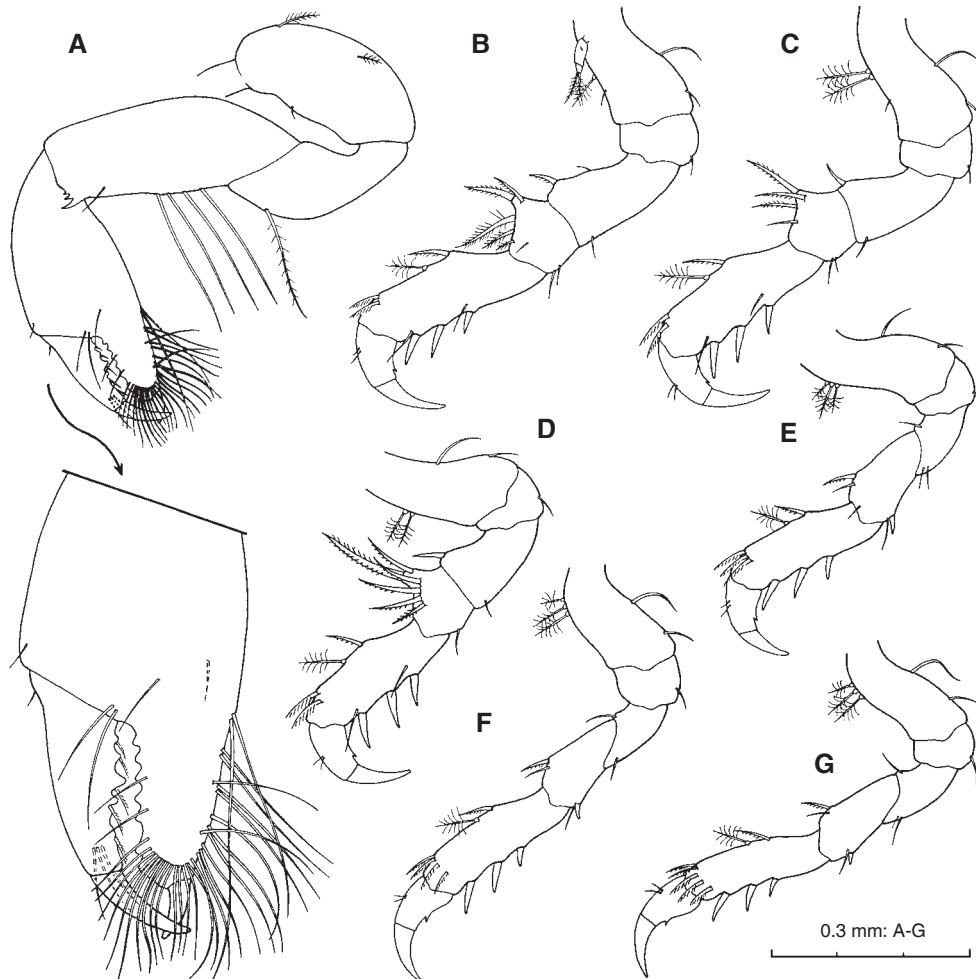


Fig. 3 - *Tanzanapseudes mirificus* n. sp., female, paratype: A, cheliped; B-G, pereopods II-VII.

distal ciliate setae on the tergal margin; sternally with three robust spines and two short simple setae: dactylus thick, curved, as long as ischium, with two tergal short setae and one distosternal small spine; claw well developed, curved, acute apically.

Pereopods III and IV (Fig. 3 C, D) similar to pereopod II, excepting the absence of exopodite, the number of basal broom setae, and the size and number of carpus ciliate spines or setae, as it results from the presented illustration.

Pereopod V (Fig. 3 E) relatively similar to pereopods II-IV, excepting the length of merus, of carpus, and the setulation or spinulation of carpus and propodus. Thus, the main features by which this pereopod differs from the previous ones consists in: the presence of three broom setae on tergal margin of basis; the smaller length of merus; the greater length of carpus (which is longer than the merus); the absence of distotergal spine of merus, but the presence of a small seta; the presence of a small spine in the distosternal corner of carpus; the presence of only one small seta and of one small spine in the distotergal margin of carpus; the presence of three distotergal ciliate setae and three sternal stout spines on propodus.

Pereopods VI and VII (Fig. 3 F, G) very similar to pereopod V, excepting the number of distotergal ciliate setae of propodus: four in pereopod VI and five in pereopod VII.

Pleopods (Fig. 4 A-C) biramous, in three unequal pairs. Basal article great, approximately three times longer than wide, with four long plumose setae on the inner margins, and two to four plumose setae on sides. Exopodite, slightly longer than endopodite, with five or six long plumose setae, around. Endopodite with five or six plumose setae around.

Uropod (Fig. 4 D) biramous. Peduncle long and narrow, with one long proximoinner simple seta. Exopodite four-articulated, 1.5 times longer than peduncle, with two broom and one ciliate setae on the outer corner of first three articles, and two broom and four simple setae, on last article. Endopodite two-articulated, shorter than the peduncle, ended in three, apparently, plumose setae.

Description of the adult and subadult males (paratypes)

The body and appendages, excepting the size and the configuration of cheliped, similar to female. Cheliped (Fig. 4 E) without exopodite. Basis large, about as long as wide, with a narrow proximotergal prolongation by which it joined with coxa; sternal margin round, having a small proximosternal denticulated expansion and one relatively short plumose seta. Merus short and thick, with one long simple seta; distosternally with some denticles. Carpus thick, about 1.8 times longer than its smaller wide, with one great proximotergal tubercle and two small tergal simple setae; distal side of inner margin with two denticles; proximosternally with three simple setae; distosternal corner of outer surface extended in a large denticulated expansion. Propodus very large; together with its fixed finger longer than the merus and carpus (measured together); sternal margin with some denticles; fixed finger narrow, with a proximoinner denticulated expansion and six simple setae; distoinner side with two small and two great denticles; about 22 unequal simple setae are present on the outer and distoinner margins; claw short, but robust. Dactylus narrow, curved, with about ten unequal tuberculiform denticles and nine ciliate setae on the inner margin, the median denticle being the greatest; distolaterally with three simple setae; claw stout, greater than the same of fixed finger. Subadult males differ from the adult ones by the smaller size of distosternal denticulated expansion of cheliped carpus.

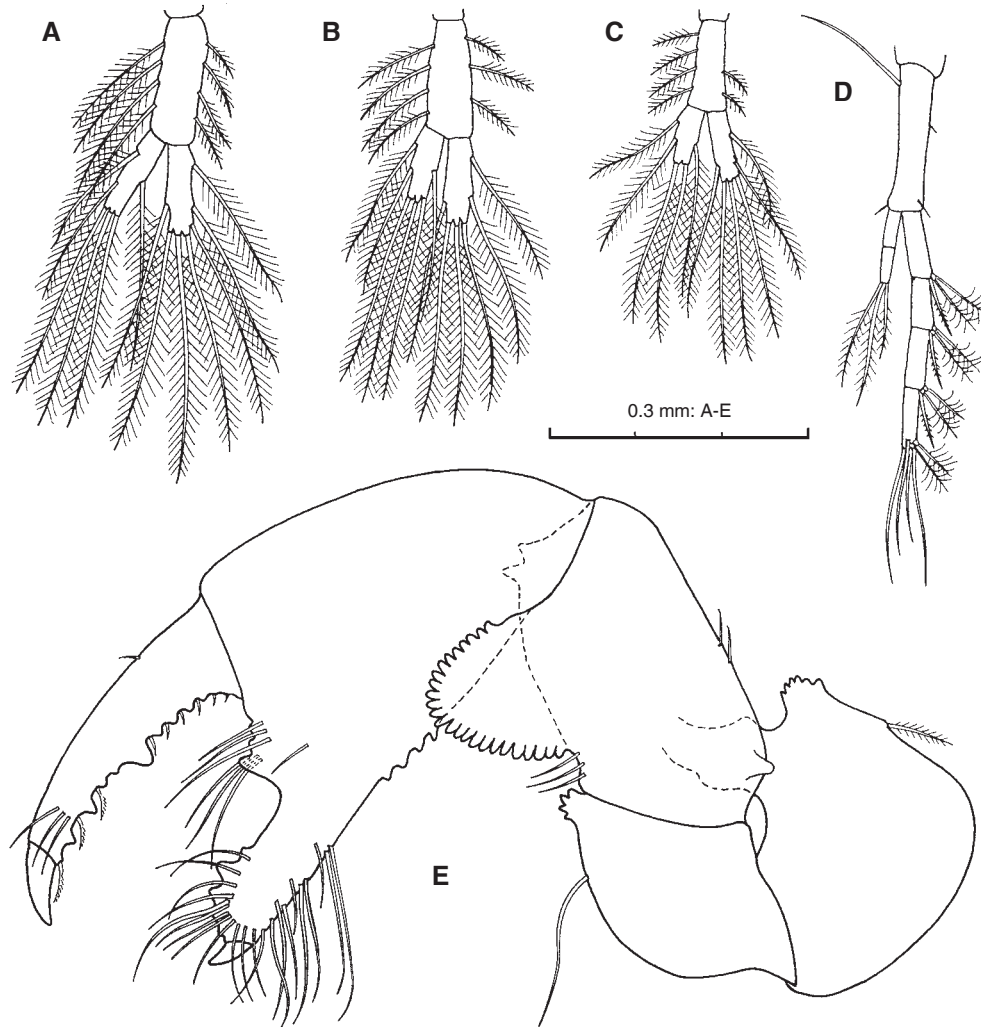


Fig. 4 - *Tanzanapseudes mirificus* n. sp., female (A-D) and male (E), paratypes: A-C, pleopods I-III, respectively; D, uropod; E, cheliped.

Description of the manca I and II, and juveniles (paratypes)

Manca I (Fig. 5) have the following characteristics: (1) the length of body, 0.8 mm; (2) the maximum width of body, 0.53 mm; (3) the ratio length/width of body (without the length of setae), 1.51; (4) the absence of pereonite VI; (5) the absence of rostral plumose setae; (6) the presence of only one plumose seta in the distal end of each lateral prolongation of body; (7) the absence of pereopod VII; (8) the presence of only two sternal spines on the pereopods II-VII propodus; (9) the absence of pleopods; (10) the uropod endopodite with only three articles.

Manca II (Fig. 6) has in addition (comparatively to manca I): (1) the length of body, 0.92 mm; (2) the maximum width of body, 0.62 mm; (3) the ratio length/width

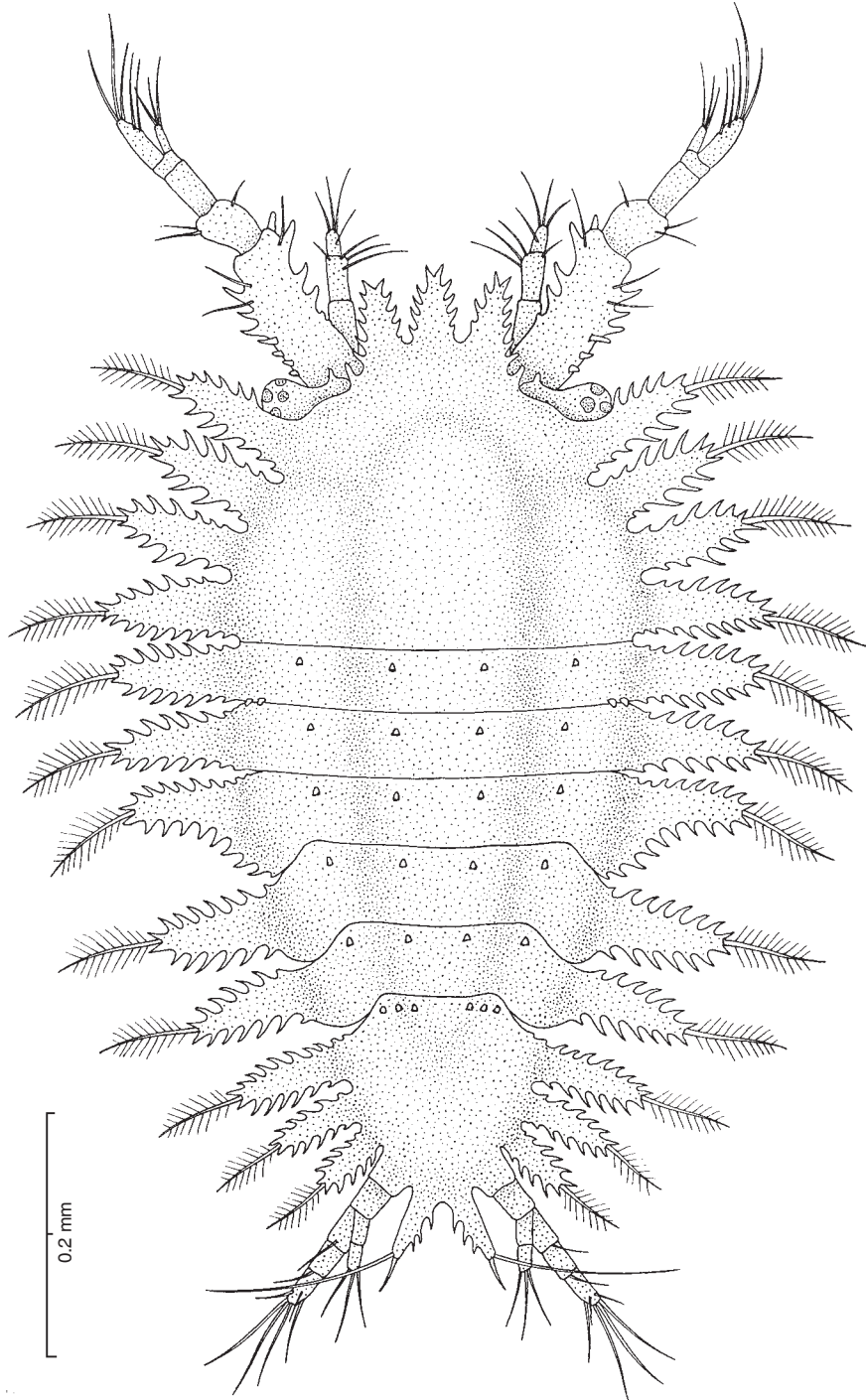


Fig. 5 - *Tanzanapseudes mirificus* n. sp., manca I, paratype: body (dorsal view).

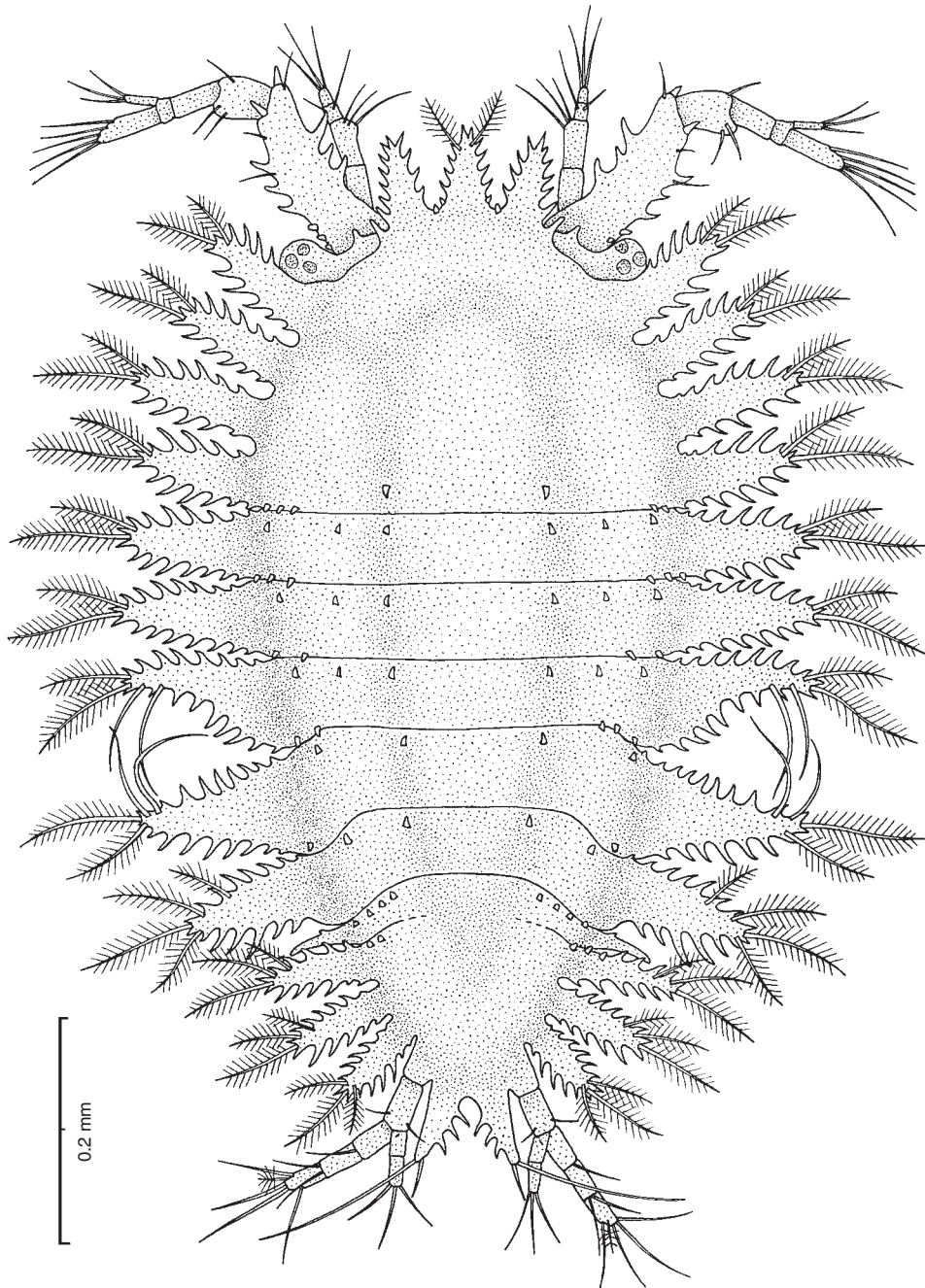


Fig. 6 - *Tanzanapseudes mirificus* n. sp., manca II, paratype: body (dorsal view).

of body (without the length of setae), 1.48; (4) the presence of a very short pereonite VI (having small epimeres, similar to a great spine, but without denticles and plumose setae); (5) the absence of the distinct joint between pereonite VI and pleon; (6) the presense of two plumose setae at least, on rostrum or lateral prolongations of body (excepting the pereonite VI); (7) the presence of two simple setae on the posterior and anterior margins of pereonite three and four, respectively; (8) the presence of incomplete pereopod VII; (9) the presence of incomplete pleopods (each of them being similar to a small ovate lobe, pointed distally).

Juveniles. Although they resemble the adults, frequently they have only two sternal spines on the propod of the pereopods II-VII or only on the last two-three pereopods. Also, the number of the denticles and of the plumose setae from the rostrum level and of the lateral prolongations of the carapace, pereon and pleon can be lower or higher, being influenced by the size of the body. Sometimes, the exopodite of the uropods has only three articles.

Variability. Some adult specimens can have the lateral expansions from the body level with more or less one or two denticles and one (rarely two) plumose seta than those described in female. Also, they can have the propod of the pereopods II and III (sometimes IV, too) with four sternal spines (instead of three, as in most of the specimens), and the pereopods VI and VII (sometimes V, too), with only two spines (instead of three). Females can have 2 or 3 distosternal denticles and 3-4 sternal setae on the cheliped carpus. Rarely, the endopodit of the uropods has only three articles.

Etymology. From the Latin *mirificus*, „wonderful”, „mirific”.

Remarks. Although *Tanzanapseudes mirificus* n. sp. has many similar morphological features to the species *T. bacescui* n. sp., *T. langi*, *T. longiseta* and *T. polynesiensis*, it differs from these by:

- the presence of denticles on the outer margin of carapace anterior prolongations (absent in *T. langi*);
- the presence of denticles on the distosternal corner of cheliped carpus of the females and males (absent in *T. longiseta*);
- the greater number of setae (about 32) situated around the fixed finger of cheliped propodus and the presence of three sternal spines on the pereopods V-VII propodus in the adult females (comparatively to approximately 23 setae and two spines, respectively, in *T. bacescui* n. sp.);
- the absence of proximotergal denticles of pereopods III and IV basis, and the greater size of the carpus expansion in male chelipeds (in contrast with the species *T. polynesiensis*).

***Tanzanapseudes bacescui* n. sp.**

(Fig. 7)

Material: 1 female with oostegites, Indian Ocean, Sri Lanka Island, Ahangama, Station SL-47, collected from large sponge (outsides brown, inside yellow) on wave-exposed coral reef flat, lower intertidal; 14 March 1993. Leg. Dr. Hans-Georg Müller.

Holotype (female with oostegites) preserved in the Collections of the „Grigore Antipa” National Museum of Natural History from Bucharest (Romania), No. 250444.

Description of the females with oostegites (holotype)

Body, very similar to the same of preceding described species, 1.4 times longer than broad, having 1.7 mm length and 1.17 mm the maximum width (measured without setae).

Carapace, pereon and pleon also similar to the same of the previous species, excepting the number of plumose setae, and of size and number of denticles of the body radial prolongations. The mentioned differences can be easily observed at the level of rostrum (which has only ten denticles and six plumose setae, comparatively to 12 denticles and eight plumose setae in *T. mirificus* n. sp.), and of the two anterior prolongations of carapace (which have 13 robust denticles, comparatively to 15-17, smaller), as it results from the figures 1 and 7 A.

Antennule and antenna without conspicuous differences, comparatively with *T. mirificus* n. sp.

Mouth parts, unstudied.

Cheliped (Fig. 7 B) without exopodite. Basis slightly curved, two times longer than wide, with one proximosternal plumose seta and other five, simple. Merus narrow, with two sternal setae, one of them setulate and very long. Carpus (longer than basis), three times narrower than its length, with six sternal simple setae, two of them shorter. Propodus, about as long as carpus but wider than that; fixed finger with approximately 23 simple setae around, and the inner margin slightly denticulated; claw stout, short and curved. Dactylus curved, a little thinner than the fixed finger, with three distal simple setae; inner margin with small tuberculiform denticles; claw much greater than that of propodus.

Pereopod II (Fig. 7 C) with a small exopodite, ended in two short plumose setae. Basis, thicker distally, with two sternal simple setae: one median, long, and one distal, short. Ischium well developed, with one distosternal small simple seta. Merus, a little shorter than basis, with one distosternal simple seta and one distotergal small ciliate spine. Carpus, only a little longer than ischium, with two distosternal simple setae; tergally with four ciliate spines, one of them stronger. Propodus, 3.7 times longer than wide, and as long as basis and ischium or merus and carpus, measured together, with one ciliate spine and one broom seta situated midtergally, and three distotergally ciliate setae; three robust spines and two short simple setae are present on the sternal margin. Dactylus thick, as long as carpus, with one very small spine and two short setae, distosternally and midtergally, respectively; claw, about as long as dactylus, stout and curved.

Pereopods III and IV (Fig. 7 D, E), very similar to pereopod II, excepting the exopodite, which is absent. Pereopod III carpus with only two tergal ciliate spines.

Pereopod V (Fig. 7 F) with two sternal simple and two tergal broom setae on basis. Ischium similar to the same of pereopods II-IV. Merus, a little shorter than carpus, with one distotergal and two distosternal small simple setae. Carpus, with one small spine and one short simple seta in distosternal cornes, and two distotergal small spines. Propodus similar to the same of previous pereopods, excepting the number of distotergal ciliate setae, four in this case, the number of sternal spines, only two, and the absence of the two sternal small setae. Dactylus and its claw as in previous pereopods.

Pereopods VI and VII (Fig. 7 G, H) similar to the pereopod V. There are three distotergal ciliate setae of propodus (not four as in pereopod V).

Pleopods with long peduncle, biramous, in three, unequal, pairs.

Uropod, as in the previous described species.

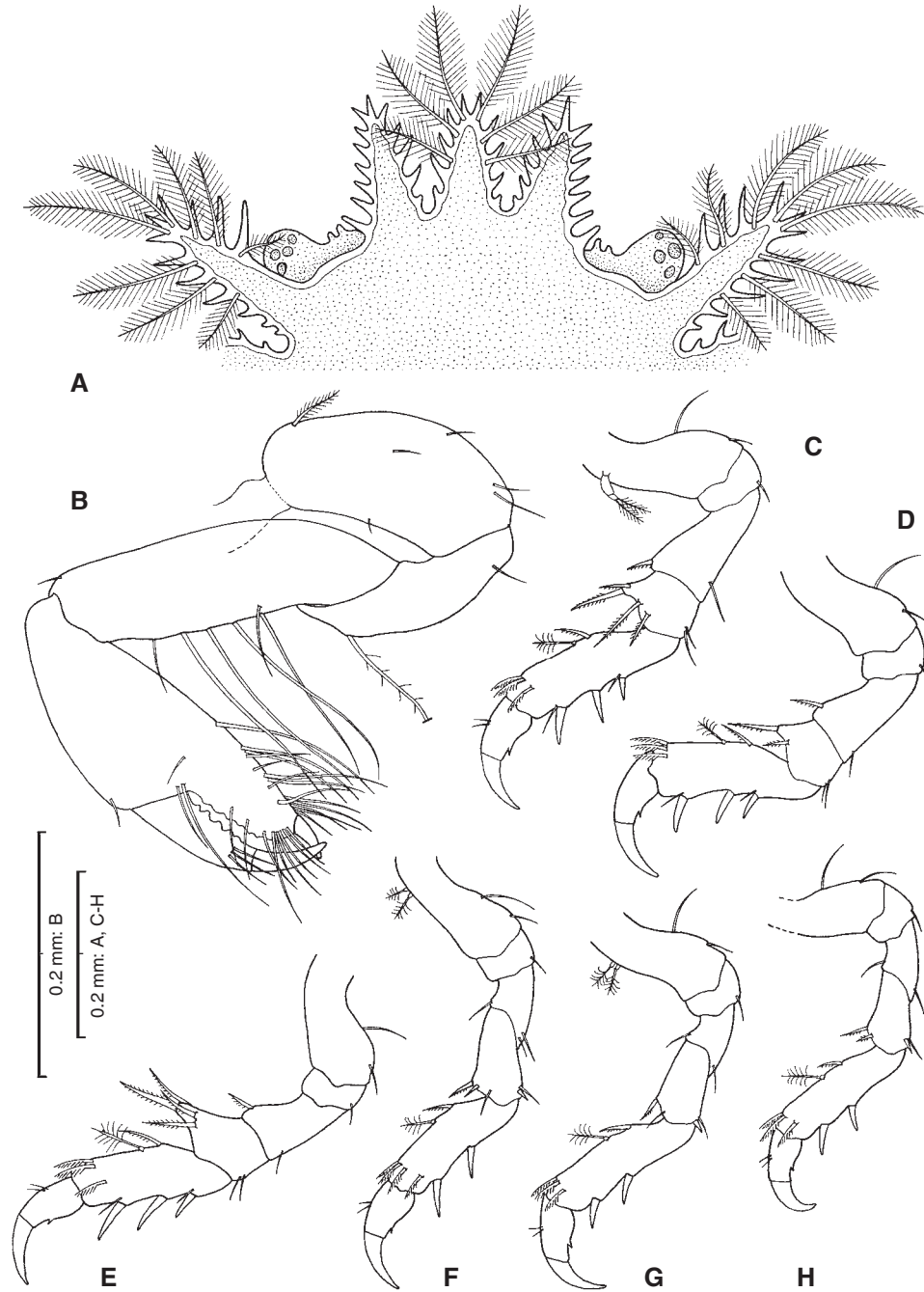


Fig. 7 - *Tanzanapseudes bacescui* n. sp., female, holotype: A, carapace, anterior part (dorsal view); B, cheliped; C-H, pereopods II-VII, respectively.

Etymology. The name of species is dedicated to the memory of my professor, the well-known carcinologist Mihai Băcescu, who discovered and described, among many other taxa, the genus *Tanzanapseudes*.

Remarks. Although *T. bacescui* n. sp. has many morphologic features similar to those of the species *T. mirificus* n. sp., both at the body level and of several appendages (antennules, antennae, pereopods, pleopods and uropods), I think it is about a different species. The most serious argument, which I took into consideration, is the low number of the setae placed at the distoinner end of the fixed finger of the cheliped propodus (of only seven or eight, fig. 7 B), in comparison with that of the species *T. mirificus* (which has, at least, 12 setae, fig. 3 A).

Another morphologic feature which distinguishes the two species is, in my opinion, the number of the sternal spines on the pereopods V-VII propodus (only two in *T. bacescui*, fig. 7 F-H, in comparison with three in the adult specimens of *T. mirificus*, fig. 3 E-G). In *T. mirificus* n. sp. only the juveniles and some subadult specimens (of small size) have only two sternal spines on the propodus of the mentioned pereopods. To the presented aspects I add (although it is very difficult to quantify) that the size of the denticles from the lateral prolongations of the carapace, pereonites and pleon is larger in the species *T. bacescui* n. sp.

Tanzanapseudes indet.
(Fig. 8)

Material: 1 female with oostegites, Indian Ocean, Mozambique Channel, Iles Glorieuses (Northwest of Ile du Lys), Lat S 11° 25' 7 - Long E 47° 19' 5, collected in coraligen sand, 26 m deep; April 8, 1977. Leg. French „Benthedi” Expedition, Station 101-DS.

Remarks. The material preserved in the Collections of the „Grigore Antipa” National Museum of Natural History from Bucharest (Romania), No. 250445.

Partial description of the females with oostegites

Remarks. Because of the precarious state of the single specimen which I had at my disposal (which was preserved in formalin for a long period of time, in all probability, this thing influencing negatively the configuration and structure of some appendages, by decalcification, as well as the prolongations of the carapace, pereon and pleon) I couldn't do a complete description of this species. That is why, I reduce myself only to the illustration and minute description of pereopods.

Body as in the two preceding species; standard length, 1.7 mm; maximum width, 1.25 mm; ratio length/width of body, 1.36.

Carapace, pereon and pleon with great denticulated prolongations and plumose setae, relatively similar to the same of previous described species.

Cheliped unstudied (lost).

Antennule, antenna and cheliped, apparently, as in above described species.

Pereopod II (Fig. 8 A) with a small exopodite, ended in two short plumose setae. Basis, thicker distally, about two times longer than the median width, with one broom and two short simple setae on tergal (anterior) margin; mid- and distosternally with one long and one short simple seta, respectively. Ischium well developed, with a small distosternal seta. Merus, shorter than basis, with four distal setulae. Carpus, only a slightly longer than ischium, with two distosternal short simple setae; tergal side with five ciliate spiniform setae, one of them much

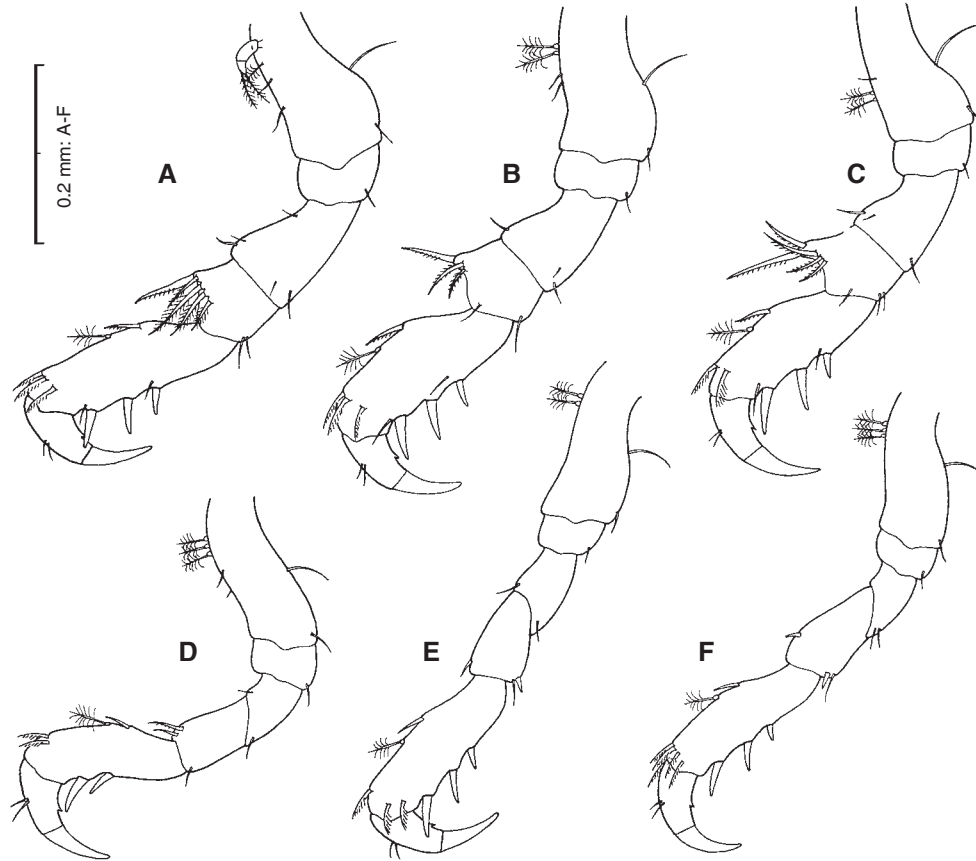


Fig. 8 - *Tanzanapseudes* indet., female: A-F, pereopods II-VII, respectively.

stronger. Propodus, about three times longer than median breadth, and a little longer than basis, with three robust spines and two small simple setae on sternal margin; midtergally with one spine and one broom seta, and distotergally with three ciliate setae. Dactylus thick, as long as carpus, with one spinule and two setulae, sternally and tergally, respectively; claw long and curved.

Pereopods III and *IV* (Fig. 8 B, C) relatively similar to preceding pereopod, excepting the absence of exopodite. The main differences between these pereopods and the previous one consists in the number of tergal ciliate spiniform setae of pereopod III carpus (only three, comparatively to five), and of the distotergal ciliate setae of pereopod IV propodus (two, not three).

Pereopod V (Fig. 8 D) slightly thinner than the previous pereopods. Basis, having an uniform thickness, with three broom and two simple setae, tergally, and other two simple, mid- and distosternally. Ischium well developed. Merus, a little shorter than carpus, with two distal simple setae. Carpus with one distosternal and two distotergal simple setae. Propodus, slightly longer than the merus and carpus

(measured together), with one fine spine and one broom seta, midtergally, and two ciliate setae, distotergally; sternal margin with only two stout spines. Dactylus and its claw as in preceding pereopods.

Pereopods VI and VII (Fig. 8 E, F) differs from the pereopod V by the sternal spines of propodus (which are in number of three), and by the distotergal ciliate setae (three in pereopod VI propodus and five in pereopod VII).

Pleopods in three pairs, biramous, ended in some plumose setae.

Uropod, with four-articulated exopodite and two-articulated endopodite.

Remarks. One of the morphologic features which distinguish it from the other described species (as well as from the other five already known) is represented by the number of the sternal spines of the pereopod V propodus (only two, fig. 8 D), while the pereopods VI and VII have three spines (Fig. 8 E, F). In the species *T. bacescui* n. sp. (Fig. 7 F-H) and *T. nieli* (cf. Stepien & Blazewicz-Paszkowycz, op. cit.: fig. 3 D-F) the propodus of the last three pereopods always has the same number of sternal spines. Also, in the species *T. mirificus* n. sp., from which I had numerous specimens, I haven't found any specimen with less sternal spines on the pereopod V propod in comparison with the pereopods VI and VII. As this morphological feature could be a deviation from the above logic, I preferred not to consider this species new to science, also, because its origin is in the same geographic perimeter from where other three similar species were described. It is about *T. mirificus* n. sp., from the water of the Mauritius Island, and the two species described by Băcescu (*T. langi* and *T. longiseta*) from the coasts of Tanzania.

A special remark is about the collecting depth (26 m), comparatively to all known species of the genus *Tanzanapseudes*, which live at the most 4-5 m (Stepien & Blazewicz-Paszkowycz, op. cit.: 47).

Genus *Acanthapseudes* Roman, 1976

New diagnosis (females; males unknown). Rostrum and all lateral denticulated prolongations of the body with simple setae. Uropod endopodite with three or four articles.

Composition (2 species): *Acanthapseudes elegans* Roman, 1976 and *A. hansgeorgmuelleri* n. sp.

Remarks. A morphologic feature observed in *Acanthapseudes hansgeorgmuelleri* n. sp., but unmentioned in the diagnosis (which might be another characteristic of the genus) is the presence of numerous tubercles placed on the dorsal side of the body. After all appearances some of them are broken, only the insertion point being visible on the body, as a small circle. The mentioned tubercles have three-four terminal short rami, which could be the proximal extremity of some long, but broken, simple setae. When I make this assertion, I take into consideration the configuration of these tubercles at the pleon level (Fig. 9). As it results from Roman's description (op. cit.: 156 and fig. 1), apparently similar tubercles can occur in the species *A. elegans*.

It is not impossible, when the males will be discovered, to remark (as I have already mentioned) other characteristic features only to the genus *Acanthapseudes*, too.

Acanthapseudes hansgeorgmuelleri n. sp.
(Figs 9, 10)

Material: 1 adult female (with 1 specimen manca I in marsupium), Indian Ocean, Mauritius Island, Flic en Flac, Station MAU-1, collected in reef flat, from mainly dead corals, 0.5-2 m deep; 15-30 March, 2006; Leg. Dr. Hans-Georg Müller.

Holotype (female with oostegites) was preserved in the Collections of the „Grigore Antipa” National Museum of Natural History from Bucharest (Romania), No. 250446.

Paratypes, 1 specimen manca I (from the female marsupium), in the same collection, No. 250447.

Description of the females with embryos (holotype)

Body (Fig. 9) oval in dorsal view, strongly dorsoventrally flattened, about 1.28 longer than broad, with 31 great denticulated prolongations and numerous simple setae, around; standard length and maximum wide (measured without setae), 1.75 and 1.36 mm, respectively.

Carapace large, 2.2 times wider than long (including the rostrum) and about 2.3 times shorter than the length of pereon and pleon (measured together); dorsally with about 12 small tubercles and other seven, greater, like a small trident. The anteromedian prolongation (rostrum) with five denticles on sides and six simple setae; at sides of rostrum with a prolongation (similar to rostrum, but with more denticles and without setae). Each lateral margin with four large denticulated prolongations. First lateral prolongation with 9-10 denticles (from which only two are situated on anterior margin) and six simple setae, around. Each of other three lateral prolongation with 14-15 unequal denticles, around, and six simple setae, situated distally and on the caudal (posterior) margin. Ocular lobes well defined, with pigmented visual elements.

Pereon with six short, but wide, pereonites. Each pereonite with large epimeres, similar to the carapace prolongation, having at the basis an evident tubercle (furcated distally), also similar to the same of carapace. Epimeres of the first two pereonites with 15-16 denticles around, and six simple setae, situated distally and on the caudal margin. Third pereonite, slightly longer than others ones, with approximately 20 denticles around of epimeres and only five simple setae (situated as in the first two pereonites). Epimeres of fourth pereonite, with about 18 unequal denticles around and six simple setae situated on the anterior (rostral) margin and distally. Epimeres of the last two pereonites with 15-16 denticles around and four or five simple setae, situated only distally.

Pleon, narrower caudally, with pleonites and pleotelson fused in a single segment, presents three prolongations on each side (similar to the last epimeres of pereon), and other two, caudally. First two denticulate prolongations with six simple setae on the anterior and distal margins. Last lateral prolongation with six or seven simple setae, around. The two caudal prolongations (pleotelson) with five denticles and two or three simple setae on inner margins and, apparently, two small spines on sides; distally with one long simple seta.

Cheliped (Fig. 10 A) without exopodite. Basis relatively narrow, about two times longer than wide, with one small sternal simple seta. Merus well developed, with one distosternal long plumose seta and other one, simple and short, proximotergally. Carpus, approximately 1.5 times longer than basis, with two short

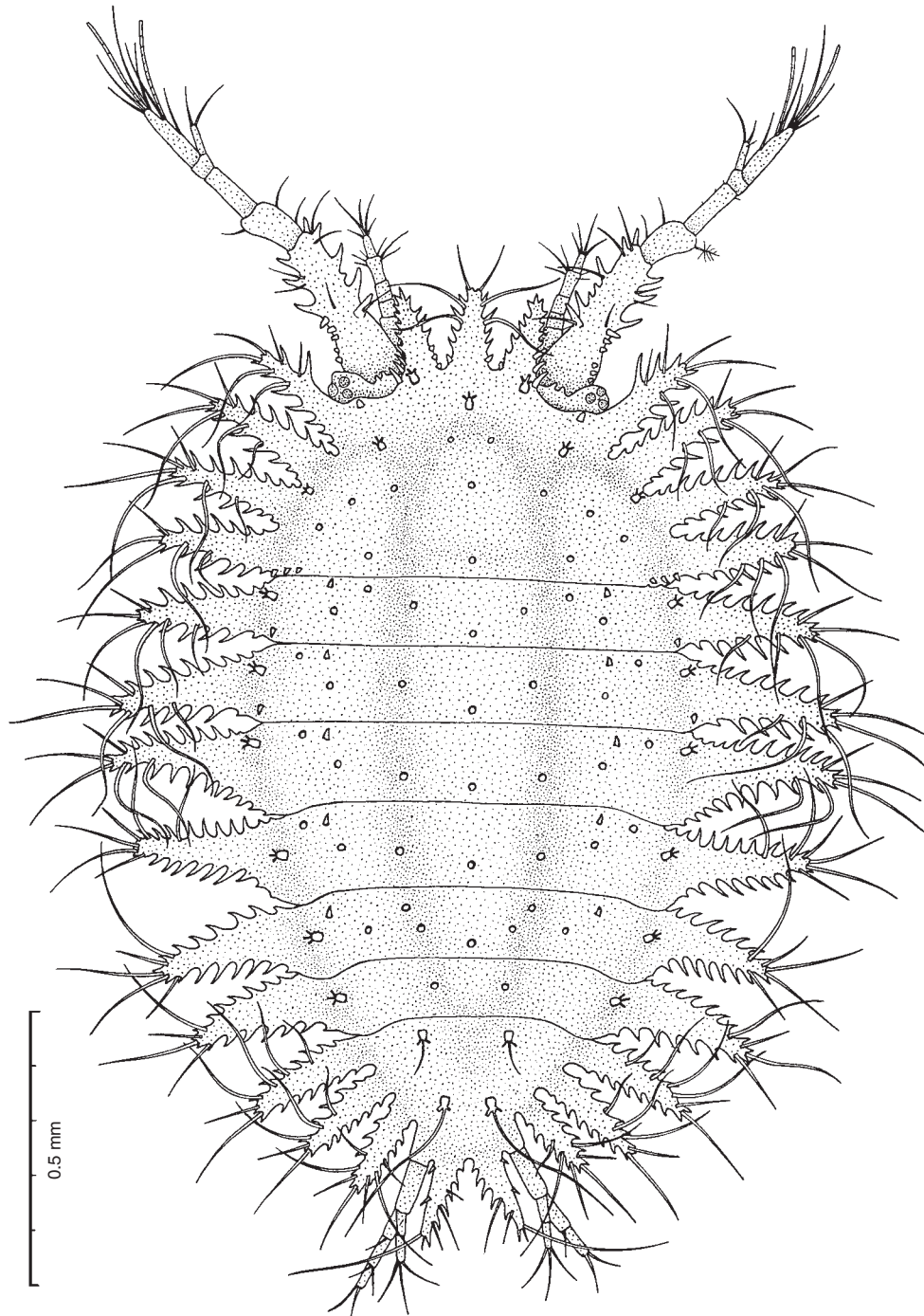


Fig. 9 - *Acanthapseudes hansgeorgmuelleri* n. sp., female, holotype; body (dorsal view).

and four very long simple setae on sternal margin; distosternally with one conspicuous denticle. Propodus (measured together with fixed finger) as long as carpus, but a little wider than that; fixed finger, relatively long, shorter than propodus palm, with about 30 unequal simple setae around; inner margin denticulated; claw robust. Dactylus, slightly narrower and shorter than fixed finger, with three distal simple setae; inner margin slightly denticulated; claw great, stout, approximately two times longer than propodus claw.

Pereopod II (Fig. 10 B) with a relatively small exopodite, ended in one plumose seta. Basis short, thicker distally, about two times longer than maximum width, with one sternomedian and one distosternal simple setae; tergally with one simple and two broom setae. Ischium great, a little shorter than carpus. Merus, 1.5 times longer than carpus, with two short distosternal simple setae; tergally with one median small seta and one distal spine. Carpus short and thick, with one stout spine and four spiniform setae (three of them apparently ciliate) on tergal margin, and two distosternal short setae. Propodus, as long as previous two articles (measured together), with one spine, one broom and three ciliate setae on tergal margin; sternally with three stout spines and two short simple setae. Dactylus, thick and curved, with one sternal spinule and two tergal small setae; claw stout, about two times shorter than dactylus.

Pereopods III and IV (Fig. 10 C, D) relatively similar to pereopod II, excepting the absence of exopodite, and the size of tergal spine in pereopod IV carpus (which is much greater than the same of pereopods II and III).

Pereopod V (Fig. 10 E) basis, ischium, propodus and dactylus similar to the same of preceding three pereopods. Merus, a little longer than ischium but narrower than that, with two distosternal and one distotergal simple setae. Carpus, longer than merus and much greater than the same of pereopods II-IV, with one small spine and one seta, distosternally, and two distotergal simple setae. Propodus differs from the same of previous pereopods by the number of distotergal ciliate setae, four in this instance.

Pereopods VI and VII (Fig. 10 F, G) similar to pereopod V, less than the number of sternal spines and distotergal ciliate setae of pereopod VII propodus (these being two and four, respectively).

Pleopods in three pairs, biramous, ended in some long plumose setae; basal article narrow, longer than branches.

Uropods (Fig. 9) short. Exopodite, two-articulated, ended in three simple setae. Left endopodite with three, and the right one with only two articles, both ended in two short simple setae.

Additional observation. Although the described female had the endopodite of the two uropods formed of two and three articles, I think it is about four, as I remarked in the manca stage, the discussed exopodites being in a regenerating process, probably (as a result of an accidental loss).

Description of the manca I (paratype)

Manca I is characterized by: (1) the length of body, 0.6 mm; (2) the maximum width of body, 0.3 mm; (3) the ratio length/width of body (without the length of setae), 2; (4) the absence of pereonite VI; (5) the absence of rostral setae; (6) the presence of only one plumose seta in the distal end of each lateral prolongation of body (Fig. 10 H, I); (7) the absence of pereopod VII; (8) the presence of only two

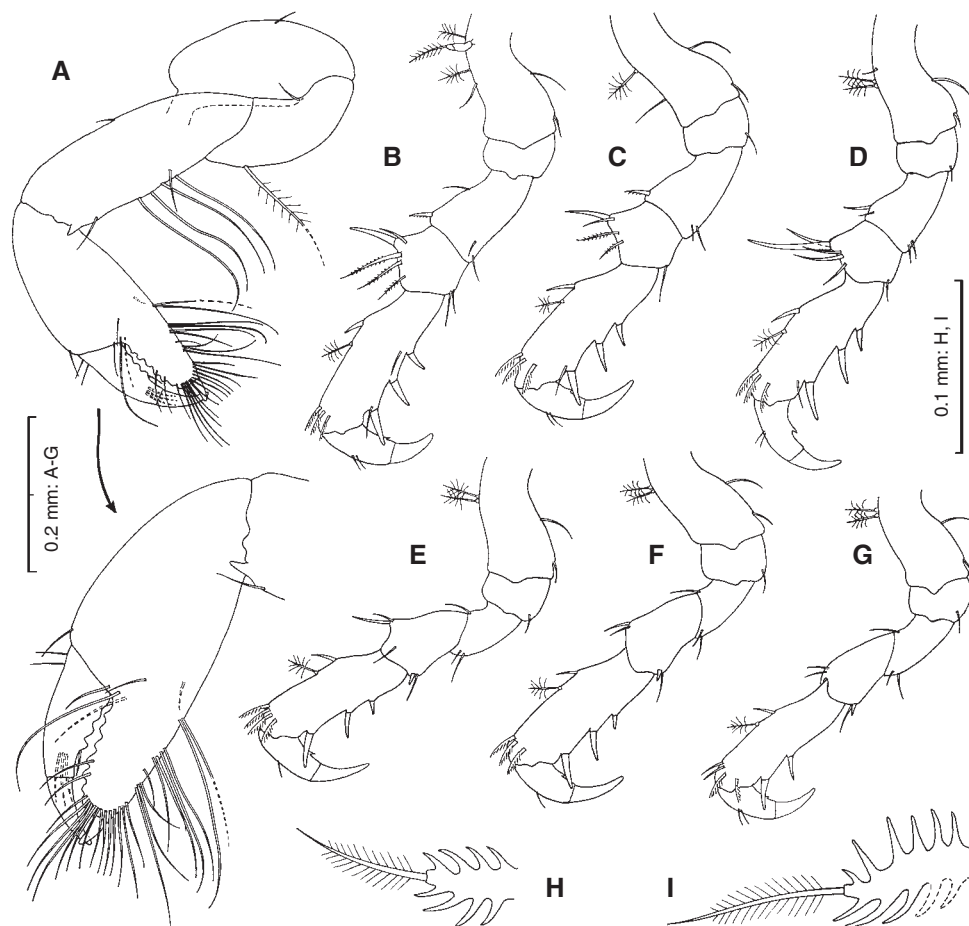


Fig. 10 - *Acanthapseudes hansgeorgmuelleri* n. sp., female (A-G) and manca I (H, I), holotype and paratype, respectively: A, cheliped; B-G, pereopods II-VII, respectively; H, second (left) prolongation of carapace; I, epimera of last (fifth) pereonite.

sternal spines on the pereopods II-VII propodus; (9) the absence of pleopods; (10) the uropod exopodite four-articulated, ended in three long simple setae.

Out of the usual differences among the adults and mancas stages, which are present in all tanaidaceans, the main morphological feature by which the manca I differs from the adult specimen in the species *A. hansgeorgmuelleri* n. sp. consists in the configuration of terminal setae of lateral prolongations of body. Thus, as I already mentioned, in contrast with the simple setae, which are characteristic to adults (Fig. 9), in manca I these setae are plumose (Fig. 10 H, I), as in the species of the genus *Tanzanapseudes* (Figs 1, 5-7).

Etymology. The species is named in the memory of the late Dr. Hans-Georg Müller, who, with uncommon generosity, offered me for study a numerous and interesting material from many geographic area.

Remarks. Comparatively to *A. elegans*, the new species it is characterized by: (1) only two denticles on the anterior margin of the first lateral prolongation of carapace (Fig. 9; Roman, op. cit.: fig. 1); (2) the presence of two small spines on the outer margins of last two pleonal prolongations, fig. 9 (in *A. elegans* are present some denticles, cf. Roman, op. cit.: fig. 24); (3) a smaller number of robust spines situated on the sides of the first peduncular article of antennule (Fig. 9; Roman, op. cit.: fig. 10); (4) the presence of one sternodistal denticles on cheliped carpus (Fig. 10 A; Roman, op. cit.: figs 12, 15); (5) only three sternal spines on pereopods II and III propodus, fig. 10 B, C (comparatively to four in *A. elegans*, Roman, op. cit.: figs 14, 16); (6) only two sternal spines on pereopod VII propodus (Fig. 10 E; three in *A. elegans*, Roman, op. cit.: fig. 21); (7) the absence of proximotergal spines of pereopods III and IV basis (Fig. 10 C, D; Roman, op. cit.: figs 16, 18); (8) a smaller number of distotergal ciliate setae on pereopod VII propodus (Fig. 10 G; Roman, op. cit.: fig. 21).

Key to the genera and the species of the family Tanzanapseudidae

- 1 - Body with simple setae on lateral denticulated prolongations *Acanthapseudes* 2
 - Body with plumose setae on lateral denticulated prolongations, excepting those situated on the posterior and anterior margins of pereonites three and four, respectively (which are simple) *Tanzanapseudes* 3
- 2 - Pereopods III and IV basis with one and two proximotergal denticles, respectively *A. elegans* (♀; ♂ unknown)
 - Pereopods III and IV basis smooth proximotergally *A. hansgeorgmuelleri* n. sp. (♀; ♂ unknown)
- 3 - The two anterior prolongations of carapace, situated on sides of rostrum, without denticles on both margins *T. levis* (♀; ♂ unknown)
 - The two anterior prolongations of carapace, situated on sides of rostrum, with denticles on inner margins, at least 4
- 4 - The two anterior prolongations of carapace, situated on sides of rostrum, with denticles only on inner margin *T. langi* (♀; ♂ unknown)
 - The two anterior prolongations of carapace, situated on sides of rostrum, with denticles on both margins 5
- 5 - Pereopods III and IV basis with four proximosternal denticles *T. polynesiensis* (♀; ♂)
 - Pereopods III and IV basis without proximosternal denticles (at most with some setae) 6
- 6 - Antennule first peduncular article with six stout denticles on outer margin *T. nieli* (♀; ♂ unknown)
 - Antennule first peduncular article with at most four stout denticles on outer margin 7

- 7 - Pereopods V-VII propodus with two sternal spines *T. bacescui* n. sp. (♀; ♂ unknown)
 - Pereopods V-VII propodus with three sternal spines **8**
- 8 - Cheliped carpus with two distosternal denticles at least *T. mirificus* n. sp. (♀; ♂)
 - Cheliped carpus rounded distosternally *T. longiseta* (♀; ♂)

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I express my special gratitude to the late Dr. Hans-Georg Müller who, with uncommon generosity, sent me for study the specimens from Sri Lanka and Mauritius Islands (and from many other geographical areas), and to Prof. Dr. Marie-Louise Roman, who offered me, with many years ago, the material from the Mozambique Channel (collected by the French „Benthedi” Expedition), which was described in present paper. Also I thank to my colleague, Mrs Mihaela Achim-Barcan, from „Grigore Antipa” National Museum of Natural History, for the English translation of this paper, as well as to the anonymous scientific reviewers for their useful comments.

CÂTEVA OBSERVAȚII PRIVIND FAMILIA TANZANAPSEUDIDAE,
 CU DESCRIEREA A TREI SPECII NOI ȘI VALIDAREA
 GENULUI *ACANTHAPSEUDES* ROMAN, 1976
 (CRUSTACEA: TANAIDACEA: APSEUDOMORPHA)

REZUMAT

Sunt descrise, din apele insulelor Sri Lanka și Mauritius (Oceanul Indian), trei specii noi din familia Tanzanapseudide, două aparținând genului *Tanzanapseudes* Băcescu, 1975 (*T. bacescui* n. sp. și *T. mirificus* n. sp.) și una genului *Acanthapseudes* Roman, 1976 (*A. hansgeorgmuelleri* n. sp.), ocazie cu care a fost invalidată sinonimizarea celui de al doilea gen cu primul, făcută de Kudinova-Pasternak (1978). Totodată sunt prezentate unele date morfologice cu privire la o specie incertă din genul *Tanzanapseudes* (colectată în cadrul expediției franceze „Benthedi”, din Canalul Mozambic, a cărei identitate nu a putut fi stabilită datorită condițiilor proaste de conservare) și sunt descrise stadiile manca I și II la *T. mirificus* n. sp. și manca I la *A. hansgeorgmuelleri* n. sp., stadii necunoscute până în prezent la tanzanapseudide. De asemenea sunt prezentate noi diagnoze, amendate, pentru familia Tanzanapseudidae și cele două genuri ale sale, *Acanthapseudes* și *Tanzanapseudes*, precum și o cheie comună de identificare a genurilor și speciilor familiei în discuție.

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NEW LEUCONIDS FROM THE GULF OF MEXICO (CRUSTACEA: CUMACEA: LEUCONIDAE)

IORGU PETRESCU, RICHARD W. HEARD

Abstract. Second paper that contained records of 13 species of Leuconidae from the Gulf of Mexico. Four new species are described: *Leucon papadopoli* n. sp., *L. andreiaae* n. sp., *L. radulezzi* n. sp. and *L. serafimae* n. sp. Other 8 species and subgenera *Crymoleucon* Watling, 1991 and *Macrauloleucon* Watling, 1991 are recorded for the first time from the area, only *Leucon americanus* Zimmer, 1943 was previously found.

Résumé. C'est le second travail contenant des espèces de Leuconidae du Golfe de Mexico. On y a trouvé 13 espèces, dont 4 sont nouvelles pour la science: *Leucon papadopoli* n. sp., *L. andreiaae* n. sp., *L. radulezzi* n. sp. et *L. serafimae* n. sp. Huit autres espèces et deux sous-genres, à savoir *Crymoleucon* Watling, 1991 et *Macrauloleucon* Watling, 1991 sont mentionnées pour la première fois dans cette zone du golfe. Une seule espèce y a été retrouvée, à savoir *Leucon americanus* Zimmer, 1943.

Key words: Gulf of Mexico, Cumacea, Leuconidae, new species, new records.

INTRODUCTION

Calman (1912) reported *Oxyurostylis smithi* from Punta Rassa, first mention of Cumacea from the Gulf of Mexico. Later, Zimmer (1943, 1944), Băcescu (1971, 1979), Băcescu & Muradian (1977), Muradian-Ciamician (1980), Watling (1977), Radhadevi & Kurian (1981), Omholt & Heard (1982), Roccatagliata & Heard (1995), Petrescu (2004), Petrescu & Heard (2001, 2004 a, b, 2005) mentioned other species and genera from families Bodotriidae, Nannastacidae and Diastylidae, but not from family Leuconidae. The only paper dedicated to cumaceans from this area in which the family Leuconidae (with genera *Eudorella* and *Leucon*) is mentioned is that of Heard, Roccatagliata & Petrescu (2007): "An illustrated guide to Cumacea (Crustacea: Malacostraca: Peracarida) from Florida coastal and shelf waters to depths of 100 m. State of Florida". The occurrence of leuconid cumaceans in the Gulf of Mexico has not been well studied. *Eudorella monodon* Calman, 1912 was the first member of the family to be reported from the Gulf of Mexico. This species, which was described by Calman (1912) from brackish waters along the coast of Louisiana, has since been reported from other areas of the northern Gulf of Mexico (Farrel, 1979; Modlin & Dardeau, 1986; Heard et al., 2007) and western Gulf of Mexico (Donath-Hernández, 1988). Modlin & Dardeau (1988) also reported *Leucon americanus* Zimmer, 1943 from Mobile Bay; however, Heard et al. (2007) concluded that material from Mobile Bay represented an undescribed species (*Leucon* sp. A"), which is apparently endemic to the northern Gulf of Mexico. *Leucon americanus* appears to be restricted to the East Coast of North America, though it was inadvertently listed from the Gulf of Mexico by Heard & Roccatagliata (2009). In their guide to the Cumacea of Florida waters, Heard et al. (2007) reported two undescribed species of *Leucon* (species A & B). from Gulf of Mexico coastal and shelf waters.

MATERIAL

The material was collected from 54 stations from the Gulf of Mexico, almost in the middle of it, west of Florida, from 213 to 3316 m depth, in April-December 2000, January-July 2001 and August 2002 by the Minerals Management Service (MMS).

Collecting stations

Station	Coordinates	Depth (m)	Data
B 1-2	27°12.1374'N 91°24.1806'W	2255	6.05.2000
B 3-2	26°09.7884'N 91°43.9954'W	2580	6.04.2001
B 3-3	26°09.9750'N 91°43.9772'W	2650	24.07.2001
BH 1-1	27°47.8832'N 91°28.2238'W	546	18.06.2001
BH 1-3	27°47.9416'N 91°28.1321'W	540	18.06.2001
C 1-1	28°03.6046'N 90°14.9329'W	334	30.05.2000
C 4-1	27°27.5640'N 89°47.1391'W	1455	30.01.2001
C 4-3	27°27.1450'N 89°46.5588'W	1463	31.05.2001
C 4-5	27°27.2854'N 89°45.7098'W	1470	31.05.2000
C 7-1	27°43.6967'N 89°58.7782'W	1080	30.05.2000
C 7-2	27°43.9413'N 89°58.6211'W	1070	30.05.2000
C 7-5	27°44.1073'N 89°58.8717'W	1057	16.06.2001
C 12-2	26°22.9752'N 89°14.4854'W	2920	22.01.2001
C 12-5	26°28.7838'N 89°14.4179'W	2920	2.06.2000
GKF-2	26°55.2967'N 90°13.2297'W	2473	15.06.2001
MT 1-1	28°32.2850'N 89°49.6638'W	487	2.06.2001
MT 1-2	28°32.3703'N 89°49.7338'W	482	13.08.2002
MT 1-3	28°32.4636'N 89°49.6283'W	676	17.06.2000
MT 1-5	28°32.5111'N 89°49.7656'W	478	2.06.2001
MT 2-1	28°27.0646'N 89°40.3563'W	676	17.06.2000
MT 2-2	28°27.0726'N 89°40.2206'W	677	17.06.2000

Collecting stations (*continued*)

Station	Coordinates	Depth (m)	Data
MT 2-5	27°26.8755'N 89°40.9167'W	680	17.06.2000
MT 3-1	28°13.2246'N 89°29.7679'W	983	16.06.2000
MT 3-2	28°13.4659'N 89°30.3941'W	982	4.06.2001
MT 3-3	28°13.1426'N 89°29.5065'W	990	16.06.2000
MT 3-4	28°13.2498'N 89°30.3220'W	984	4.06.2001
MT 3-5	28°13.2906'N 89°29.2627'W	985	16.06.2000
MT 4-1	28°49.6198'N 89°09.9562'W	1401	18.12.2000
MT 4-2	27°49.7018'N 89°09.9562'W	1401	16.05.2001
NB 2-1	27°43.6967'N 89°58.7782'W	1530	7.05.2000
NB 5-2	26°15.0855'N 91°12.7524'W	2060	9.05.2000
RW 1-1	27°30.0242'N 96°00.1437'W	213	23.05.2000
RW 1-2	27°29.9333'N 96°00.2164'W	213	13.11.2000
RW 1-5	27°30.5085'N 96°50.1708'W	213	23.05.2000
RW 2-3	27°14.9757'N 95°44.8287'W	950	6.08.2001
RW 5-2	26°30.0261'N 95°00.1315'W	1620	27.06.2001
RW 6-3	25°59.9982'N 94°29.5629'W	3000	11.07.2001
RW 6-4	25°59.8684'N 94°29.9071'W	3000	18.05.2000
S 5-33	25°29.5313'N 88°16.2453'W	3316	13.06.2002
S 35-1	29°20.0500'N 87°03.3758'W	658	27.08.2000
S 35-2	29°19.9897'N 87°02.9021'W	667	2.04.2001
S 35-3	29°19.9337'N 87°03.0166'W	668	11.06.2000
S 35-5	29°20.1091'N 87°02.7818'W	666	11.06.2000
S 36-1	28°54.7195'N 87°40.7687'W	1849	10.06.2001
S 36-2	28°54.8933'N 87°37.4229'W	1925	12.08.2001
S 36-3	28°55.1485'N 87°40.9469'W	1825	13.06.2001

Collecting stations (*continued*)

Station	Coordinates	Depth (m)	Data
S 36-4	28°54.5677'N 87°40.6751'W	1850	10.06.2001
S 36-5	28°54.9072'N 87°40.5773'W	1840	10.06.2001
S 37-1	28°33.4057'N 87°45.7357'W	2388	2.08.2000
S 37-2	28°33.4292'N 87°45.6441'W	2382	13.06.2000
S 37-3	28°33.2345'N 87°45.8373'W	2387	12.09.2001
S 40-1	27°50.3354'N 86°45.1549'W	2975	30.10.2000
S 42-1	28°15.1557'N 86°25.0663'W	767	27.11.2000
S 43-1	28°30.1055'N 86°04.9983'W	366	6.11.2000
W 1-1	27°34.7791'N 93°32.8573'W	379	2.11.2000

The material was sorted at Gulf Coast Research Laboratory, Ocean Springs, Mississippi, U. S. A. and identified in the „Grigore Antipa” National Museum of Natural History, Bucharest (Romania). The type specimens are mainly deposited in the collections of the National Museum of Natural History, Smithsonian Institution, Washington and partially in the „Grigore Antipa” National Museum of Natural History, Bucharest.

RESULTS

In the present material we identified 13 species, from two genera and four subgenera; four species of genus *Leucon* are new to sciences.

Two species of genus *Eudorella* Norman, 1867 are presented in Heard, Roccatagliata & Petrescu (2007), *Eudorella monodon* Calman (1912) and *Eudorella* sp. A. We mentioned other two, including a new species; none of the previously mentioned species are present in our material. Regarding the genus *Leucon*, three species were found by Heard, Roccatagliata & Petrescu, *Leucon americanus* Zimmer, 1943, *Leucon* sp. A and *Leucon* sp. B; in our material we found twelve species, including four new species; the subgenera *Crymoleucon* Watling and *Macrauloleucon* Watling are mentioned for the first time from deep waters of the Gulf of Mexico.

Genus *Eudorella* Norman, 1867

Eudorella hispida G. O. Sars, 1871

Eudorella hispida G. O. Sars, 1871: 49, figs 95-97.

Material: 1 immat. ♂, sta. BH 1-1; 1 ♀, sta. BH 1-3; 1 immat. ♂, sta. C 7-5; 1 ♂, 1 ♀, sta. MT 1-1; 1 immat. ♂, sta. MT 1-2; 5 ♀♀, sta. MT 1-3; 1 ♀, 2 ♂♂, sta. MT 1-5; 1 ♀, sta. MT 2-2; 5 ♀♀, sta. MT 3-2; 1 ♂, sta. MT 3-3; 1 ♀, sta. MT 3-4; 2 ♀♀, sta. MT 3-5; 1 ♀, sta. S 35-2; 1 ♀, sta. S 35-5; 2 ♂♂, sta. S 37-1.

Remarks

Previously known from the Atlantic coast of U. S. A., up to 39°N. First mention from 28°N latitude, from the Gulf of Mexico.

Genus *Leucon* Krøyer, 1846
Subgenus *Crymoleucon* Watling, 1991
***Leucon papadopoli* n. sp.**
(Figs 1, 2)

Material: holotype, ♂, no. USNM 1149371. *Type locality*: sta. S 37-2, 28°33.4292'N, 87°45.6441'W, 2382 m, 13.06.2000.

Etymology: species dedicated to the memory of Aurel Papadopol (1923-2009), former deputy director of „Grigore Antipa” National Museum of Natural History, reknown ornithologist, who generously devoted his life to the museum in which he worked for 38 years.

Description of male (holotype)

Body length: 4.6 mm.

Carapace (Fig. 1 A, B), 0.3 of entire body length, twice as long as high, pseudorostrum 0.48 times as long as frontal lobe, ocular lobe without lenses, with a median tooth, short serration on anterior margin, antero-ventral corner not evident, not visible antennal notch, dorsal and ventral margins smooth.

Antenna 1 (Fig. 1 C), median article of peduncle, the longest, two pappose setae on inner margin of 2nd and one on 3rd article; main flagellum with four articles, four aesthetascs on basal article; accessory flagellum reaches the distal extremity of second article of main one.

Antenna (Fig. 1 D), peduncle with five articles, flagellum reaches the uropods.

Maxilliped 3 (Fig. 1 E), basis 0.53 times as long as entire length of maxilliped, a plumose seta on inner margin, two long plumose setae on outer margin; merus 1.5 times as long as ischium, with a long plumose seta on outer margin; carpus 1.3 times as long as merus and propodus, with three short plumose setae on inner margin, a long plumose seta on outer margin, propodus with a plumose seta on inner margin, two long simple ones on outer margin; dactylus as long as propodus, with long terminal simple setae. Exopod, large, longer than basis, flagellum with six articles.

Pereopod 1 (Fig. 1 F), basis 0.38 times as long as entire pereopod length, 10 plumose setae on inner margin, two plumose longer ones on outer margin; merus twice as long as ischium, a plumose seta on outer margin; carpus twice as long as merus, with three simple setae on inner margin, four plumose ones on outer margin, one plumose seta on ventral surface; propodus 1.25 times as long as carpus, second longest article of 1st pereopod, simple and plumose setae on both margins; dactylus 0.4 times as long as propodus, with terminal setae longer than article.

Pereopod 2 (Fig. 2 A), basis 0.46 times as long as entire pereopod length, three plumose setae on inner margin; merus three times as long as ischium, with a plumose seta on inner margin; carpus 1.9 times as long as merus with four plumose setae on outer margin and two simple ones on inner distal corner; propodus 0.4 of carpus length; dactylus 1.9 times as long as propodus, with five plumose setae on inner margin, and a long plumose seta distally. Exopod, reaching extremity of carpus, with large peduncle and flagellum with eight articles.

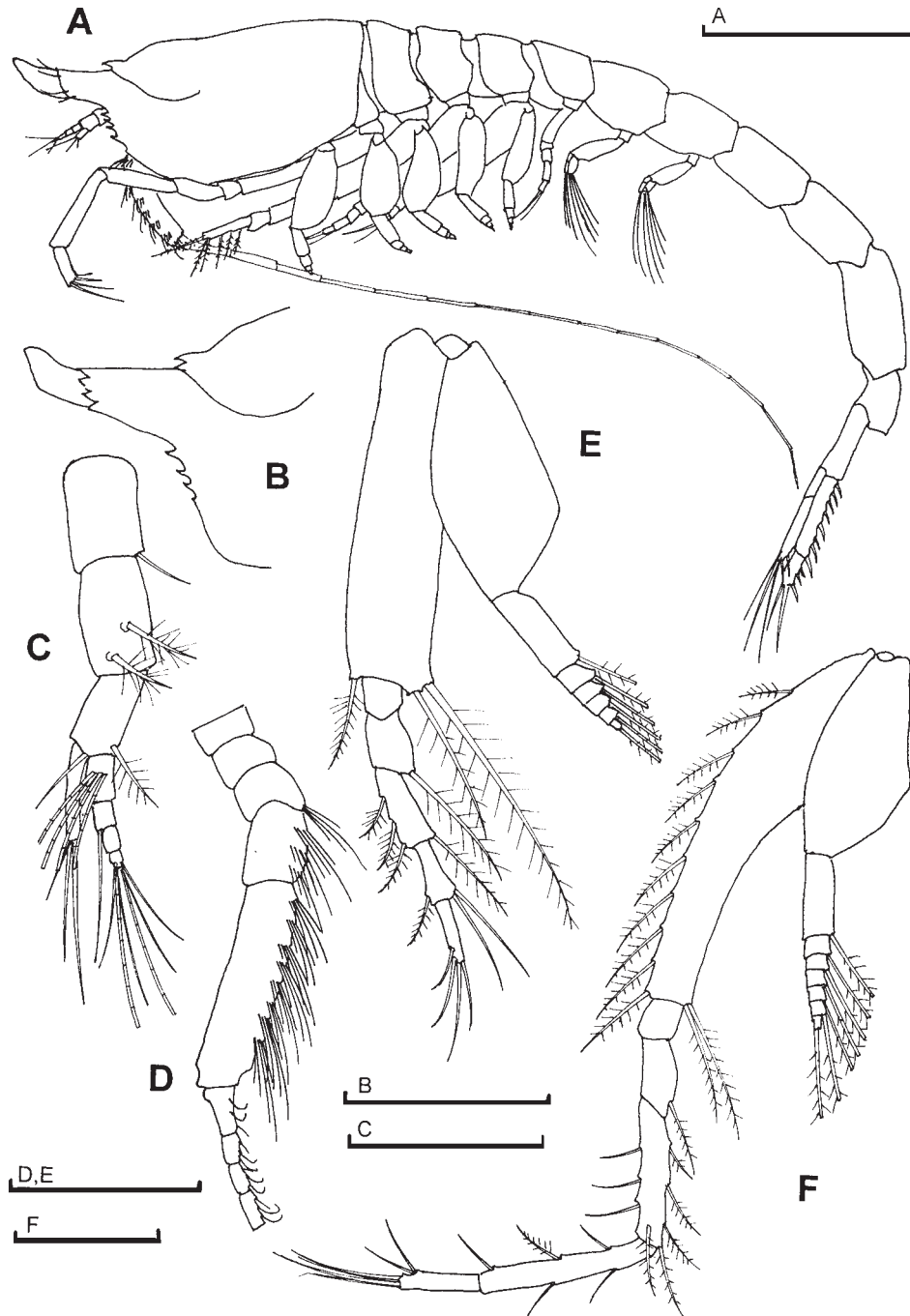


Fig. 1 - *Leucon (Crymoleucon) papadopoli* n. sp. Holotype male: A, body, lateral view; B, carapace, frontal part; C, antenna 1; D, antenna; E, maxilliped 3; F, pereopod 1. Scale bars (in mm): A, 1; B, 1; C, 0.2; D, E, 0.3; F, 0.3.

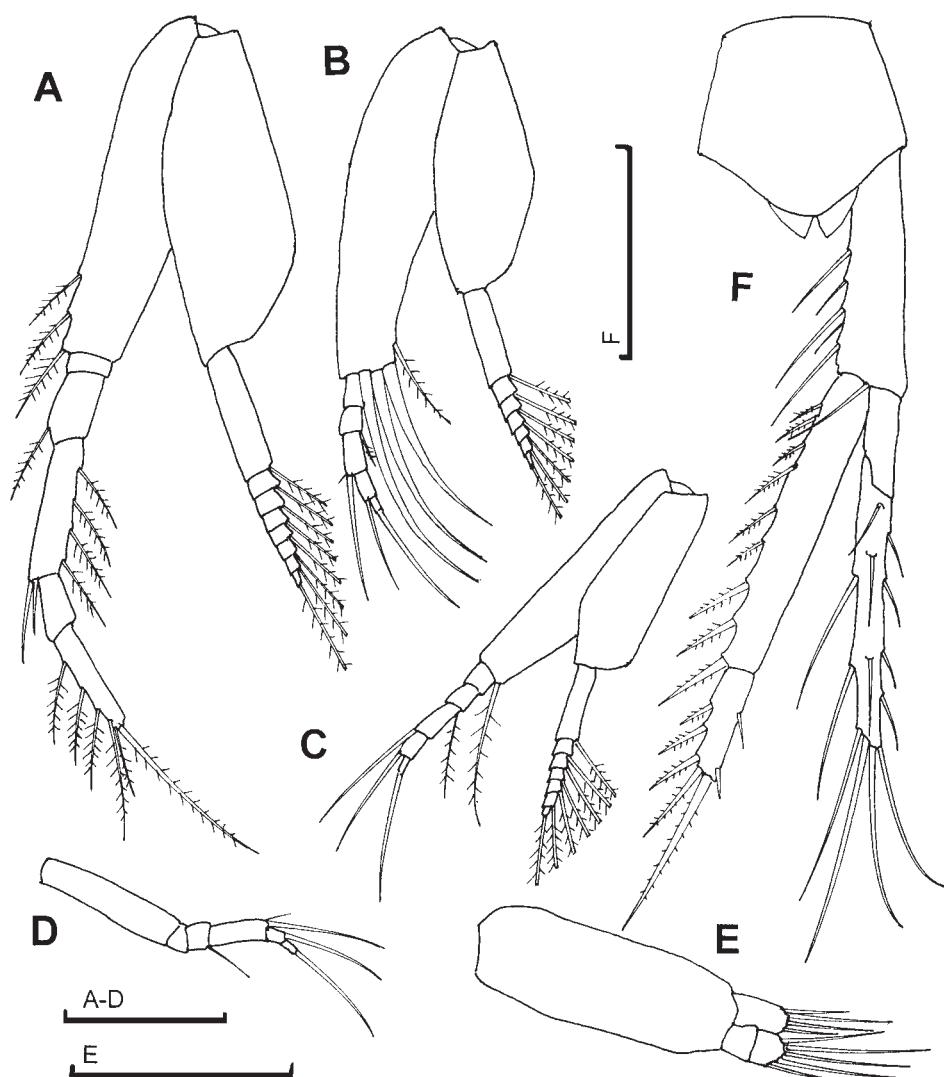


Fig. 2 - *Leucon* (*Crymoleucon*) *papadopoli* n. sp. Holotype male: A, pereopod 2; B, pereopod 3; C, pereopod 4; D, pereopod 5; E, pleopod; F, last pleonite and right uropod. Scale bars (in mm): A-D, 0.3; E, 0.2; F, 0.3.

Pereopod 3 (Fig. 2 B), basis longer than rest of articles combined, a plumose seta on outer margin and three very strong annulate setae distally; carpus 1.6 times as long as merus, with an annulate seta; propodus also with an annulate seta and very short dactylus with a long terminal simple seta. Exopod, large, exceeding extremity of merus.

Pereopod 4 (Fig. 2 C), basis longer than rest of articles combined, a long plumose seta on distal outer corner; merus also with a plumose outer seta. Exopod, exceeding merus.

Pereopod 5 (Fig. 2 D), basis half pereopod length, carpus 1.4 times as long as ischium and merus combined.

Pleopod (Fig. 2 E), peduncle with equal rami.

Uropod (Fig. 2 F), peduncle 1.2 times as long as last pleonite, 0.58 times as long as its endopod, with five simple setae on inner margin and a medio-distal one; exopod 0.8 times as long as endopod, proximal article 0.3 times as long as distal one, distal article with four simple setae on outer margin, three median ones and two longer ones on inner margin, three subterminal ones and a robust terminal seta; endopod with two articles, proximal article 2.8 times as long as distal one, with nine microserrate setae on inner margin, distal article with three microserrate inner setae, one subterminal and a terminal stout one.

Remarks

First mention of the subgenus *Crymoleucon* Watling (1991) from North-western Atlantic. *Leucon papadopoli* n. sp. has a dorsal, median tooth on frontal lobe like *Leucon andreiaae* n. sp. It differs mainly by first pereopod, shorter in *L. papadopoli* n. sp. than in *L. andreiaae* n. sp. and uropods, with shorter peduncle, longer rami, longer proximal article of endopod. It also differs from all the known species of the subgenus by accessory flagellum of antenna 1, longer than first two articles of main flagellum.

***Leucon andreiaae* n. sp.**

(Fig. 3)

Material: holotype, ♀, no. USNM 1149370; *paratypes*: 1 ♀, sta. MT 2-2, no. USNM 1149370; 1 ♀, sta. MT 3-1, no. MGAB CUM 1687; 1 ♀, 1 immat. ♂, sta. MT 3-5, no. USNM 1149370. *Type locality*: sta. MT 2-1, 28°27.0646'N, 89°40.3563'W, 676 m, 17.06.2000.

Etymology: species dedicated in honor of distinguished colleague Gabriela Andrei, specialist in Mollusca from „Grigore Antipa” National Museum of Natural History, as a sign of perpetuals remember of her discrete dedication to the history of the museum, and for all the friendship that she shown to the first author.

Description of female paratype

Body length: 3.6 mm.

Carapace (Fig. 3 A), 0.3 times as long as entire body length, a medial dorsal tooth on frontal lobe, pseudorostrum 1.4 times as long as frontal lobe, with serrate margins, small antennal notch, serrated ventral margin.

Pereon, 0.7 times as long as carapace length.

Pleon, little shorter than half of body.

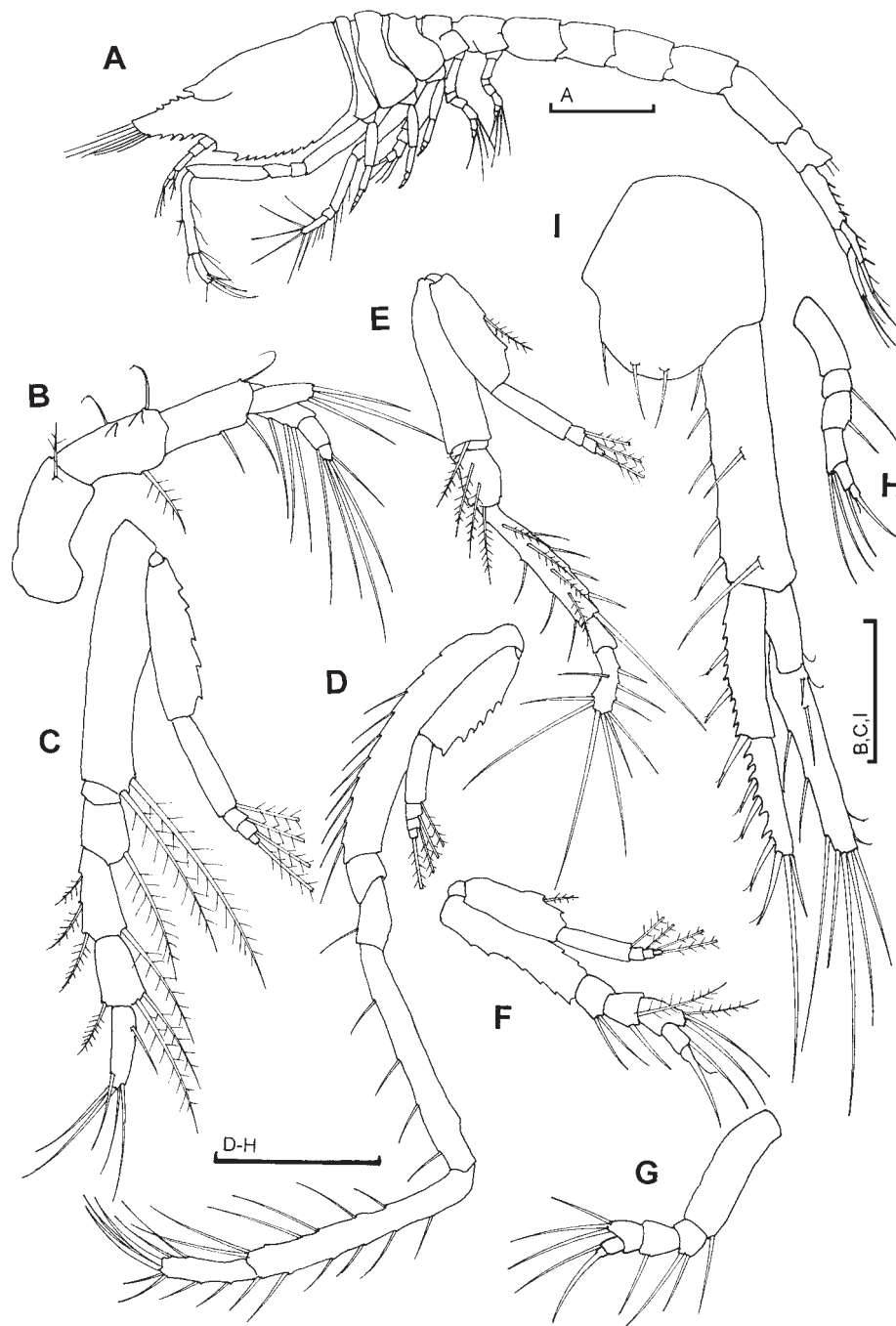


Fig. 3 - *Leucon (Crymoleucon) andreiae* n. sp. Holotype female: A, body, lateral view; B, antenna 1; C, maxilliped 3; D, pereopod 1; E, pereopod 2; F, pereopod 3; G, pereopod 4; H, pereopod 5; I, last pleonite and right uropod. Scale bars (in mm): A, 2.5; B, C, I, 0.2; D-H, 0.3.

Antenna 1 (Fig. 3 B), peduncle with progressively shorter articles, two teeth on outer margin of median one; main flagellum as long as median article of peduncle, with three articles; accessory flagellum as long as main flagellum basal article, with three long stout setae distally.

Maxilliped 3 (Fig. 3 C), basis 0.47 times as long as entire length of maxilliped, two long plumose setae on outer margin; merus twice as long as ischium, one plumose seta on outer margin; carpus 1.6 times as long as merus, three plumose setae on inner margin, one on outer margin; propodus 0.75 times as long as carpus, a seta on inner margin, two on outer margin; dactylus 1.13 times as long as propodus, with long terminal simple setae. Exopod reaches half of merus.

Pereopod 1 (Fig. 3 D), short basis, 0.28 of entire length, eight simple setae on inner margin; merus 1.5 times as long as ischium, with one seta on outer margin; long carpus, 3.5 times as long as merus, simple setae on inner margin; propodus as long as carpus, numerous simple setae on both margins, two long simple subterminal setae; dactylus 0.34 times as long as propodus, terminal simple setae. Exopod, shorter than endopodal basis.

Pereopod 2 (Fig. 3 E), basis 0.34 as long as entire length of pereopod, with a plumose distal seta; merus 6 times as long as ischium, with three plumose median ones; carpus 2.6 times as long as merus, with four simple setae on outer margin, three simple setae on inner one, four plumose median ones and a long stout distal one, exceeding extremity of dactylus; dactylus twice as long as propodus, five simple setae on outer margin, two longer ones on inner margin, two much longer subterminally, and a terminal one, the longest, 3 times as long as dactylus. Exopod, reaching distal extremity of merus.

Pereopod 3 (Fig. 3 F), basis almost as long as rest of articles combined; carpus 1.4 times as long as merus, with two annulate setae; short dactylus, 0.6 as long as propodus, fused with a terminal stout long seta. Exopod exceeds dorsal extremity of merus.

Pereopod 4 (Fig. 3 G), basis longer than rest of articles combined, carpus as long as merus, with three annulate setae, tiny dactylus. Without exopod.

Pereopod 5 (Fig. 3 H), basis almost half of pereopod, ischium and merus with an inner simple seta, carpus with two annulate setae, propodus with one annulate seta, tiny dactylus. Without exopod.

Uropod (Fig. 3 I), peduncle 1.34 times as long as 6th pleonite, as long as endopod, with two median simple setae and other four ones on inner margin; exopod as long as endopod, proximal article 0.45 times as long as distal one, distal article with two median simple setae, two inner ones, four subterminal long ones and a terminal stout seta little shorter than exopod; endopod proximal article 1.28 times as long as distal one, three short stout sensory setae on serrate inner margin of proximal article; distal article with three and two subterminal longer ones and a terminal stout sensory seta, 0.74 times as long as endopod length.

Remarks

Leucon (*C.*) *andreae* n. sp. is close related to *L. (C.) papadopoli* n. sp., both of them with an apical tooth on ocular lobe and long accessory flagellum of first antenna. It differs mainly by: carapace with ventral serrate margin, flagelli of antenna 1 and by uropods, longer peduncle, shorter rami, longer distal article of endopod.

Subgenus *Macrauloleucon* Watling, 1991

***Leucon radulețzi* n. sp.**

(Fig. 4)

Material: holotype, ♂, no. USNM 1149372; *paratype:* 1 manca, no. USNM 1149372. *Type locality:* sta. GKF-2, 26°55.2967'N, 90°13.2297'W, 2473 m, 15.06.2001.

Etymology: species dedicated to the honor of Năstase Răduleț, specialist in Chiroptera, Mammalia from „Grigore Antipa” National Museum of Natural History, distinguished colleague of first author, as a sign of eternal remember of his kindness and disscretion.

Description of male holotype

Body length: 3.9 mm.

Carapace (Fig. 4 A), 0.3 times as long as entire body length, twice longer than high, four small teeth on dorsal margin, another on pseudorostrum; long pseudorostrum, twice as long as frontal lobe, 0.36 of entire carapace length, large serration on its ventral margin, strong spines on anterior margin, long siphon, 0.7 of entire carapace length, serrate ventral margin.

Pereon, 0.18 of entire length, five segments visible, short serration on dorsal margin on 2-4 segments.

Pleon, 0.51 of entire length.

Antenna 1 (Fig. 4 B), peduncle with one long plumose seta, main flagellum little longer than 3rd article of peduncle, with three articles, four long terminal aesthetascs; accessory flagellum, half of 1st article of main flagellum, with two aesthetascs.

Maxilliped 3 (Fig. 4 C), massive basis 0.38 times as long as entire length, three pappose setae on inner margin, three long pappose setae on outer process; merus twice as long as ischium, long pappose seta on outer serrate margin; carpus 1.5 times as long as merus, two pappose setae on inner margin, one long pappose seta on serrate outer margin; propodus 0.76 times as long as carpus; dactylus half of propodus, with terminal stout long setae. Exopod, large, reaches half of merus.

Pereopod 1 (Fig. 4 D), basis 0.3 times as long as entire length, with two plumose setae interspersed with robust sensory inner ones, a plumose seta on distal outer margin; ischium with a plumose seta on inner margin; merus 1.6 times as long as ischium, a spine on inner margin, two plumose distal setae; carpus 2.75 times as long as merus, three plumose setae on inner margin, three plumose setae on outer margin; propodus as long as carpus, four plumose setae on both margins, dactylus 0.43 times as long as propodus. Exopod, smaller than that of maxilliped 3.

Pereopod 2 (Fig. 4 E), basis 0.3 of entire length; carpus 1.8 times as long as merus, three plumose setae on inner margin, two plumose ones on outer margin, two long plumose setae and a stout sensory seta distally; dactylus 2.7 times as long as propodus, two stout sensory setae on inner margin, two plumose setae on outer margin, five long plumose setae subterminally and a long plumose seta terminally.

Pereopod 3 (Fig. 4 F), basis longer than rest of articles combined, carpus as long as ischium and merus combined with two annulate setae, dactylus fused with terminal stout setae.

Pereopod 4 (Fig. 4 G), basis as long as articles combined, carpus shorter than merus and ischium combined, dactylus fused with terminal seta.

Pereopod 5 (Fig. 4 H), basis shorter than rest of articles combined.

Exopods, on pereopods 1-4.

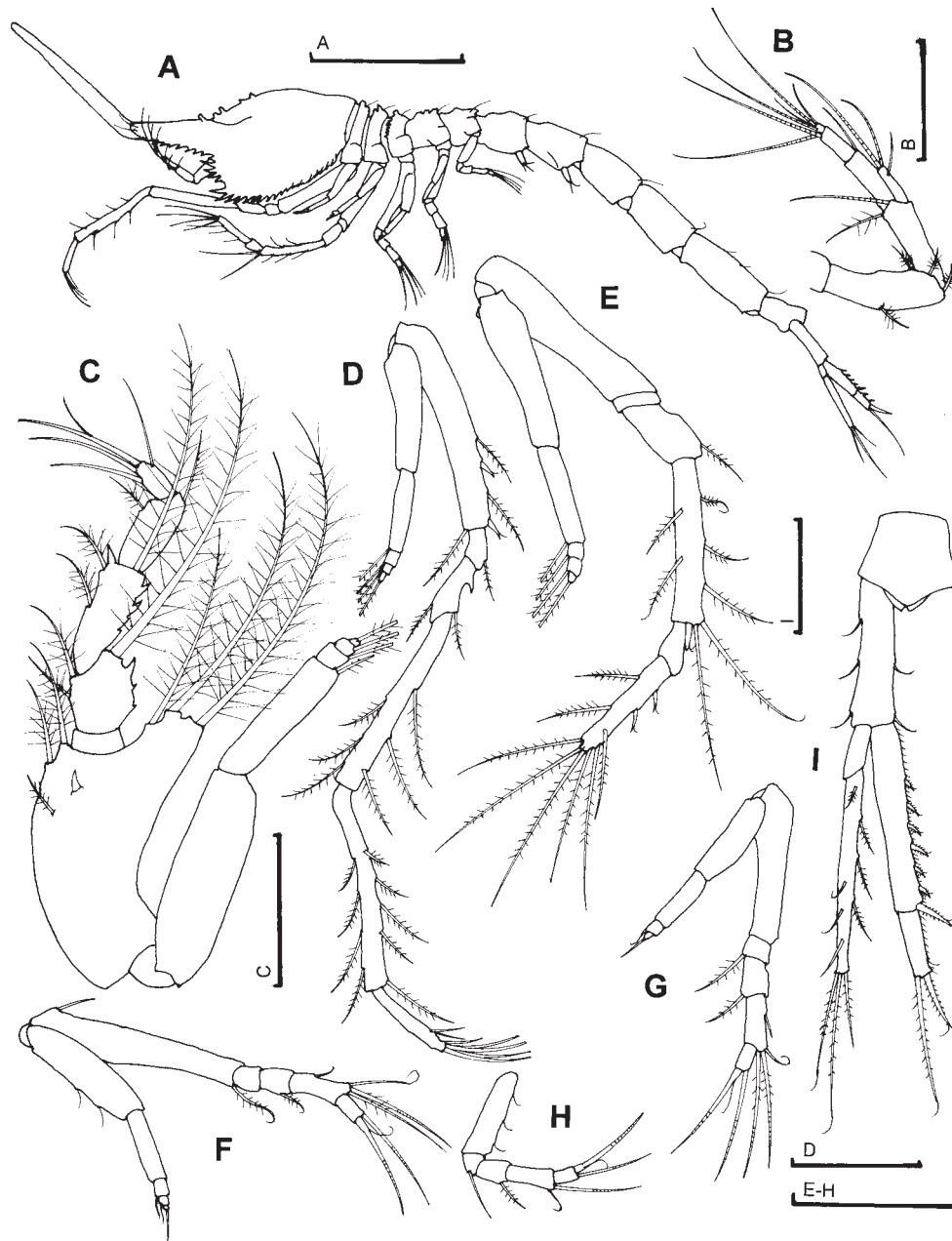


Fig. 4 - *Leucon* (*Macrauloleucon*) *radulezzi* n. sp. Holotype immature male: A, body, lateral view; B, antenna 1; C, maxilliped 3; D, pereopod 1; E, pereopod 2; F, pereopod 3; G, pereopod 4; H, pereopod 5; I, last pleonite and left uropod. Scale bars (in mm): A, 1; B, 0.2; C, 0.2; D, 0.3; E-H, 0.3.

Uropod (Fig. 4 I), peduncle 1.5 times as long as 6th pleonite, 0.57 times as long as endopod, simple setae on both margins; exopod as long as endopod, distal article four times as long as proximal one, four setae on dorsal surface (one plumose, three simple), three plumose setae on inner margin, two subterminal plumose setae, a terminal plumose seta; endopod proximal article 2.8 times as long as distal one, seven micro serrate sensory setae on inner margin; distal article with a long plumose seta and a micro serrate sensory seta terminally.

Remarks

Leucon (*M.*) *radulezti* n. sp. resembles *L. (M.) spinulosus* Hansen (1920) and *L. (M.) siphonatus* Calman (1906) from the Arctic, but with lesser spines on carapace, shorter siphon and other number and form of setae on uropods. It is also close to *L. parasiphonatus* Mühlenhardt-Siegel (1994), but with spines on carapace, uropods with different number of setae. The new species is closer related to *L. (Macrauloleucon) dentirostris* and *L. (M.) brigittehilbigae*, both described by Mühlenhardt-Siegel (2005) from Angola waters, it differs by uropodal rami longer than peduncle than in *L. dentirostris*, several spines on dorsal margin of carapace in *L. radulezti* n. sp. than in *L. brigittehilbigae*.

Leucon siphonatus Calman, 1905

Leucon siphonatus Calman, 1905: 19-20, figs 2-4.

L. (Macrauloleucon) siphonatus - Watling, 1991: 572-573.

Material: 1 ♂, sta. MT 1-1; 1 manca, sta. C 7-1; 1 ♂, sta. RW 2-3; 1 ♀, sta. S 37-2; 1 ♂, sta. C 7-5.

Remarks

First record from the Gulf of Mexico. Previously mentioned from North East Atlantic and the Mediterranean (Băcescu, 1988).

Subgenus *Epileucon* Jones, 1956

Leucon ensis (Bishop, 1981)

Epileucon ensis Bishop, 1981 a: 375-379, figs 9,10.

L. (Epileucon) ensis - Watling, 1991: 572.

Material: 1 manca, sta. MT 3-4; 1 manca, sta. S 36-2; 1 ♀, sta. C 1-1; 2 ♀♀, sta. S 35-1.

Remarks

First record from the Gulf of Mexico.

Leucon longirostris G. O. Sars, 1871

Leucon longirostris G. O. Sars, 1871: 42-43, fig. 75.

Material: 4 ♀♀, sta. C 7-2; 1 ♀, sta. MT 2-1; 5 ♀♀, sta. MT 3-1; 5 ♂♂, sta. MT 3-2; 2 ♀♀, sta. MT 4-1; 1 ♀, sta. S 37-2.

Remarks

First mention from the Gulf of Mexico, previously known from Greenland, Atlantic coast of U. S. A., of Europe and Africa (Băcescu, 1988).

Leucon tenuirostris G. O. Sars, 1887*Leucon* (*Epileucon*) *tenuirostris* G. O. Sars, 1887: 38-40, figs 1-4.

Material: 1 ♀, sta. C 4-1; 3 ♀♀, 3 ♂♂, sta. C 7-1; 2 ♀♀, sta. C 7-5; 1 ♀, sta. S 5-33; 1 immat. ♂, sta. S 36-2; 1 ♀, sta. S 36-4; 1 ♀, sta. S 35-2; 2 ♂♂, sta. S 37-1; 1 ♀, sta. S 37-2.

Remarks

Recorded for the first time from the Gulf of Mexico, previously known from both coasts of Atlantic (Băcescu, 1988).

Subgenus *Leucon* Kröyer, 1846*Leucon americanus* Zimmer, 1943*Leucon americanus* Zimmer, 1943: 159-160.

Material: 1 ♀, sta. MT 3-2; 1 manca, sta. S 36-5.

Remarks

Previously known from the Western Central Atlantic (Băcescu, 1988).

Leucon homorhynchus Bishop, 1981*Leucon homorhynchus* Bishop, 1981 b: 145-151, figs 1-3.

Material: 1 immat. ♂, sta. C 7-5; 2 ♂♂, sta. B 1-2; 1 ♀, sta. B 3-2; 1 ♀, sta. MT 2-2; 1 ♀, sta. MT 3-5; 1 ♀, sta. NB 2-1; 1 ♂, sta. NB 5-2; 1 ♀, sta. RW 2-1; 1 ♀, sta. RW 6-3; 3 ♀♀, sta. S 35-1; 1 ♀, sta. S 35-5; 1 ♀, sta. S 37-2; 1 ♀, sta. S 42-1; 2 ♂♂, sta. S 43-1; 2 ♀♀, sta. W 1-1.

Remarks

First record from the Gulf of Mexico, previously recorded only from both sides of Atlantic (Băcescu, 1988).

Leucon serafimae n. sp.

(Figs 5, 6)

Material: holotype, ♀, no. USNM 1149373. *Type locality*: sta. RW 1-1, 27°30.0242'N, 96°00.1437'W, 213 m, 23.05.2000.

Etymology: species dedicated to the honor of Rodica Serafim, specialist in Coleoptera from „Grigore Antipa” National Museum of Natural History, distinguished colleague of the first author, as a sign of high appreciation of her devotion to her domain of work, of her firm position in crucial events.

Description of female (holotype)

Body length: 4.08 mm.

Carapace (Fig. 5 A-C), 0.28 of entire length, 1.7 times as long as high, 2.5 times as long as width, with a median dorsal row of denticles, two pairs of small denticles on basis of frontal lobe, anterior and ventral margin, serrated.

Pereon, 0.75 times as long as carapace.

Pleon, about half of entire length.

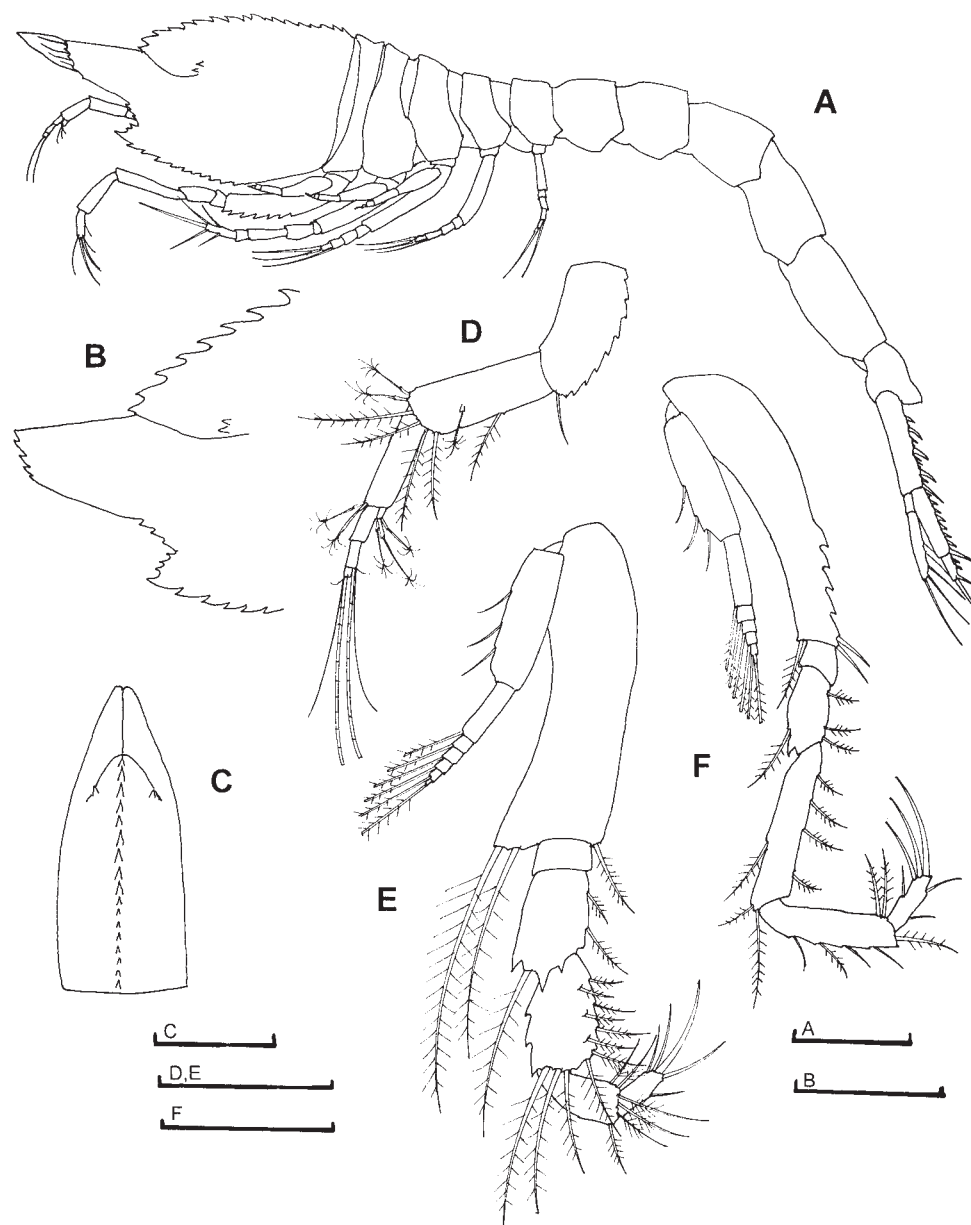


Fig. 5 - *Leucon (Leucon) serafimae* n. sp. Holotype female: A, body, lateral view; B, carapace frontal part, lateral view; C, carapace, dorsal view; D, antenna 1; E, maxilliped 3; F, pereopod 1. Scale bars (in mm): A, 0.5; B, 0.3; C, 0.5; D, E, 0.2; F, 0.3.

Antenna 1 (Fig. 5 D), first article of peduncle as long as second one, numerous plumose and pappose setae on second and third articles; main flagellum with three articles, accessory flagellum short.

Maxilliped 3 (Fig. 5 E), basis 0.46 times as long as entire maxilliped, one plumose seta on inner margin, two long ones on outer process; merus 3.6 times as long as ischium, outer and distal margin serrate, long plumose seta on outer margin; large carpus little longer than merus, with four distal plumose setae and numerous shorter ones on inner margin; propodus 0.74 times as long as carpus, with six distal micro serrate shorter setae; dactylus 0.76 times as long as propodus, with simple terminal setae. Exopod as long as endopodal basis.

Pereopod 1 (Fig. 5 F), basis 0.42 times as long as entire pereopod length, distal half of inner margin with a strong serration, two setae distally; merus twice as long as ischium, with a tooth and a plumose seta on outer margin and three plumose setae on inner margin; carpus twice as long as merus, with plumose setae on both margins; propodus 0.8 times as long as carpus; dactylus, half of propodus length, long terminal stout setae. Exopod, little exceeding endopodal basis.

Pereopod 2 (Fig. 6 A), basis 0.47 times as long as entire pereopod length, five simple setae on outer margin, two plumose ones on distal inner margin; merus with a stout sensory seta on inner margin; carpus little longer than merus, with two short plumose setae and three strong stout setae, distally; dactylus 1.8 times as long as propodus, terminal stout seta twice as long as dactylus. Exopod, shorter than endopodal basis.

Pereopod 3 (Fig. 6 B), basis 0.67 times as long as entire pereopod length, simple and plumose setae on both margins; merus as long as ischium; carpus little longer than merus, two annulate distal setae; propodus with an annulate seta; dactylus with a long terminal seta. Exopod, shorter than endopodal basis.

Pereopod 4 (Fig. 6 C), basis 0.6 times as long as entire pereopod length, three plumose setae on each margin; carpus 1.5 times as long as merus, two annulate setae distally; dactylus 0.3 times as long as propodus, with a long terminal simple seta. Without exopod.

Pereopod 5 (Fig. 6 D), basis 0.47 times as long as entire pereopod length. Without exopod.

Uropod (Fig. 6 E), peduncle 1.3 times as long as last pleonite, four micro serrate stout setae interspersed with four simple shorter ones on inner margin, 0.9 times as long as exopod; exopod 1.04 times as long as endopod, distal article 2.73 times as long as proximal one, with short plumose and simple setae on outer margin, five long plumose ones on inner margin, terminal stout plumose seta 0.6 times as long as exopod; proximal article of endopod 1.8 times as long as distal one, with three stout micro serrate sensory setae and seven stout simple ones on inner margin; distal article with six stout simple setae on inner margin and a subterminal and a short terminal ones.

Remarks

Leucon (*L.*) *serafimae* n. sp. resembles many species of the subgenus from the Atlantic and Eastern Pacific due to serrate dorsal margin of carapace. Main differences: frontal lobe with two pairs of contiguous lateral denticles, endopodal uropod with more setae on inner margin than *L. robustus* Hansen, 1920 from North Atlantic (16 versus 13); *L. assimilis* Sars, 1887 from Kerguelen, also with 16 setae but it has fewer setae on peduncle and exopod.

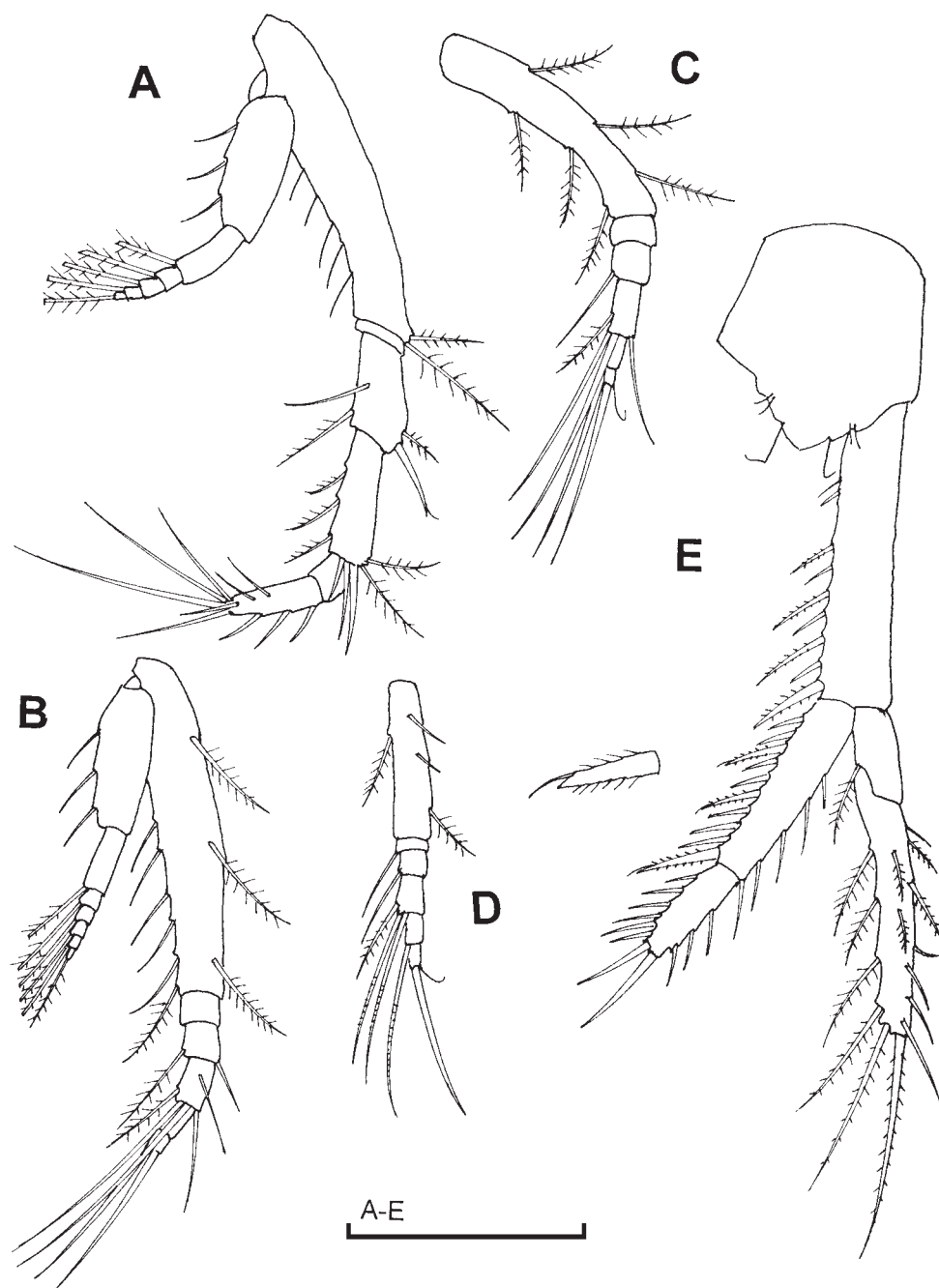


Fig. 6 - *Leucon (Leucon) serafimae* n. sp. Holotype female: A, pereopod 2; B, pereopod 3; C, pereopod 4; D, pereopod 5; E, last pleonite and right uropod. Scale bar (in mm): A-E, 0.3.

Leucon tener Hansen, 1920*Leucon tener* Hansen, 1920: 9-10, fig. 2.*Material*: 1 ♂, sta. C 12-2.*Remarks*

First record out of previously known distribution area: North West Atlantic coast (Băcescu, 1988).

Leucon turgidulus Bishop, 1982*Leucon turgidulus* Bishop, 1982: 346-348, fig. 1.

Material: 1 ♀, sta. B 3-3; 1 ♀, sta. C 4-3; 1 ♂, sta. C 4-5; 1 immat. ♂, sta. C 12-5; 2 manca, sta. MT 2-5; 1 manca, sta. MT 3-4; 1 ♀, sta. MT 1-1; 2 ♀♀, sta. MT 3-5; 1 ♀, sta. RW 1-5; 1 ♀, sta. RW 5-2; 1 ♀, sta. RW 6-4; 1 ♀, sta. S 36-4; 1 ♀, sta. S 37-3.

Remarks

First mention from the Gulf of Mexico.

ACKNOWLEDGEMENTS

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NOI LEUCONIDE DIN GOLFUL MEXIC
(CRUSTACEA: CUMACEA: LEUCONIDAE)

REZUMAT

Este cea de a doua lucrare conținând specii de Leuconidae din Golful Mexic.

A fost studiat materialul provenind din 54 stații, colectate aproximativ din mijlocul Golfului Mexic, vest de Florida, de la adâncimi între 213 și 3316 m, în anii 2000, 2001 și 2002, de Minerals Management Service, S. U. A.

Au fost găsite 13 specii, patru dintre ele fiind noi pentru știință: *Leucon papadopoli* n. sp., *L. andreiae* n. sp., *L. radulezsi* n. sp. și *L. serafimae* n. sp.

Alte opt specii și două subgenuri, *Crymoleucon* Watling, 1991 și *Macrauloleucon* Watling, 1991 sunt menționate pentru prima oară din această zonă a Golfului. O singură specie a fost regăsită, *Leucon americanus* Zimmer, 1943.

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XENODIVERSITY OF DECAPOD SPECIES (CRUSTACEEA: DECAPODA: REPTANTIA) FROM THE ROMANIAN WATERS

ANA-MARIA PETRESCU, ANA-MARIA KRAPAL, OANA PAULA POPA,
ELENA IULIA IORGU, LUIS OVIDIU POPA

Abstract. This paper is a synthesis of the faunistic data present in the specialized literature on the alien decapod species identified in the Romanian fauna between 1951 and 2010: *Orconectes limosus* (Rafinesque, 1817), *Callinectes sapidus* Rathbun, 1896, *Rhithropanopeus harrisi* (Gould, 1841), *Eriocheir sinensis* H. Milne Edwards, 1853, *Hemigrapsus sanguineus* (de Haan, 1835), *Palaemon macrodactylus* Rathbun, 1902, *Dyspanopeus sayi* (Smith, 1869).

Résumé. Ce travail présente une synthèse des données faunistiques de la littérature spécialisée sur les espèces allochtones décapodes identifiées dans la faune de Roumanie entre 1951 et 2010: *Orconectes limosus* (Rafinesque, 1817), *Callinectes sapidus* Rathbun, 1896, *Rhithropanopeus harrisi* (Gould, 1841), *Eriocheir sinensis* H. Milne Edwards, 1853, *Hemigrapsus sanguineus* (de Haan, 1835), *Palaemon macrodactylus* Rathbun, 1902, *Dyspanopeus sayi* (Smith, 1869).

Key words: alien species, Romania, decapod, Black Sea, lagoons, freshwater.

INTRODUCTION

Freshwater and marine biotas are in a continuous and rapid change worldwide. The Danube River is a main aquatic corridor in Europe, part of the Southern corridor (Rhine-Main-Danube Canal, connecting the North Sea and Atlantic Ocean to the Black Sea) of the invasion of Ponto-Caspian species. The changes which appeared in the Black Sea during the last 75 years have been very deep, especially on the western coast. The Black Sea as well as the Baltic Sea, the Azov Sea, the Caspian Sea, and the Aral Sea are geologically and biologically young seas (Leppäkoski & Olenin, 2000). Today the biotas of these water bodies are exposed to each other, due to the breakdown of geographical barriers by ship traffic, leading to an exchange of species. In addition to their connections through straits with the Mediterranean Sea and the Atlantic Ocean, the Baltic, Black, and Caspian Sea basins are connected to each other by canals and rivers. Anthropogenic translocations of aquatic organisms are associated with this change. In the Black Sea, decapod crustaceans are an important group, representing links in the trophic chain with ecological and economical importance, respectively as environment quality indicator species and for commercial fishing.

Seven new decapod species have been recorded so far on the Romanian territory: *Orconectes limosus* (Rafinesque, 1817) in freshwater, and *Callinectes sapidus* Rathbun, 1896, *Rhithropanopeus harrisi* (Gould, 1841), *Eriocheir sinensis* H. Milne Edwards, 1853, *Hemigrapsus sanguineus* (de Haan, 1835), *Palaemon macrodactylus* Rathbun, 1902, *Dyspanopeus sayi* (Smith, 1869) in the Black Sea and its adjacent lagoons.

Order DECAPODA Latreille, 1802
Infraorder Astacidea Latreille, 1802
Family Cambaridae Hobbs, 1942
Orconectes limosus (Rafinesque, 1817)

This species belongs to *Orconectes* genus, one of the three dominant genera (*Procambarus*, *Cambarus* and *Orconectes*) of freshwater crayfish from North America and presently accounts for approximately 25% of the total North American crayfish fauna. It is one of the most widely distributed non-indigenous crayfish species in Europe (Souty-Grosset et al., 2006) present in at least 20 countries. Native to the eastern part of North America, the spiny-cheek crayfish was introduced for the first time in Europe in 1890 by Max von dem Borne in Germany (Hamr, 2002). In Austria the invasiveness of *O. limosus* is relatively low and in large rivers it can coexist with native species (Pöckl & Pekny, 2002). Numerous populations are currently established in The Netherlands, Switzerland, Italy, Belgium, France, England, Belarus (Holdich & Black, 2007), Croatia (Maguire & Klobucar, 2008). The species is spreading fast in Hungary (Puky & Schád, 2006), is already widely distributed in Czech Republic, Poland, Eastern Germany (Schulz & Śmietana, 2001; Petrusek et al., 2006) and in the Serbian part of the Danube River, which represents the most Eastern place in Europe (Pavlović et al., 2006). In Slovakia (Janský & Kautman, 2007; Puky, 2009) and in Romania (Pârvulescu et al., 2009) the species is just mentioned.

In Romania *O. limosus* was reported by Pârvulescu et al. in 2009 from Caraș-Severin district, on the left shore of the Danube River, part of the Iron Gates Natural Park (located in SW Romania, near the Serbian border) in four localities between Baziaș and Berzasca (Fig. 1).

Orconectes limosus acts as a vector of the crayfish plague (Vey et al., 1983), caused by the oomycet fungus *Aphanomyces astaci* Schikora, 1903, an obligate parasite. As the spiny-cheek crayfish is capable of rapid and strong expansion, it represents a potential danger to the indigenous crayfish which are highly susceptible to the crayfish plague and cannot act as a permanent host (Chybowski, 2007).

Infraorder Brachyura Latreille, 1802
Family Panopeidae Ortmann, 1893
Rhithropanopeus harrissii (Gould, 1841)

Rhithropanopeus harrissii is a xanthoid crab native to the American Atlantic coast from Cape Cod to Brazil. The first European record dates back to before 1874, when it was described as a new species from the Zuiderzee in The Netherlands (Wolff, 2005).

In the Black Sea it was introduced from Zuiderzee Bay, North Sea probably by ballast water and/or ship hull fouling. First it was discovered by Makarov (1939) in the liman (estuary) of the Dnieper and South Bug Rivers. Now it is widely distributed in the low salinity (less than 15‰) Black Sea areas. It is distributed in all the Sea of Azov and the Caspian Sea (first record dates from 1958 when the species was accidentally introduced from the Sea of Azov via the Volga-Don Canal) (Zaitsev & Ozturk, 2001).

R. harrissii is an alien species in the Romanian Black Sea (Micu & Micu, 2006). Its presence was recorded for the first time in the brackish waters of Razelm-

Sinoe Lagoon Complex by Zemiankowski in 1951 and Băcescu in 1952. In 1954 Băcescu mentioned that after that winter frost it was the most common crab species in the Black Sea at Tăbăcărie. This species was considered as rare in 1980 by Guțu, but in 1995 Petrescu and Bălășescu pointed out a larger distribution of the species south to Constanța by adding 4 new collecting points (Agigea, Mangalia, 2 Mai and Vama Veche) and stated that this oligobrackish species can be considered frequent. Its areal reaches upstream as far as Cernavodă (Micu & Micu, 2006) (Fig. 1).

Although treated like an alien species it succeeded to establish a self-maintaining population near the Black Sea.

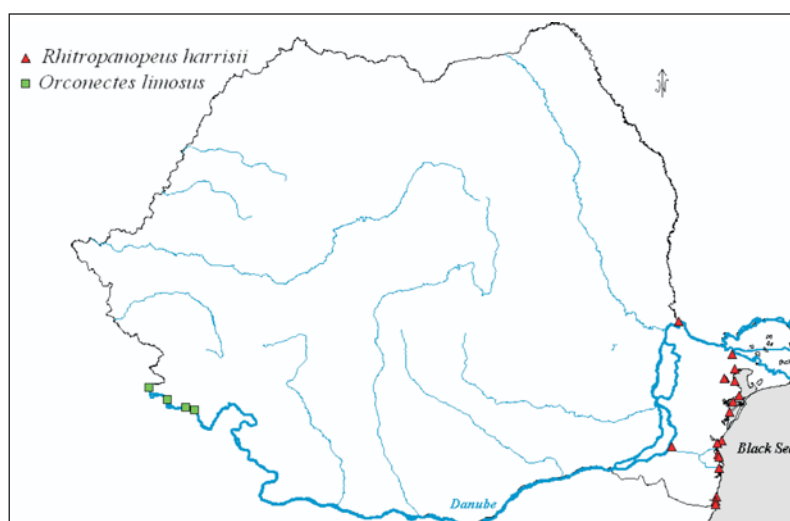


Fig. 1 - Romanian distribution map of *Rhithropanopeus harrisii* and *Orconectes limosus*.

Dyspanopeus sayi (Smith, 1869)

Dyspanopeus sayi is a very common species along the American Atlantic coasts, from Florida to the Gulf of St. Lawrence (Rathbun, 1930) and to Canada (Mistri, 2004), where it got into the ports and estuaries characterised by small variations of the salinity and the temperature. The species is able to stand particularly low temperature values. In Europe, the first recording of the species was made in Swansea, on the sandy South West Wales Coast by Naylor in 1960. In Italy, it was first reported in 1993 by Frogliani and Speranza but had been in the Venice Lagoon since the 1980s (Mizzan, 1995), according to local fishermen. It is currently the most widespread crab in many areas of the Lagoon (Occhipinti, 2000), slowly spreading south along the Adriatic coast of Italy: Valli di Comacchio and Po River Delta, Varano Lagoon in Apulia (Florio et al., 2008).

The first record of *D. sayi* from the Romanian Black Sea belongs to Micu et al. (2010 b), when six specimens (two females and four males) were captured by scuba diving from Constanța Harbour, below the sluice gates of the Danube-Black Sea Canal and from Agigea Bay. The Constanța Harbour is an estuarine environment with variable salinity while in the Agigea Bay there are clean open coastal waters with stable salinity (Fig. 2).

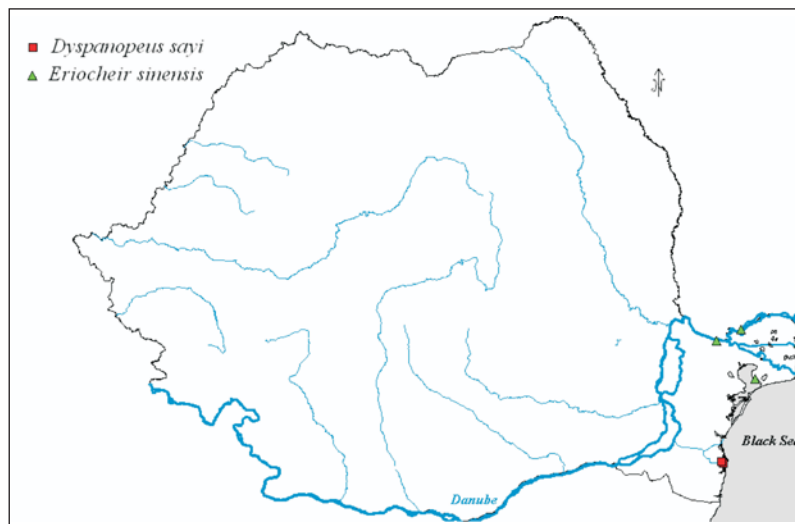


Fig. 2 - Romanian distribution map of *Dyspanopeus sayi* and *Eriocheir sinensis*.

Family Portunidae Rafinesque, 1815

Callinectes sapidus Rathbun, 1896

It is native in the North American coast of the Atlantic Ocean from Cape Cod to Florida and Gulf of Mexico. A possible pathway of introduction of the species in the Black Sea is represented by ship's ballast waters and/or hull fouling, but it is also possible that the species migrated from the Mediterranean Sea, where it was introduced by ships, probably in the 1960s (Zaitsev & Ozturk, op. cit.). It was also recorded in the Northern Aegean Sea, Mediterranean coast of Turkey and Sea of Marmara (Zaitsev & Ozturk, op. cit.), German North Sea estuaries of Elbe and Weser (Nehring et al., 2008). Other citations include the Lagoon of Patok (South-East Adriatic Sea) (Beqiraj & Kashta, 2010), Cantabrian Sea (Caballero et al., 2006), France, The Netherlands and Belgium (Wolff, 2005).

In the Black Sea, it was firstly discovered in 1967 on the Bulgarian shelf by Bulgurkov (1968). Later, in the 1970s, it was found in the Kerch Strait and in 1984 once again on the Bulgarian coast, but in each case only isolated individuals were observed (Gomoiu & Skolka, 1998).

In 1998, a male of *C. sapidus* was collected in the southern part of the Romanian coast (Gomoiu & Skolka, op. cit.) from shallow waters, near 23 August (N of Mangalia). In 1999 a female adult specimen was captured near Mangalia in fishermen nets. The female of *C. sapidus* is deposited in the collection of "Grigore Antipa" National Museum of Natural History, Bucharest (Petrescu et al., 2000). Until today only these two specimens have been discovered at the Romanian Black Sea Coast (Fig. 3). It appears that this species has not yet established a self-maintaining population in the Black Sea.

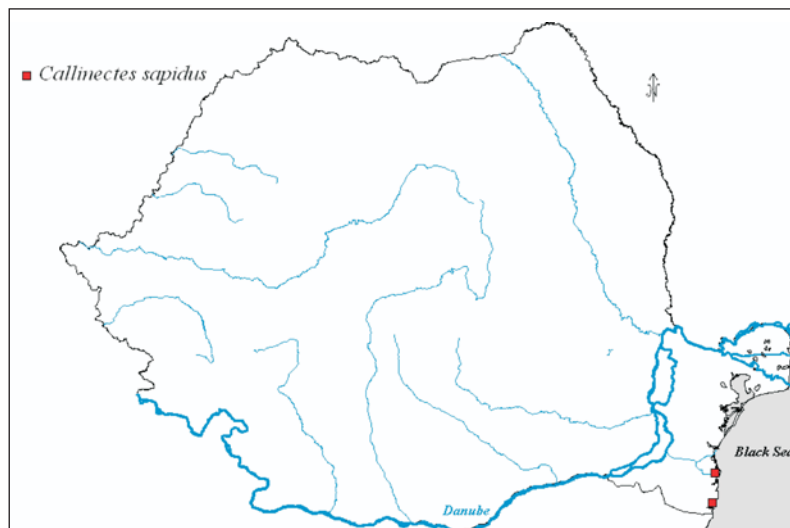


Fig. 3 - Romanian distribution map of *Callinectes sapidus*.

Family Varunidae H. Milne Edwards, 1853

Eriocheir sinensis H. Milne Edwards, 1853

The species originates from the eastern Asia estuaries and coastal marine waters (the South China Sea and Yellow Sea), from the Province of Fukien, China northwards to Korean Peninsula.

After reaching the European shore via ballast waters from container vessels in Germany in 1912, it spread rapidly throughout Europe (Finland, Sweden, Russia, Poland, The Netherlands, Belgium, England, France, Portugal, Czech Republic, Lithuania) (Herborg et al., 2003; Clark et al., 1998; Normant et al., 2000; Gomoiu & Skolka, op. cit.; Bacevičius & Gosiūnaitė, 2008). Only a single male specimen was caught in May 1998, in the northeastern part of the Azov Sea (Murina & Antonovsky, 2001). In 1998 and 1999 Zaitsev mentions about the capture of a male in the Black Sea at east of Odessa Gulf and a female crab near the Bolshoy Fontan Cape, south of Odessa Gulf (Zaitsev & Ozturk, op. cit.).

The presence of this species in the Romanian Black Sea was noted for the first time in 1934 by Vasiliu, but later on Băcescu (1967) invalidated this citation. In 1997, an adult female carrying eggs was captured in Musura Bay, near Sulina, in the Danube Delta Biosphere Reserve area (Gomoiu & Skolka, op. cit.). Between 1997 and 2004, Oțel (2004) found four specimens of the species (one of them being partially destroyed) from Danube River, caught with fishing nets in four different locations: Potelu Lake (from Somova-Parcheș Complex), Chilia Arm (Danube), Holbina Lake and Sulina Bay (Fig. 2).

Based on the recent record of *Eriocheir sinensis* from the Serbian part of Danube River (Paunovic et al., 2004) and the existing information from the fishermen operating in the Danube Delta it is very likely that the chinese mitten crab has established populations in the Romanian stretch of Danube River, the Danube Delta and prodelta (Skolka & Gomoiu, 2004; Micu & Micu, 2006).

Hemigrapsus sanguineus (de Haan, 1835)

The species is indigenous to the western North Pacific, Sakhalin Island, Korea, Japan, North China and Taiwan (McDermott, 1998). Outside its native area, it was first discovered on the east coast of the United States, in New Jersey in 1988 (Lohrer, 2001). Since then *H. sanguineus* has become abundant along a large portion of the mid-Atlantic and southern New England coast.

In 1999, the species reached the European coasts by way of ship ballast waters, in Le Havre, France and the former estuary “Oosterschelde” in The Netherlands (Breton et al., 2002) where it has established stable populations (Faasse, 2004). In 2003 a single adult male of *H. sanguineus* was recorded from the northern Adriatic Sea (Schubart, 2003) and this remains the only known Mediterranean record to date. Since then it has been recorded from western Scheldt (close to Belgium) and at Knokke Heist in 2006 in Belgium (d’Udekem d’Acoz, 2006). *H. sanguineus* is today known from the west coast of Cotentin Peninsula in the English Channel, to the Lower Saxony, state of Schleswig-Holstein, Germany (d’Udekem d’Acoz & Faasse, 2002; Obert et al., 2007; Dauvin, 2009; Dauvin et al., 2009).

At the Romanian Black Sea, one adult male of *Hemigrapsus sanguineus* was collected inside Tomis Marina, Constanța (Micu et al., 2010 a). The author assumes that yachts have been the vector of introduction in the Black Sea (Fig. 4).



Fig. 4 - Romanian distribution map of *Hemigrapsus sanguineus* and *Palaemon macrodactylus*.

Infraorder Caridea Dana, 1852
 Family Palaemonidae Rafinesque, 1815
Palaemon macrodactylus Rathbun, 1902

It is native to Japan, Korea and China (Holthuis, 1980). In the 1950s, this shrimp species was accidentally introduced in the eastern Pacific, in San Francisco Bay, California (Newman, 1963) where it is now a common and well-established

species. It has also been found in Australia (Poore, 2004). Since the end of the 1990s, *Palaemon macrodactylus* has been found in several European waters: in Spain (Guadalquivir and Guadalete Estuaries, Salado River, San Pedro River) (Cuesta et al., 2004; González-Ortegón et al., 2006), in England (Orwell, Stour, Medway and Thames) (Ashelby et al., 2004; Worsfold & Ashelby, 2006), in the Southern Bight of the North Sea (The Netherlands, Belgium and northern France) (d'Udekem d'Acoz et al., 2005; De Blauwe, 2006; Rappé, 2007; Soors et al., 2010), in the Gironde Estuary in France (Beguer et al., 2007), and in Portugal (Chicharo et al., 2009).

The first record of the species in the Black Sea belongs to Micu et al. in September 2009, when 909 specimens of *P. macrodactylus* were collected by scuba diving from seven locations along the Romanian Black Sea coast: Periboina, Edighiol, Midia Harbour, Mamaia Bay, Constanța Harbour, Eforie Marina, Mangalia Lake (Fig. 4). The vector of introduction was ship ballast water. All introduction points reported until now worldwide are in, or near major international harbours, and Constanța is the largest maritime traffic hub in the Black Sea (Micu & Niță, 2009).

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XENODIVERSITATEA SPECIILOR DE DECAPODE (CRUSTACEA: DECAPODA: REPTANTIA) DIN APELE ROMÂNEȘTI

REZUMAT

Această lucrare reprezintă o sinteză a datelor faunistice existente până în prezent în literatura de specialitate în ce privește speciile de decapode străine identificate în fauna României între anii 1951 și 2010: *Orconectes limosus* (Rafinesque, 1817), *Callinectes sapidus* Rathbun, 1896, *Rhithropanopeus harrisii* (Gould, 1841), *Eriocheir sinensis* H. Milne Edwards, 1853, *Hemigrapsus sanguineus* (de Haan, 1835), *Palaemon macrodactylus* Rathbun, 1902 și *Dyspanopeus sayi* (Smith, 1869).

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THE DISTRIBUTION OF STONE CRAYFISH *AUSTROPOTAMOBIOUS TORRENTIUM* (SCHRANK, 1803) (CRUSTACEA: DECAPODA: ASTACIDAE) IN THE SOUTH-WEST ROMANIAN MOUNTAIN AND SUB-MOUNTAIN AREA

LUCIAN PÂRVULESCU, IORGU PETRESCU

Abstract. Data is presented in relation to the geographical distribution of the endangered crayfish species *Austropotamobius torrentium*. One hundred and seventy-four sampling stations situated along the streams of 15 geographical units from the South-West of Romania (Anina Mountains, Almăj, Dognecea, Godeanu, Locva, Țarcu, Retezat, Semenic, Mehedinți, Vâlcan, Parâng, Șureanu, Poiana Ruscă, Lipova Hills and Mehedinți Plateau) have been investigated. A distribution map was compiled. The data from older publications were collated. The actual habitat of this species occupies a large area of South-West Romania in the mountain and sub-mountain area, being absent in the Poiana Ruscă Mts, Lipova and Dognecea Hills.

Résumé. Données sur la distribution géographique de l'espèce menacée *Austropotamobius torrentium*. Un nombre de 174 endroits qui se trouvent sur les ruisseaux des 15 unités géographiques du Sud-Ouest de la Roumanie (les montagnes de Anina Almăj, Dognecea, Godeanu, Locvei, Țarcu, Retezat, Semenic, Mehedinți, Vâlcan, Parâng, Șureanu, Poiana Ruscă, les collines de Lipova et le plateau Mehedinți) ont été inventoriés. On a réalisé une carte détaillée de distribution. On a centralisé les données des autres publications qui étaient plus anciennes. L'habitat actuel de l'espèce occupe une grande partie du Sud – ouest de la Roumanie de la zone de montagne et sous montagne, et est absent dans les montagnes de Poiana Ruscă et les collines de Dognecea et Lipova.

Key words: *Astacus astacus*, *Austropotamobius torrentium*, crayfish, distribution, South-West Romania, endangered species, noble crayfish, stone crayfish.

INTRODUCTION

Three indigenous freshwater crayfish species reside in the Romanian aquatic ecosystems, i.e. the stone crayfish *Austropotamobius torrentium* (Schränk, 1803), the noble crayfish *Astacus astacus* (Linnaeus, 1758) and the narrow-clawed crayfish *Astacus leptodactylus* Eschscholtz, 1823 (Băcescu, 1967; Holdich et al., 2009; Pârvulescu, 2009 a). Recently, a new crayfish was discovered in Romania, belonging to the Cambaridae family, i.e. the spiny-cheek crayfish *Orconectes limosus* (Rafinesque, 1817) (Pârvulescu et al., 2009). In the European Council's Directive 92/43, *Austropotamobius torrentium* is rated as a “priority species” and thus a series of management measures are necessary to be carried out in the protected areas, among which is the periodic measurement of population density that is of great importance (Pârvulescu, in: Combroux et al., 2007). Moreover, both *A. torrentium* and *A. astacus* are considered by the IUCN as “vulnerable” (IUCN, 2010). These crayfish remain vulnerable to various threats: overexploitation, habitat modification and loss, pollution, the spread of non-indigenous crayfish species or crayfish plague (Holdich & Pöckl, 2005; Pârvulescu, 2009 b).

There are few data published regarding the freshwater crayfish species in Romania. First records of *Austropotamobius torrentium* in Romania place this

species in the Racovăț River, from Mehedinți Plateau (Scriban, 1908). Entz (1914) mentioned it in this area (Mehadia, Anina), but also in the centre of the Transylvanian Plateau. Călinescu (1929) talks about the species in the Cerna Basin on the Naibei Valley and Corcoaia. In the SW of Romania, the species is concentrated especially in the Mehedinți Plateau and in the South of the Banat Mountains. Băcescu (1967) studied the Romanian crayfish fauna in detail. The results of his studies are mentioned in the book “Crustacea, Decapoda” (in Romanian). During 1935-1962 there are mentions about its presence in the South-West, West, centre and North (Maramureș) of Romania. The “Grigore Antipa” National Museum of Natural History in Bucharest also holds approximately 160 specimens in its collection. From the area we studied, Băcescu found the species in 24 places in Caraș-Severin county. Bănărescu & Oprescu (1971) mentioned the species in Naidăș, Cerna’s tributary. The last study of the species, containing not only distribution data but also biometrical measurements, that were more complete than those of Entz, can be found in Papadopol & Diaconu (1987), who studied a material from Șușara stream, Nera’s tributary (collected in 1966 by the late Petre Bănărescu). Recent research has begun to be published from 2007 (Pârvulescu, 2008; Pârvulescu, 2009 c).

The “Atlas of Crayfish in Europe” (Souty-Grosset et al., 2006), the most recent monograph on crayfish species of Europe, shows the age of the data regarding the distribution of crayfish species in Romania and the fact that a part of this work was published in Romanian language and therefore they couldn’t be accessible to foreigners.

Since the existing data relating to the distribution of the stone crayfish in Romania is rather obsolete, we thought to offer, as a result of these investigations, a distribution map for this species considered a “priority species” in order to assist in an efficient conservation management in the natural protected areas.

MATERIAL AND METHOD

Between July and September 2009 a total of 174 sampling stations were analyzed, in order to establish the distribution of *Austropotamobius torrentium* in the permanent waters in the upper sector of the main courses and tributaries in the mountain area and sub-mountain area of the South-West of Romania. The investigated area lies from South of the Mureș River and West of the Jiu and Strei rivers including the surface of 15 geographical units (i.e. mountains, plateaus, hills). The sampling stations were chosen at random, investigating an average of 10 mainstreams with permanent character per geographical unit, depending on its size. Each sampling station had on average about 200 m of river for investigation. On this occasion, observations were carried out regarding the riverbed morphology and the surrounding habitats. The crayfish were collected using direct hand sampling from the river bed, by checking into the galleries, spaces between rocks, roots and within banks. Where we couldn’t find any crayfish we declared the sampling station as one with “no crayfish” but only after investigating at least 300 m of river.

The crayfish were identified *in situ* according to their morphological features, sexed and photographed. Tissue for subsequent molecular analysis was sampled, by detaching the last pereopod on the right side and preserving it in alcohol (96%). Moreover, an inspection was carried out, to determine the specimens’ health status and potential parasites (Holdich, 2003). Subsequently, the specimens were set free exactly in the same location where they have been captured. To identify the

specimens, we used the keys in Ingle (1997), Souty-Grosset et al. (2006) and Pârvulescu (2009 a).

A distribution map of older data was made using ArcMap and we took as reference the name of the rivers provided by the authors, which are the only data available from older literature. A distribution map of recent data was made taking into consideration the field data that were placed on a digital map at a 1:50,000 scale. We used Global Mapper program, we placed the points where we found each of the crayfish species as well as the points where those weren't found, obtaining a map of distribution points. Then, using InkScape, we coloured all the rivers and the distribution points making visible the water catchment areas. The distribution area was established later on after having analyzed the point's distribution, taking into consideration the biogeography of the species, on water collecting areas, relief and antropic impact.

RESULTS AND DISCUSSION

The older observations are difficult to locate in the field because of the lack of coordinates, making them almost impossible to use in the conservation management of the species. Nevertheless they show a good representation of the species especially in the southern part of South-West Romania (Fig. 1), but from this information it is hard to establish a clearly defined geographical area for this *A. torrentium*. On the other hand, due to their age, more than 30 years, it is very possible that the actual situation may not be the same anymore.

The results of the investigations (Tab. 1) are shown next according to the hydrographic basin where they were obtained.

The Timiș hydrographic basin. Twenty-two stations in several geographical units in this basin were investigated: Semenice, Țarcu and Poiana Ruscă Mts. *Austropotamobius torrentium* was found in 59% of the stations investigated. The maximum altitude at which the species was found was 860 m, on the Brebu stream, where eight specimens along 50 m of river were found. *Astacus astacus* was captured at only one station, on the Străjești stream that flows into the Timiș River at a lower altitude than the Pogăniș River.

The Cerna hydrographic basin. Twenty-two stations situated in four geographical units were investigated: Mehedinți, Semenice, Almăj, Godeanu Mts. The only crayfish species that was identified was *A. torrentium*, which was found in 40.9% of the stations investigated. The highest crayfish location was in the Areaca stream, at 760 m, where, because of the powerful flash flood, we could capture only one specimen. The greatest number of specimens were found in the Munc stream (Munc spring), Cerna's tributary, in the area of Băile Herculane where, along a distance of 80 m, six specimens were collected.

The Nera hydrographic basin. Nineteen stations distributed in the area of Anina, Almăj and Locva Mts were investigated; only *A. torrentium* was identified in 94.7% of the stations. With a relatively low altitude, the Nera basin has a big population of this species. In this region we also found the lowest altitude where we found *A. torrentium*, in Zlatița stream, at 60 m, where we captured five specimens in only 10 m of river investigated.

The Caraș hydrographic basin. Sixteen stations in the Anina Mts. and Dognecea Hills were investigated. Two crayfish species, *A. astacus* and *A. torrentium*, were identified. *Astacus astacus* was most often found occurring in over 68.7% of the stations, while *A. torrentium* appears only in 18.7% of the stations. At

Table 1

Sampling stations toponyms, geographic coordinates (Stereo 70) and captured specimens.

Rivers toponyms	Geographic coordinates	Altitude (m)	<i>Austropotamobius torrentium</i>	<i>Astacus astacus</i>	<i>Orconectes limosus</i>
Timiș hydrographic basin					
Brebu	45°14'03"N 22°08'47"E	860	5 ♂♂, 3 ♀♀	-	-
Grădiște	45°13'13"N 22°06'42"E	820	1 ♂, 1 ♀	-	-
Hididel	45°09'20"N 22°28'07"E	680	1 ♂, 4 ♀♀	-	-
Balota	45°25'05"N 22°31'25"E	650	1 ♂	-	-
Valea Vidra	45°25'05"N 22°31'25"E	620	4 ♂♂, 10 ♀♀	-	-
Valea Mare	45°25'26"N 22°31'08"E	615	5 ♂♂, 3 ♀♀	-	-
Luncavița	45°05'59"N 22°16'10"E	450	2 ♂♂, 1 ♀	-	-
Armeniș	45°14'21"N 22°21'25"E	440	3 ♂♂	-	-
Malița	45°20'19"N 22°21'38"E	420	4 ♂♂	-	-
Loznișoara	45°34'28"N 22°29'35"E	415	1 ♂	-	-
Slătinoara	45°21'38"N 22°22'01"E	395	1 ♂	-	-
Valea de Runc	45°22'46"N 22°07'47"E	320	1 ♀	-	-
Valea Petroșniței	45°19'14"N 22°14'14"E	300	1 ♂	-	-
Străjești	45°23'08"N 22°02'43"E	280	-	1 ♂, 2 ♀♀	-
Maciova	45°31'59"N 22°11'53"E	235	7 ♂♂, 4 ♀♀	-	-
Cerna hydrographic basin					
Areaca	45°02'11"N 22°37'12"E	760	1 ♂	-	-
Ponorovăț	41°04'10"N 22°27'49"E	720	1 ♂, 1 ♀	-	-
Pogara	45°04'12"N 22°27'23"E	650	1 ♂, 6 ♀♀	-	-
Munc	44°54'00"N 22°25'01"E	485	3 ♂♂, 3 ♀♀	-	-
Țăsna	44°52'16"N 22°29'56"E	420	2 ♂♂, 2 ♀♀	-	-
Verendin	45°04'24"N 22°15'20"E	420	1 ♂	-	-
Lăpușnicel	44°58'39"N 22°13'12"E	410	1 ♀	-	-
Slătinic	45°00'51"N 22°15'31"E	340	2 ♂♂, 1 ♀	-	-
Vânturătoarea	44°58'01"N 22°28'57"E	300	1 ♂	-	-
Sfirdinu Mare	44°54'03"N 22°19'55"E	300	3 ♂♂, 2 ♀♀	-	-
Bârza	44°48'52"N 22°23'59"E	138	1 ♂, 6 ♀♀	-	-
Nera hydrographic basin					
Miniș	45°01'29"N 21°49'24"E	595	5 ♂♂, 2 ♀♀	-	-
Plopa	45°01'43"N 21°50'13"E	590	1 ♀	-	-
Rudăria	44°50'05"N 22°08'29"E	575	2 ♂♂, 6 ♀♀	-	-
Predilcova	45°01'57"N 21°52'39"E	505	1 ♂	-	-
Poneasca	45°03'29"N 21°57'36"E	465	2 ♂♂, 1 ♀	-	-
Golumbului	45°00'43"N 21°54'55"E	430	3 ♂♂	-	-
Țerova	44°59'10"N 22°09'40"E	380	1 ♂	-	-
Babii	45°01'18"N 21°54'24"E	350	1 ♂, 1 ♀	-	-
Bănia	44°51'43"N 22°02'43"E	340	1 ♂, 6 ♀♀	-	-
Righidia	44°56'09"N 21°57'57"E	310	4 ♂♂, 5 ♀♀	-	-
Lăpușnic	44°55'03"N 21°55'37"E	298	10 ♂♂, 8 ♀♀	-	-
Mocerîș	44°53'36"N 21°53'53"E	298	2 ♀♀	-	-

Table 1 (continued)

Rivers toponyms	Geographic coordinates	Altitude (m)	<i>Austropotamobius torrentium</i>	<i>Astacus astacus</i>	<i>Orconectes limosus</i>
Ducin	44°52'31"N 21°53'47"E	280	3 ♂♂, 3 ♀♀	-	-
Răchita	44°47'07"N 21°50'20"E	270	2 ♀♀	-	-
Beiu	44°55'22"N 21°46'28"E	240	2 ♂♂, 1 ♀	-	-
Valea Slatinei	44°55'06"N 21°41'50"E	178	6 ♂♂, 8 ♀♀	-	-
Zlatița	44°51'46"N 21°29'09"E	60	4 ♂♂, 1 ♀	-	-
Caraș hydrographic basin					
Buhui stream	45°03'51"N 21°53'20"E	660	4 ♂♂, 4 ♀♀	2 ♂♂, 1 ♀	-
Navătu Mare	45°09'41"N 21°56'52"E	500	-	3 ♂♂, 2 ♀♀	-
Răviștea	45°03'10"N 21°52'35"E	475	-	2 ♂♂, 10 ♀♀	-
Comarnic	45°10'46"N 21°57'10"E	470	-	1 ♀	-
Toplița	45°10'56"N 21°56'56"E	465	-	3 ♂♂, 3 ♀♀	-
Celnicu Mare	45°06'48"N 21°51'46"E	435	-	1 ♂, 3 ♀♀	-
Dognecea	45°18'36"N 21°46'40"E	360	-	1 ♂	-
Cândenii	44°56'49"N 21°44'08"E	295	9 ♂♂, 14 ♀♀	-	-
Natra	45°06'21"N 21°46'09"E	295	-	1 ♂, 1 ♀	-
Potocelu	44°56'05"N 21°43'48"E	280	6 ♂♂, 11 ♀♀	-	-
Clocotici	45°14'43"N 21°50'28"E	270	-	6 ♂♂, 8 ♀♀	-
Ciornovăț	45°15'04"N 21°34'42"E	100	-	3 ♂♂, 5 ♀♀	-
Cârnecea	45°12'36"N 21°38'16"E	140	-	1 ♀	-
Bârzava hydrographic basin					
Dignacea	45°10'54"N 22°00'23"E	655	1 ♂, 2 ♀♀	-	-
Crivaia	45°12'10"N 22°00'38"E	600	-	1 ♂, 3 ♀♀	-
Grindești	45°13'14"N 22°00'33"E	595	-	2 ♂♂, 7 ♀♀	-
Radomir	45°15'48"N 22°02'59"E	470	1 ♂, 1 ♀	-	-
Crainicul	45°15'23"N 22°02'37"E	460	3 ♀♀	-	-
Bogatu	45°16'47"N 22°03'44"E	455	1 ♂	-	-
Râul Alb	45°17'32"N 21°59'41"E	430	1 ♂	-	-
Lișcov	45°17'32"N 22°02'33"E	380	1 ♂, 1 ♀	-	-
Cuptoare	45°16'36"N 21°57'35"E	360	2 ♂♂, 5 ♀♀	-	-
Stârnici	45°18'13"N 22°02'43"E	330	1 ♀	-	-
Doman	45°15'38"N 21°54'18"E	320	-	2 ♂♂, 6 ♀♀	-
Moravița	45°21'25"N 21°45'51"E	240	-	1 ♂, 1 ♀	-
Topolnița hydrographic basin					
Mălărișca	44°54'07"N 22°34'14"E	555	2 ♂♂, 1 ♀	-	-
Prejna	44°55'02"N 22°38'01"E	475	2 ♂♂, 4 ♀♀	-	-
Topolnița	44°49'14"N 22°34'09"E	420	2 ♂♂, 6 ♀♀	-	-
Jidoștița	44°43'53"N 22°33'24"E	330	5 ♂♂, 4 ♀♀	-	-
Șușița	44°43'35"N 22°35'55"E	220	3 ♂♂, 6 ♀♀	-	-
Jiu hydrographic basin					
Cerbului	45°28'21"N 23°29'08"E	795	1 ♂	-	-
Râscoalei	45°28'54"N 23°27'22"E	790	1 ♂	-	-
Aninoasa	45°25'19"N 23°17'26"E	730	5 ♂♂, 8 ♀♀	-	-
Motru	44°10'10"N 22°46'50"E	710	1 ♂, 1 ♀	-	-

Table 1 (continued)

Rivers toponyms	Geographic coordinates	Altitude (m)	<i>Austropotamobius torrentium</i>	<i>Astacus astacus</i>	<i>Orconectes limosus</i>
Valea Ungurului	45°21'49"N 23°19'08"E	700	3 ♂♂	-	-
Valea Roşie	45°27'09"N 23°22'14"E	685	1 ♂, 2 ♀♀	-	-
Micota	45°08'14"N 22°48'12"E	560	1 ♀	-	-
Obîrşia	45°01'32"N 22°40'34"E	520	3 ♂♂, 1 ♀	-	-
Valea lui Dragu	44°01'41"N 22°42'20"E	500	2 ♂♂, 2 ♀♀	-	-
Capra	45°05'36"N 22°43'27"E	495	2 ♀♀	-	-
Isverna	44°58'47"N 22°37'18"E	440	2 ♂♂, 2 ♀♀	-	-
Brâgleasca	44°58'02"N 22°38'39"E	435	5 ♂♂, 7 ♀♀	-	-
Turtaba	44°58'19"N 22°41'97"E	410	2 ♂♂, 3 ♀♀	-	-
Nadanova	44°56'47"N 22°39'06"E	410	1 ♂, 1 ♀	-	-
Coşuştea	44°55'43"N 22°40'51"E	400	7 ♂♂, 9 ♀♀	-	-
Brebina	45°01'16"N 22°42'40"E	395	1 ♂, 3 ♀♀	-	-
Valea Ursului	44°58'54"N 22°43'59"E	380	2 ♂♂, 6 ♀♀	-	-
Tismana	45°05'59"N 22°55'22"E	340	-	2 ♂♂, 4 ♀♀	-
Valea Bulbei	44°59'42"N 22°47'09"E	295	1 ♂, 2 ♀♀	-	-
Strei hydrographic basin					
Crivadia	45°27'55"N 23°15'17"E	700	1 ♂	-	-
Peştera	45°28'21"N 22°57'58"E	700	2 ♂♂, 4 ♀♀	-	-
Valea Zlatina	45°29'39"N 22°45'28"E	620	1 ♂	-	-
Sălaş	45°29'06"N 22°56'14"E	600	1 ♂	-	-
Râu Mare	45°27'36"N 22°49'27"E	550	9 ♂♂, 11 ♀♀	-	-
Balta	45°30'28"N 22°52'59"E	470	5 ♂♂, 6 ♀♀	-	-
Valea Vânătorului	45°36'39"N 23°07'37"E	470	2 ♂♂, 4 ♀♀	-	-
Ohaba	45°31'43"N 23°08'44"E	460	1 ♂, 2 ♀♀	-	-
Mureş direct tributaries					
Stănceasca	45°52'25"N 22°39'01"E	245	-	3 ♂♂	-
Țiganilor	45°59'09"N 22°23'14"E	180	-	1 ♂	-
Danube direct tributaries					
Radimna	44°48'09"N 21°42'41"E	440	2 ♀♀	-	-
Cămenița	44°44'37"N 21°47'34"E	410	1 ♂	-	-
Sirinea	44°38'21"N 22°05'10"E	360	1 ♀	-	-
Bahna	44°50'21"N 22°31'38"E	275	1 ♂	-	-
Dragoselea	44°41'00"N 22°03'48"E	230	4 ♂♂, 4 ♀♀	-	-
Valea Mare	44°44'28"N 21°43'05"E	220	3 ♂♂, 8 ♀♀	-	-
Eibenthal	44°34'08"N 22°07'18"E	190	2 ♀♀	-	-
Belobreșca	44°48'39"N 21°29'51"E	190	3 ♂♂, 3 ♀♀	-	-
Mraconia	44°40'59"N 22°14'43"E	180	2 ♀♀	-	-
Valea Racovăț	44°45'55"N 22°28'07"E	150	2 ♂♂, 4 ♀♀	-	-
Strenica	44°32'47"N 22°04'26"E	110	2 ♂♂, 1 ♀	-	-
Valea Satului	44°40'32"N 22°17'51"E	110	1 ♂, 2 ♀♀	-	-
Mala	44°41'39"N 22°20'34"E	100	4 ♂♂, 4 ♀♀	-	-
Ogradena	44°40'25"N 22°17'57"E	100	2 ♂♂, 1 ♀	-	-
Berzasca (dws.)	44°39'02"N 21°58'06"E	95	-	-	9 ♂, 33 ♀♀
Gura Văii	44°40'26"N 22°33'54"E	80	3 ♂♂, 3 ♀♀	-	-
Liborajdina (dws)	44°40'13"N 21°46'33"E	70	-	-	4 ♀♀

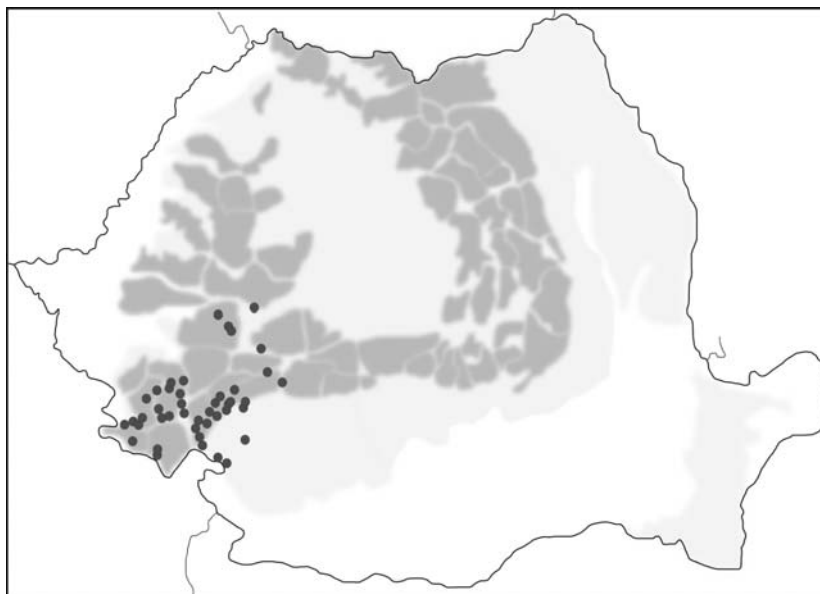


Fig. 1 - Distribution points of *Austropotamobius torrentium* in South-western Romania, based on data at least 10 years old.

Buhui station (660 m altitude) both species were found. It is very interesting and hard to explain the presence of *A. torrentium* in the Buhui stream, a fact also mentioned by Băcescu in 1967, in the volume "Crustacea, Decapoda", one possible explanation could be its artificial introduction when the dam on the Buhui Lake was built with rocks taken from the Poneasca stream from the Nera basin, situated at a close distance to this one.

The Bârzava hydrographic basin. Twelve stations were investigated in the area of Semenice, Anina, Dognecea, two species of crayfish being found, 58.3% being *A. torrentium* and 33.3% being *A. astacus*. *Astacus astacus* was found at a higher altitude, at 600 m (Crivaia), while *A. torrentium* was captured at 655 m altitude, the highest altitude for this basin at the Dignacea location.

The Topolnița hydrographic basin. Six stations were investigated, situated on the Mehedinți Plateau. We found out that the species *A. torrentium* was very well represented in all the stations where the investigations were made.

The Jiu hydrographic basin. Twenty-eight stations in Retezat, Țarcu, Vâlcan and Mehedinți Plateau were investigated. *Austropotamobius torrentium* being identified at of 64.2% of them. A well represented population was found in the Aninoasa stream, higher than Aninoasa place, where 13 specimens were captured along a distance of 110 m of river investigated. From the local inhabitants' information, they consume crayfish very often, and our investigations show that the species is at a very favourable density. Also, Jiul de Est (Eastern Jiu) represents eastern limit of the species distribution area in Romania.

The Strei hydrographic basin. Investigations were made in the Retezat, Țarcu and Șureanu Mts. We found only one species of crayfish, *A. torrentium*. This was found in 44.4% of the stations, at an altitude starting at 470 m. The highest location was Peștera stream, at 700 m altitude where six specimens were found.

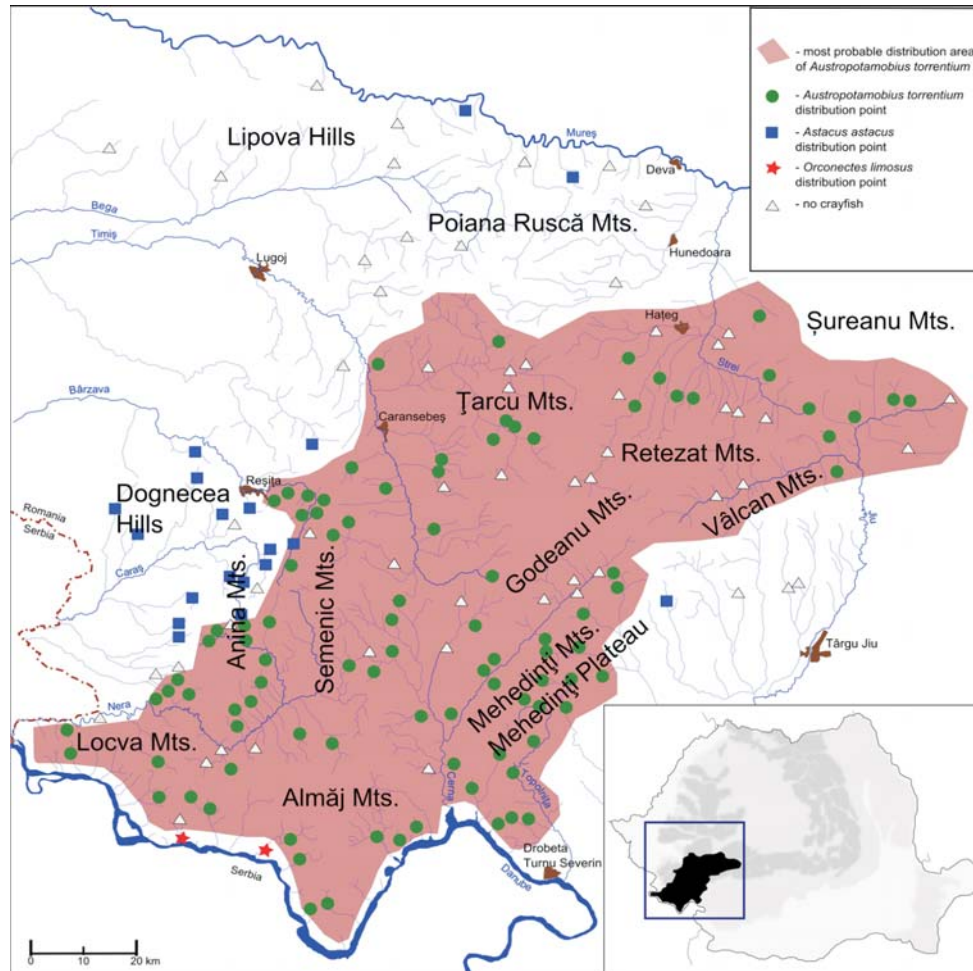


Fig. 2 - The distribution area of the *Austropotamobius torrentium* obtained from the data assembled during the 2009 campaign in the SW of Romania.

The Bega tributaries. Six tributaries were investigated in the Poiana Ruscă Mts. and Lipova Hills but we could not find any species of crayfish.

The direct Mureș tributaries. Eight direct tributaries of the Mureș River from Poiana Ruscă Mts. and Lipova Hills were investigated, indicating the presence of one species of crayfish, *A. astacus* at two stations, Stănceasca and Țiganilor, situated at an altitude of 245, respectively 180 m.

The direct Danube tributaries. Seventeen streams have been investigated in the Almăj, Locva Mts. and the Mehedinti Plateau. *Austropotamobius torrentium* was found in 88.2% of the stations. Upstream of the Berzasca River, in Dragoselea stream, lives *A. torrentium*, the investigations in the lower sector of the river showed the presence of the North American species *Orconectes limosus*. More than 40 individuals being collected from the river mouth into the Danube as far as 2000 m

upstream on this river. Also, this invasive species was found up to 150 m upstream on the Liborajdina River. Although the distribution of the two species did not overlap this fact is very important showing that *O. limosus* could occupy the territory of the protected species *A. torrentium*.

As a result from the data obtained, the most frequent species of crayfish in the mountain and sub-mountain area of the SW of Romania is *A. torrentium*, excepting Bega basin and the direct tributaries of Mureş. In a small number of cases, *A. astacus* was found in the higher area of the Caraş basin. Mixed populations between *A. torrentium* and *A. astacus* were found in one station, Buhui stream from the Caraş hydrographic basin. In fig. 3 we present a graph showing the frequency of the three species of crayfish in the hydrographical basins investigated.

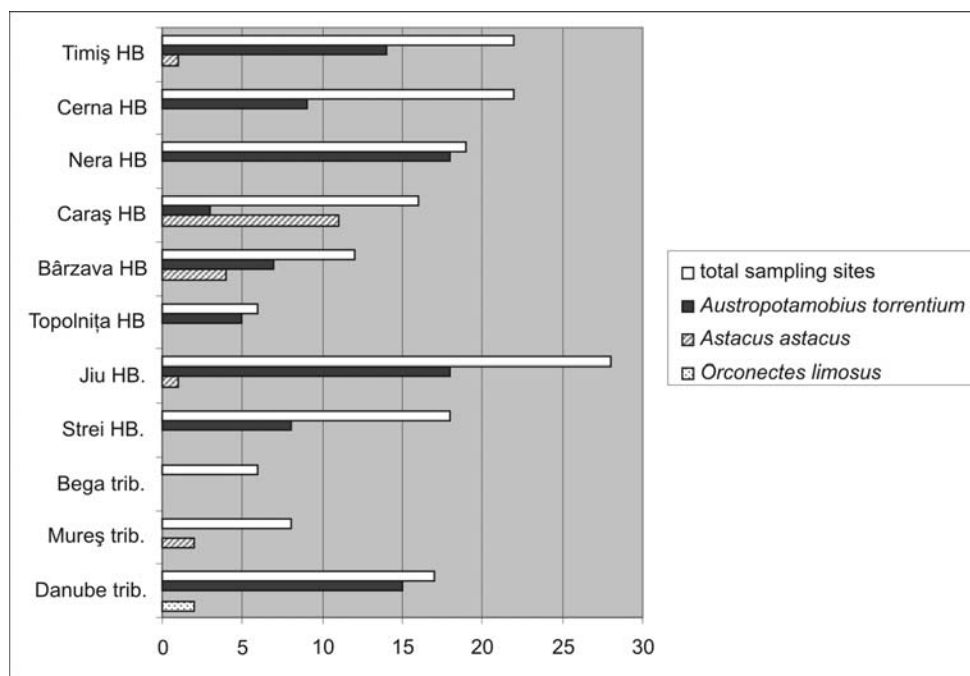


Fig. 3 - The frequency of the crayfish species in the hydrographic basins, investigated during the 2009 campaign in the SW area of Romania.

As for the geographical units, we can say that the species investigated live in: Almăj Mountains, Locva, Anina, Semenic, Mehedinţi (including Plateau), Godeanu, Țarcu, Retezat, Vâlcan, Șureanu and that they are very poorly represented in the South of Poiana Ruscă Mountains.

At the end of the investigation we could establish the distribution area of the crayfish species *A. torrentium* for the SW area of Romania. The distribution area covers the entire area of the Locva Mountains, Almăj, Semenic, Mehedinţi (including Plateau), Godeanu, Retezat, Țarcu, the North of the Vâlcan Mountains, the South-East of the Șureanu Mountains, the North, East and South of the Anina Mountains and only a small part of the Poiana Ruscă Mountains. The distribution area of stone crayfish covers the territory of six natural protected sites: the National

Park Cheile Nerei Beușnița, the Natural Park Semenik Cheile Carașului, the Natural Park Porțile de Fier, the Mehedinți Geopark, the National Park Retezat, and the National Park Domogled. The creation of several “Natura 2000” sites of community importance (OUG57/2007) was based on the presence of *A. torrentium*. The species was found to be absent in the area investigated of the Poiana Ruscă Mountains, the West and the centre of the Anina Mountains as well as in the Dognecea Hills, these areas being populated mostly by *A. astacus*. Only in the Lipova Hills we did not find any species of crayfish, during summer the waters being completely drained here.

More attention should be given to the situation found in the Berzasca River, where the invasive species *O. limosus* could very soon affect the native population of *A. torrentium* situated in the upper streams of the river. We have proposed to the environmental administrators of this region that they should monitor the situation periodically and to manually remove any invasive crayfish if they get nearer to the upper streams.

ACKNOWLEDGEMENTS

This study was funded by CNCSIS - Exploratory research projects PCE-4 grant no 1019/2008 „The stone crayfish (*Austropotamobius torrentium*), distribution in Romanian habitats, ecology and genetics of populations”. We want to thank the Romanian Academy, especially the Commission for the Natural Protected Monuments, for approving this study, as well as to the administrators of the natural protected areas for the permission to work in the field. The authors also wish to thank Dr. David M. Holdich for proofreading this article. Last but not least we want to thank the volunteer students of the Faculty of Chemistry, Biology and Geography from West University of Timișoara who have participated at the field activities.

DISTRIBUȚIA RACULUI-DE-PONOARE *AUSTROPOTAMOBIUS TORRENTIUM* (SCHRANK, 1803) (CRUSTACEA: DECAPODA: ASTACIDAE) ÎN ZONA MONTANĂ ȘI SUBMONTANĂ A SUD-VESTULUI ROMÂNIEI

REZUMAT

În această lucrare sunt prezentate date referitoare la distribuția geografică a speciei amenințate, *Austropotamobius torrentium*. Au fost investigate 174 locații aflate pe pâraiele a 15 unități geografice din sud-vestul României (Munții Aninei, Almăj, Dognecea, Godeanu, Locvei, Țarcu, Retezat, Semenik, Mehedinți, Vâlcău, Parâng, Șureanu, Poiana Ruscă, Dealurile Lipovei și Platoul Mehedinți). Exemplarele au fost capturate activ, căutând în albia râului spațiile folosite ca ascunzători, după care au fost eliberate în același loc de unde au fost capturate. A fost realizată o hartă detaliată de distribuție. Au fost centralizate și datele provenite din publicații mai vechi. Aria actuală de răspândire a speciei ocupă o mare parte din sud-vestul României în zona montană și submontană, lipsește din Dealurile Lipova și Munții Dognecei precum și în cea mai mare parte a Munților Poiana Ruscă.

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THE CATALOGUE OF THE FRESHWATER CRAYFISH (CRUSTACEA: DECAPODA: ASTACIDAE) FROM ROMANIA PRESERVED IN “GRIGORE ANTIPA” NATIONAL MUSEUM OF NATURAL HISTORY OF BUCHAREST

IORGU PETRESCU, ANA-MARIA PETRESCU

Abstract. The largest collection of freshwater crayfish of Romania is preserved in “Grigore Antipa” National Museum of Natural History of Bucharest. The collection consists of 426 specimens of *Astacus astacus*, *A. leptodactylus* and *Austropotamobius torrentium*.

Résumé. La plus grande collection d'écrevisses de Roumanie se trouve au Muséum National d'Histoire Naturelle «Grigore Antipa» de Bucarest. Elle comprend 426 exemplaires appartenant à deux genres et trois espèces, *Astacus astacus*, *A. leptodactylus* et *Austropotamobius torrentium*.

Key words: Astacidae, Romania, museum collection, catalogue.

INTRODUCTION

The first paper dealing with the freshwater crayfish of Romania is that of Cosmovici, published in 1901 (Băcescu, 1967) in which it is about the freshwater crayfish from the surroundings of Iași. The second one, much complex, is that of Scriban (1908), who reports *Austropotamobius torrentium* for the first time, from Racovăț, Bahna basin (Mehedinți county). Also Scriban made the first comment on the morphology and distribution of the species *Astacus astacus*, *A. leptodactylus* and *Austropotamobius torrentium*, mentioning their distinctive features. Also, he published the first drawings of these species (cephalothorax).

Entz (1912) dedicated a large study to the crayfish of Hungary, where data on the crayfish of Transylvania are included. Probably it is the amplest paper dedicated to the crayfish of the Romanian fauna from the beginning of the last century, with numerous data on the outer morphology, distinctive features between species, with more detailed figures and with the very first morphometric measures, and also with much detailed data on the distribution in Transylvania.

Călinescu (1929) published a paper dedicated to the Stone crayfish (*Austropotamobius torrentium*), in which he presented a more complete critical diagnosis of the species, with additional data referring to the species distribution in Romania.

Marcu (1930) gave new data on the distribution of *Astacus* species of Bucovina, from the basins of Nistru, Prut, Siret, Suceava, Moldova and from Bistrița Aurie.

Papers on the anatomy, inner morphology of the crayfish were published by Dornescu & col. (1950), regarding the structure of the gills and of the endothelial reticulum in *Astacus astacus*.

English translation by Mihaela Barcan Achim.

Pop (1965, in Băcescu, 1967) studied the parasites in the species of *Astacus*, making a systematic revision of the species of *Branchiobdella* (Oligochaeta) of Europe, *Branchiobdella astaci* Odier, 1923 (parasite on *A. leptodactylus*), *B. hexodonta* Gruber, 1883 (parasite on *Astacus astacus*, *A. leptodactylus* and *Austropotamobius torrentium*), *B. parasita* (Braun, 1805) (parasite on all Romanian Astacidae species) and *B. pentodonta orientalis* Pop, 1965 (parasite on *Astacus astacus*).

Studies of physiology were made mainly by Pora & col. (1962). They studied the summer and winter metabolism in *Astacus astacus*.

Bănărescu and Oprescu mentioned *Austropotamobius torrentium* in the Nera basin, in 1966, without any other comment.

In 1967, Băcescu published the fascicle dedicated to the decapod crustaceans in „Fauna României“ (“Romanian Fauna”). It is the most ample best documented paper, with the most complete data regarding the distribution in Romania. Also, there are comments on the species outer morphology, biology, ecology, interspecific relationships with the enemies which eat them and with the ecto- and endoparasites. The paper is completed by the first identification keys made for the Astacidae decapods, with their synonymies, with suggestive drawings and photos. For the time being, it is the only monograph paper dedicated to the crayfish species of Romania, very comprehensive and complex.

Papadopol & Diaconu (1987) gave the first biometric measures up to now for the crayfish species of western and eastern Romania, from Banat, Bicăz and the Danube Delta. Their studies are completed with electrophoresis data for the two *Astacus* species.

After 2000, Pârvulescu, assistant at the Western University of Timișoara, published several papers, identification keys for crayfish of Romania. Thus, in 2007, in “Note book of habitats and species – pilot cards”, includes a card for *Austropotamobius torrentium*. In 2008, also Pârvulescu published a paper on the malacostracans, amphipods and decapods from the rivers of the area of Mehedinți Tableland, from Mehedinți and Gorj counties, mentioning again *Austropotamobius torrentium*. In 2009 (a), Pârvulescu published an “Illustrated guide for the identification of the crayfish species of Romania”, offering a welcomed book for this moment, with new recent data on the species distribution and their protection at the national level. The guide is an excellent paper for a rapid identification on the spot, with suggestive illustration, including the sexual dimorphism. And also in 2009 (b), Pârvulescu opened a website named “Racii din România” (“Crayfish of Romania”) including information on this subject, with an English variant (<http://crayfish.ro>). In 2009, Pârvulescu, Petrescu & Petrescu published a paper on the malformations of the Romanian crayfishes, in the specimens studied in their own environment as well as in those preserved in the collections of the “Grigore Antipa” National Museum of Natural History (București). Pârvulescu, Paloș & Molnar (2009) reported a new crayfish species for Romania, *Orconectes limosus* (Rafinesque, 1817), found in the Danube, at Baziaș, Moldova Nouă, Sichevita and Berzasca, an invasive species, which came from the Central-European countries (brought in Europe from North America in 1890).

Souty-Grosset et al. (2006), in the most recent monograph paper of the European crayfishes, present a truncated knowledge on the Romanian crayfish, mostly basing on the papers published in foreign languages.

The largest crayfish collection of the Romanian fauna is preserved at “Grigore Antipa” National Museum of Natural History of București (Bucharest), in

other museums of the country being preserved a few specimens, mainly where specialists interested in their study carried on their activity (e.g. Cluj, Craiova, etc).

It is the first paper dedicated to the catalogue of a crayfish collection preserved in one of the Romanian museums.

MATERIAL

The collection is based mainly on Mihai Băcescu's collecting, who worked in "Grigore Antipa" Museum from 1940 till the end of his life, in 1999. Together with different collaborators from the museum or from Romania, he gathered a number of specimens, from localities almost all over the country, minus Dobrogea (excepting the Danube Delta and littoral lakes) within the period 1935-1974. That was the moment when the first catalogue of a Romanian crayfish collection was published.

The study on this collection allowed us to create a more complete image of the crayfish distribution in Romania, much more real in comparison with that of the foreign authors' one. Of course it is about the distribution of the crayfish species in Romania within the above-mentioned period, when, theoretically, the natural ecosystems of the studied areas had another state.

Astacus astacus is protected in Romania, by several national laws and international conventions to which Romania adhered: O.U.G. 57/2007 on the regime of the protected natural areas, conservation of the natural habitats, of wild flora and fauna, completed and modified by O.U.G. 154/2008, species of community interest, included in the Annex 5 A, Bern Convention on the conservation of the wild life in Europe, adopted by Romania by the Law 13/1993, species included in the Annex 3, Directive of the European Council 92/43 EEC regarding the conservation of the natural habitats and of the wild flora and fauna – Annex 5, in IUCN Red List being considered vulnerable species.

Austropotamobius torrentium is included in several national laws and international conventions to which Romania adhered: O.U.G. 57/2007 on the regime of the protected natural areas, conservation of the natural habitats, of wild flora and fauna, completed and modified by O.U.G. 154/2008, prior species included in the Annex 3, Order MMDD no. 1964/2007 on the initiation of the protected natural area regime of the sites of the community interest of the Natura 2000 European ecological network in Romania, Bern Convention on the conservation of the wild life in Europe, adopted by Romania by the Law 13/1993, species included in the Annex 3, Directive of the European Council 92/43 EEC regarding the conservation of the natural habitats and of the wild flora and fauna – Annex 5, in IUCN Red List being also included in the vulnerable species. It is the most threatened species at the European level, more sensitive to the changes of the environment than the other ones, therefore being the most protected at this level.

Astacus leptodactylus is not protected by the national or European legislation.

RESULTS AND DISCUSSIONS

When this collection was founded (1974), Romania fauna included two genera and three species, *Astacus* Pallas, 1772, with the species *Astacus astacus* (Linné, 1758) and *A. leptodactylus* (Escholtz, 1823) and *Austropotamobius*

Skorikow, 1908, with the species *Austropotamobius torrentium* (Schränk, 1803). The material which was used for the editing of the fauna volume is presented in this catalogue.

Catalogue presentation
Family Astacidae
Genus *Astacus* Pallas, 1772
Astacus astacus (Linné, 1758)

Collection of "Grigore Antipa" National Museum of Natural History includes 150 specimens:

1 ♂ (specimen with a microchela on pereopod 1), November 1900, specimen bought from the market by Grigore Antipa, 9109; 2 ♂♂, 1 ♀, Iza River, Maramureş county, leg. Mihai Băcescu, 9111; 1 spec., Neajlov River, Mihai Bravu, Giurgiu county, 07.1976, leg. Nicolae Găldean, DCP 17; 1 ♂, 2 ♀♀, Razelm Lake, Tulcea county, 25.05.1915, DCP 25; 6 ♂♂, 1 ♀, without locality, leg. Mihai Băcescu, DCP 30; 1 spec., Razelm Lake, Enisala, Tulcea county, 27.06.1991, leg. Nicolae Găldean, DCP 40; 2 specs, Danube, km. 186, 7.08.1984, leg. Dan Manoleli & Nicolae Găldean, DCP 41; 3 ♀♀, Iaşi, pond, DCP 185; 2 ♀♀ (one of them ovigerous with a microchela on pereopod 1), without data, DCP 199; 2 ♂♂, 3 ♀♀, Danube Pools, Ilfov, DCP 200; 1 ♂ (very big), 1 ♀ (small), Olt River, Miercurea Ciuc, Harghita county, 25.08, leg. Aurelian Popescu-Gorj, DCP 201; 3 ♂♂, 6 ♀♀, Şipot or Valea Gorgotel River, tributary Nera River, Caraş-Severin county, 19.07.1948, leg. Mihai Băcescu, DCP 250; 3 ♂♂, 2 ♀♀, Danube Delta, Nebunu Lake, Periprava, 12.10.1966, leg. Ştefan Negrea, DCP 267; 1 ♂, 1 ♀, Siret River, Furceni, 6.07.1941, DCP 293; 2 specs, Danube Delta, 28.07.1978, DCP 296; 1 ♂, Pufeşti, Putna, Balta Mare, 2.10.1949, leg. Mihai Băcescu, DCP 307; 1 ♂, 1 ♀, Mirajul Mare Streamlet, East to Eremitul, 30.07.1949, leg. Iosif Lepşi, DCP 311; 1 ♂, 1 ♀, Stânceni River, Mureş county, 5.10.1950, leg. Petre Bănărescu, DCP 313; 2 specs, Tămănda River, Bihor county, leg. Petre Bănărescu; 1 ♂, 3 ♀♀, Argeş River, Piteşti, Argeş county, DCP 318; 2 specs, Tismana River, Gorj county, 9.04.1945, leg. Nicolae Semen, DCP 323; 1 ♀, Nucet, Dâmboviţa county, 9.11.1949, DCP 325; 1 ♂, Topeşti River, Tismana, Gorj county, 1952, leg. Mihai Băcescu, DCP 326; 1 ♂, 3 ♀♀, Fălciţeni Lake, DCP 330; 5 ♂♂, 1 ♀, Crişul Repede River, Ciucea, Cluj-Napoca county, 10.09.1949, leg. Mihai Băcescu, DCP 331; 6 specs, Ştiubieni Lake, Dorohoi, Botoşani county, DCP 333; 9 ♂♂, 7 ♀♀, Balş Railway station pool, 17.09.1949, leg. Marcheş, DCP 334; 8 ♂♂, 4 ♀♀, Bunio streamlet, Voşloveni, Mureş county, 21.09.1949, leg. Mihai Băcescu, DCP 337; 2 ♂♂, 4 ♀♀, Voşloveni, Mureş county, 24.09.1949, leg. Mihai Băcescu, DCP 338; 5 specs, Iaşi, 08.1949, leg. Bădescu, DCP 339; 6 ♂♂, 3 ♀♀, Alunu, Mureş county, 2 ♂♂, 1 ♀, 27.09.1957, Vâlsan River, Merişani, 2 ♀♀, 5.09.1957, Someş River, Satu Mare, 4 ♂♂, 29.08.1958, leg. Petre Bănărescu, DCP 340; 1 ♀, Răstoaca River, Grumăzeşti, 17.03.1974, DCP 344; 1 ♂ (monster specimen with both chelae hypertrophied), Herăstrău Lake, Bucureşti, DCP 347; 2 ♂♂, Nera River, at the mouth of Beiu River, upstream Sasca Română, Caraş Severin county, 9.09.1948, leg. Petre Bănărescu, DCP 349; 1 ♂, 2 ♀♀, Magherniţa streamlet, Neamţ Monastery, Neamţ county, DCP 351; 1 ♂, Valea Arieşului River, Apuseni Mountains (valley with an underground flow), leg. Valeriu Butură, DCP 358; 3 ♂♂, 1 ♀, right tributary of Olt River, Govora, Vâlcea county, 08.1949, leg. Nicolae Botnariuc, DCP 360; 1 spec., without data, DCP 362; 1 spec., without data, DCP 379.

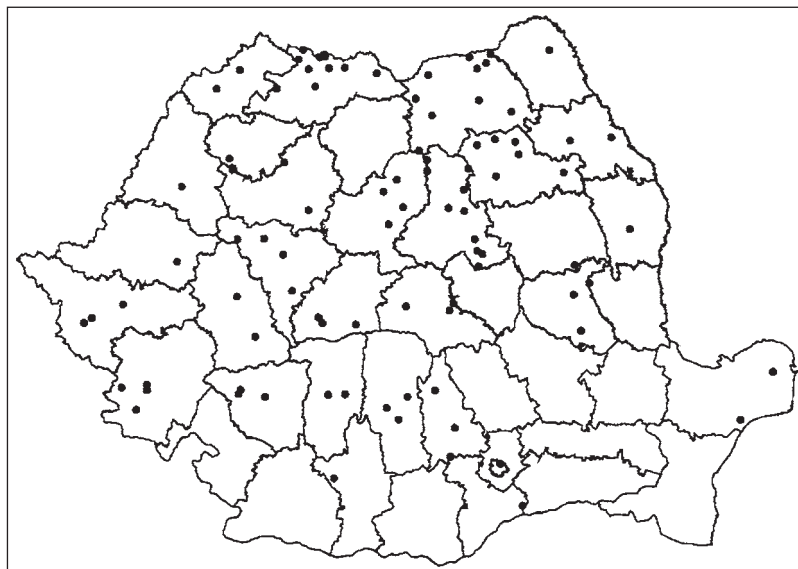


Fig. 1 - Distribution of *Astacus astacus* in Romania.

Remarks

Holdich (2002) reported the distribution of the species in the entire surface of Romania, while, recently, Souty-Grosset et al. (2006) cited it only in the Apuseni Mountains and Eastern Carpathians. According to the collection data, but also to those from literature (Băcescu, 1967; Entz, 1912; Papadopol & Diaconu, 1987), the species was distributed in almost all mountain and submountain areas, including the Danube Delta, when the material was collected (Fig. 1).

Astacus leptodactylus (Escholtz, 1823)

Collection of “Grigore Antipa” National Museum of Natural History includes 117 specimens:

1 ♂, Danube Delta, 28.06.1943, leg. Zemiancovschi, 9108; 1 ♂ (of a large size, 30 cm with the claws stretched – the Danube crayfish), Danube Delta, leg. Mihai Băcescu, 9112; 3 ♂♂, Sulina, Baia Sud, Danube Delta, 17.04.1970, leg. Mayer & Pușcașu, DCP 207; 5 ♂♂, 4 ♀♀, Boianul, Călărași, 17.09.1954, DCP 210; 1 ♂, Balta Iortmac, Băneasa, South Dobrogea, 23.07.1993, leg. Mircea Andrei, DCP 246; 2 ♀♀ (one ovigerous), Musura, Tulcea county, 26.03.1950, DCP 346; 2 ♂♂, Danube, Brăila county, 20.09.1954, DCP 335; 1 ♂, 1 ♀, Greaca pond, Giurgiu county, leg. Mihai Băcescu, 9113; 1 ♂ (of a large size), leg. Mihai Băcescu, DCP 15; 2 ♂♂, Boscoteni pond, Heleșteni, Târgu Frumos, Iași county, 28.02.1952, DCP 198; 4 ♂♂, 1 ♀ (ovigerous), Vănișor pond, Bucium, Bârnova village, Iași county, 10.03.1949, leg. Mihai Băcescu, DCP 298; 1 ♂, 1 juv., 2 ♀♀, Crișul Negru River, Tămășelu, Bihor county, 4.11.1953, leg. Petre Bănărescu, DCP 312; 1 ♂, Balătău, Bunești, Fălciu, Iași county, 16.08.1949, leg. Mihai Băcescu, DCP 317; 4 ♂♂, 2 ♀♀ ovigerous, Strâmbu pond, Bădeni, Hârlău, Iași county, 18.04.1953, leg. Mihai Băcescu, DCP 329; 5 ♂♂, 7 ♀♀ (an ovigerous female), Căldărușani, Ilfov county, 29.03.1949, DCP 204; 1 ♂, Melea, Sfântu

Gheorghe, Tulcea county, 16.04.1949, leg. Gheorghe Ulea; 1 ♂, Obilești pond, Vrancea county, 22.09.1949; 2 ♂♂, 5 ♀♀, Greier pond, Dragomirești, Ilfov county, 20.06.1949, leg. A. Crețu, DCP 302; 5 ♂♂, 4 ♀♀, Boianul, Călărași county, 17.09.1954, DCP 210; 1 ♂, Iortmac pond, Băneasa, South Dobrogea, Constanța county, 23.07.1993, leg. Mircea Andrei, DCP 246; 2 ♂♂, 2 ♀♀, Crișul Negru River, Tămășelu, Bihor county, 4.11.1953, leg. Petre Bănărescu, DCP 312; 1 ♂, 2 ♀♀, lower Prut River, 21.08.1933, leg. Mihai Băcescu, DCP 343; 4 ♀♀, Neajlov River, Mihai Bravu, Giurgiu county, 07.1976, leg. Nicolae Găldean, DCP 17; 1 ♀ (ovigerous), Razelm Lake, Enisala, Tulcea county, 27.06.1991, leg. Nicolae Găldean, DCP 40; 2 ♂♂, Danube, km. 186, 7.08.1984, leg. Dan Manoleli & Nicolae Găldean ("Stuful" Campaign), DCP 41; 1 ♂, 1 ♀, Matîța, Danube Delta, 28.07.1978, DCP 296; 9 ♂♂, 7 ♀♀, Railway station pond, Balș, Olt county, 17.09.1949, DCP 334; 1 ♂, Valea Federului River, Ohaba, Alba county, 17.09.1949, leg. Mihai Băcescu, DCP 332; 1 ♂, Nucet, Dâmbovița county, 9.11.1949, DCP 325; 2 ♂♂, 3 ♀♀, Turuși, Dolj county, 8.09.1949, leg. Bădescu, DCP 339; 3 ♂♂, 1 ♀, Știubei Lake, Dorohoi, Botoșani county, DCP 333; 1 ♀, Crișul Repede River, Ciucea, Bihor county, DCP 331; 3 ♀♀, Fălticeni Lake, Suceava county, DCP 330.



Fig. 2 - Distribution of *Astacus leptodactylus* in Romania.

Remarks

A situation, relatively similar, can be observed in this species. It has a wider distribution after Holdich (2002), and more restrictive in Souty-Grosset et al. (2006), who reported it only from eastern Romania, southern Moldova, the Danube Delta and Dobrogea. Băcescu (1967) collected it mainly from southern and eastern Romania, sporadically from Transylvania, from the lower flow of the most important rivers (Fig. 2).

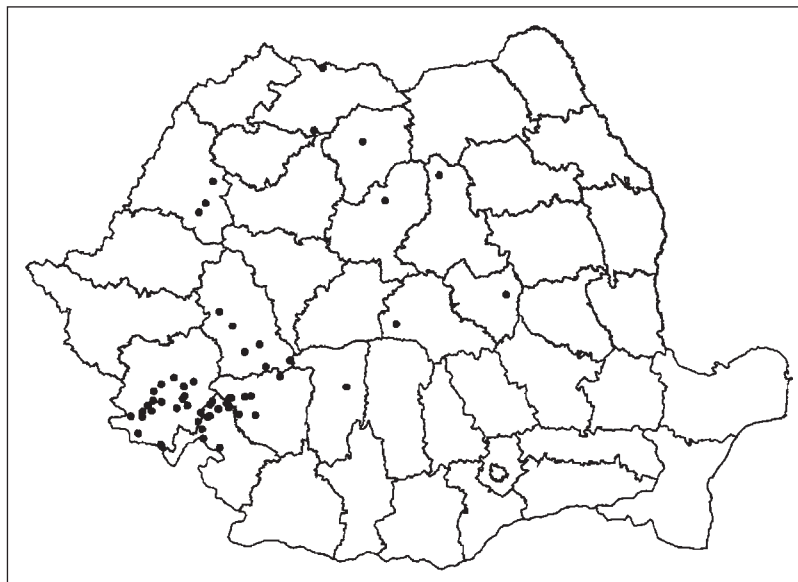


Fig. 3 - Distribution of *Austropotamobius torrentium* in Romania.

Genus *Austropotamobius* Skorikow, 1908
Austropotamobius torrentium (Schränk, 1803)

Collection of "Grigore Antipa" National Museum of Natural History includes 159 specimens:

1 ♂, 1 ♀, Pecineașca, tributary Cerna River, Turnu Severin, Caraș-Severin county, 23.10.1943, 500 m alt., leg. Mihai Băcescu, 9110; 2 ♂♂, 5 ♀♀ (1 ♀ ovigerous), Cerna River, 1935-1936, leg. Mihai Băcescu, DCP 69; 1 ♀ ovigerous, Băile Herculane, Munk stream, Caraș-Severin county, 12.05.1966, leg. Iosif Căpușe, DCP 123; 1 ♀, Valea Izei River, Sighet, Maramureș county, leg. Mihai Băcescu, DCP 168; 1 ♀, 1 ♂ Valea Beiului streamlet, tributary Nera, Cheile Beușniței, 21.09.2000, leg. Alexandru Iftime, DCP 243; 2 ♀♀, Băile Herculane, Caraș-Severin, 21.07.1963, DCP 261; 2 ♀♀, 1 ♂, Timiș River, Timiș county, DCP 294; 2 ♂♂, 5 ♀♀, Valea Șasa, tributary Crișul Negru River, Meziad, Bihor county, 13.07.1952, leg. Petre Bănărescu, DCP 304; 3 ♀♀, 2 ♂♂, Bistrița River, Gorj county, 30.10.1952, leg. Mihai Băcescu, DCP 305; 3 ♂♂, 6 ♀♀, 1 juv., Ponor streamlet, from Motru River, Gorj county, 10.09.1960, leg. Nicolae Semen, DCP 306; 4 ♀♀, 2 juvs, Someș River, Valea Mare, Moiseni, Satu Mare county, leg. Mihai Băcescu, DCP 309; 1 ♂, 2 ♀♀, Mureș River, Toplița, Bistrița-Năsăud county, 27.09.1949, leg. Iosif Cohen, DCP 310; 6 ♂♂, 5 ♀♀, 1 juv., Mureș River, Reghin, Mureș county, leg. Mihai Băcescu, DCP 316; 4 ♂♂, 12 ♀♀, Seriovia streamlet, tributary Strei River, Peștera, Hațeg, Alba county, 3.09.1946, leg. Mihai Băcescu, DCP 320; 4 ♂♂, 1 ♀, Racoș River, Brașov county, 24.09.1951, leg. Traian Orghidan, at light, DCP 322; 2 ♀♀, Sâmbăta, Făgăraș, 5.11.1949, leg. Mihai Băcescu, DCP 324; 1 ♂, Topești River, Tismana, Gorj county, 1952, leg. Mihai Băcescu, DCP 326; 2 ♂♂, 3 ♀♀, Sâmbăta streamlet, Făgăraș, 9.06.1940, leg. Aurelian Popescu-Gorj, DCP 328; 9 ♂♂, 8 ♀♀, Valea Federului River, Ohaba, Alba county, 17.09.1949, leg. Mihai Băcescu, DCP 332; 1 ♂, 2 ♀♀ (1 ♀ ovigerous),

streamlet between Morilor canal and Jieț River, 22.04.1956, leg. Mihai Băcescu, DCP 336; 5 ♂♂, 5 ♀♀, Mehadica, tributary Cerna River, Verendin, Caraș-Severin county, leg. Ion Armaș, det. Mihai Băcescu, DCP 319; 6 ♂♂, 1 ♀, Gorj county, leg. Mihai Băcescu, DCP 321; 2 ♂♂, Tismana, Gorj county, DCP 323; 4 ♂♂, 3 ♀♀, Tamaș streamlet, tributary Timiș River, Piatra Albă, Semenice, Caraș-Severin county, leg. I. Armaș, DCP 341; 2 ♂♂, 2 ♀♀, 1 juv., Valea Resii, Vipere streamlet, between Berzeasca and Cozla, Caraș-Severin county, 2.04.1951, leg. Mihai Băcescu, DCP 342; 7 ♂♂, 8 ♀♀, Cerna River, Gornenți, Mehedinți county, between Severin Mountains and Cerna Mountains, leg. Alexandru Grossu, DCP 345; 3 ♀♀, Richidia streamlet, 2 km upstream Bozovici, Caraș-Severin county, 8.07.1962, leg. Mihai Băcescu, DCP 361.

Remarks

Holdich (2002) reported it similarly, in the entire country, Souty-Grosset et al. (2006) reported it from SW Romania, basing on the unconfirmed original distribution. Pârvulescu (2007, 2008, 2009 b) reported the stone crayfish species from the area of the Mehedinți Mountains, Anina Mountains and Apuseni Mountains. We extend the known species range (at least at the collecting date of the specimens of the collection, 1974) to the western side of the Southern Carpathians, Transylvania and Maramureș (Fig. 3).

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All our gratitude to Lucian Pârvulescu (Western University, Faculty of Chemistry, Biology, Geography, Timișoara) for the specialised papers he offered; to Dr. Alexandru Iftime, for making the maps, to Petruța Dumitrică ("Grigore Antipa" National Museum of Natural History) for her help in working in the collection; to the anonymous referees of this paper, to Mihaela Achim (,"Grigore Antipa" National Museum of Natural History) for translating the paper and, not the least, to Dr. Angela Petrescu, for her consistent moral support.

CATALOGUL COLECȚIEI DE DECAPODE ASTACIDE (CRUSTACEA: DECAPODA: ASTACIDAE) DIN ROMÂNIA, AFLATĂ ÎN MUZEUL NAȚIONAL DE ISTORIE NATURALĂ „GRIGORE ANTIPA” DIN BUCUREȘTI

REZUMAT

Cea mai mare colecție de raci (Crustacea, Astacidae) din România se găsește la Muzeul Național de Istorie Naturală "Grigore Antipa" (București).

Aceasta conține 426 exemplare aparținând la două genuri și trei specii, *Astacus astacus*, *A. leptodactylus* și *Austropotamobius torrentium*.

Materialul a fost colectat în perioada 1933-2000 de Mihai Băcescu și colaboratorii acestuia din aproape toată țara.

Sunt date primele hărți mai complete ale răspândirii în România a acestor specii, realizate pe baza datelor din colecție și din literatură (Scriban, 1908; Entz, 1912; Băcescu, 1967; Papadopol & Diaconu, 1987).

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CRITICAL EVALUATION OF THE SPECIMENS OF *LITHOBIUS VALIDUS* MEINERT – SPECIES GROUP (CHILOPODA: LITHOBIIDAE) FROM THE “Z. MATIC” AND “ȘT. NEGREA” COLLECTIONS (ROMANIA)

ȘTEFAN NEGREA

Abstract. Z. Matic’s collection, preserved at the Zoological Museum of the “Babeș-Bolyai” University of Cluj-Napoca, and Șt. Negrea’s collection, preserved at the “Emil Racovitza” Speleological Institute of Bucharest (the only chilopod collections existing in Romania) are containing three species of the *Lithobius validus* Meinert group: *L. (L.) validus* Meinert, 1872 (*sensu* Eason, 1974 a), *L. (L.) moldavicus* Prunescu, 1966 (*sensu* Negrea, in the present paper) and *L. (L.) matici* Prunescu, 1966. New synonymies are proposed: *Lithobius punctulatus moldavicus* Prunescu, 1966 = *Lithobius moldavicus* Negrea in this work = *Lithobius validus* Zapparoli, 1994 nov. syn.; *Lithobius matici* Prunescu, 1966 = *Lithobius matici biharicus* Prunescu, 1966 nov. syn. The subspecies *Lithobius punctulatus moldavicus* Prunescu, 1966 is elevated to the taxonomical rank of species, *Lithobius moldavicus* Prunescu, establishing its geographical area as it is currently known. The following species are redescribed: *Lithobius validus* Meinert, 1872, based on the Romanian Carpathians populations; *Lithobius moldavicus* Prunescu, 1966 based on the specimens of the Eastern Carpathians – including the type series, establishing a *lectotypus* and an *allolectotypus*; *Lithobius matici* Prunescu, 1966 based on populations from the Eastern Carpathians and the Western Carpathians.

Résumé. La collection de Z. Matic, gardée au Musée Zoologique de l’Université “Babeș-Bolyai” de Cluj-Napoca et la collection de Șt. Negrea, gardée à l’Institut de Spéléologie “Émile Racovitza” de Bucarest (les seules collections de chilopodes existant en Roumanie) contiennent trois espèces du groupe Meinert de *Lithobius validus*: *L. (L.) validus* Meinert, 1872 (*sensu* Eason, 1974 a), *L. (L.) moldavicus* Prunescu, 1966 (*sensu* Negrea, dans l’article ci-présent) et *L. (L.) matici* Prunescu, 1966. Sont proposées de nouvelles synonymies: *Lithobius punctulatus moldavicus* Prunescu, 1966 = *Lithobius moldavicus* Negrea dans l’article présent = *Lithobius validus* Zapparoli, 1994 nov. syn.; *Lithobius matici* Prunescu, 1966 = *Lithobius matici biharicus* Prunescu, 1966 nov. syn. La sous-espèce *Lithobius punctulatus moldavicus* Prunescu, 1966 est élevée au rang d’espèce, *Lithobius moldavicus* Prunescu, en lui traçant l’aire géographique telle qu’elle est connue à présent. Les espèces suivantes sont décrites à nouveau: *Lithobius validus* Meinert, 1872 basée sur des populations des Carpates roumaines; *Lithobius moldavicus* Prunescu, 1966 basée sur des populations des Carpates Orientaux – incluant la série type et établissant un *lectotypus* et un *allolectotypus*; *Lithobius matici* Prunescu, 1966 basée sur des populations des Carpates Orientaux et Occidentaux.

Key words: *Lithobius validus* s. str., *Lithobius moldavicus*, *Lithobius matici*, new synonymies, re-description, geographical distribution, “Z. Matic” and “Șt. Negrea” collections, Romania.

INTRODUCTION

The study of the biodiversity is a priority objective of the UE zoologists engaged, among others, in the achievement of the “Fauna Europaea” project. The Romanian Chilopod Catalogue (Negrea, 2006) fitted in this context by critically presenting all the species mentioned on the present Romanian territory, including the probable ones. This catalogue is to be continued by a series of works containing the reexamination of the two chilopod collections existing in Romania: the “Zachiu

English version by Oriana Irimia-Hurdugan.

Matic" collection (Zoological Museum of the "Babeș-Bolyai" University, Cluj-Napoca) and the "Ștefan Negrea" collection ("Emil Racovitza" Speleological Institute, Bucharest). The present work is the first of this series and refers to the "*Lithobius validus* Meinert - group species" that I have identified in the two collections. At the end of the study of these collections, while publishing the results, I will indite a monography, bringing our knowledge on the Romanian chilopods up to date, for the first time in forty years that passed since the publishing of the remarkable volumes of my regretted colleague and friend, Zachiu Matic (1966, 1972).

The collection constituted by Z. Matic has been donated to the Zoological Museum of the Cluj University during his lifetime, without publishing its catalogue. It contains the specimens he collected himself as well as the geophilomorphs collected by his collaborator, Cornelia Dărăbanțu for her PhD thesis, a series of tubes with biological material borrowed from the famous "Biospeologica" collection put together by R. Jeannel and E. Racovitza, as well as the "type series" containing specimens collected and used by Prunesco (1966) for the description of *Lithobius punctulatus moldavicus* and of *Lithobius matici* with its two subspecies: *L. matici matici* and *L. matici biharicus*. Thus, the valuable collection of Z. Matic has offered me the necessary material for the revision I was about to enterprise in order to elucidate the taxonomical status of the above mentioned subspecies as well as that of *Lithobius matici* Prunesco (*nomen novum* for *L. validus punctulatus* Verhoeff, 1937) and of the populations of *Lithobius validus* Meinert, 1872 of the Romanian Carpathians.

The presence of some tubes suffering at some point of desiccation showed that the Museum's personnel have manipulated sometimes the collection. I suppose that, during one of these verifications, the content of several tubes containing different species was mixed together. Only this would explain the presence of some *Eupolybothrus tridentinus* (Fanzago, 1874) specimens alongside *Lithobius validus* in the tubes no. 513 (Cheile Bicazului) and 515 (Trascău) labeled as *L. punctulatus*; also it could explain why the only specimen (1 ♀ ps) from the tube no. 529 (Băile Herculane), labeled in ink as *L. punctulatus moldavicus*, is actually *E. tridentinus* (details are presented in the description of the mentioned species, paragraph: "Examined material").

The "Ștefan Negrea" collection is still not finished (chilopods are still received and identified by me). In the near future, this collection is to be closed and its catalogue is to be published for the use of taxonomists interested in information on its contents.

In this study I reached the conclusion that, from a classification point of view, one and the same taxon appears under several different names for different authors so new synonymies are proposed:

- *Lithobius validus* Meinert, 1872 and Eason, 1974 a = *Lithobius punctulatus punctulatus sensu* Prunesco, 1966;

- *Lithobius validus* Meinert, 1872 = *Lithobius punctulatus sensu* Matic, 1966;

- *Lithobius punctulatus moldavicus* Prunesco, 1966 = *Lithobius moldavicus sensu* Negrea in this paper = *Lithobius validus sensu* Zapparoli, 1994 nov. syn. (the synonymy is based on the author's gonopod draw on the collected material, see species description in the present paper);

- *Lithobius matici* Prunesco, 1966 = *Lithobius matici biharicus* Prunesco, 1966, nov. syn. (the synonymy is based on the study of the same specimens of the "Zachiu Matic" collection, also examined by C. Prunesco, see the species description in the present paper).

The "*Lithobius punctulatus* Prunesco, 1966 subspecies" (sic! Correct: *Lithobius punctulatus moldavicus* Prunesco, 1966) is elevated at the taxonomical rank of species – *L. moldavicus* Prunesco – establishing its geographical area based on the data presently known.

Lithobius validus Meinert, 1872, *L. moldavicus* Prunescu, 1966 and *L. matici* Prunescu, 1966 are redescribed after the specimens from the studied collections. *Lectotypus*, *allolectotypus* and *paralectotypi* are established for *Lithobius moldavicus*, chosen from the typical series kept in the “Zachiu Matic” collection.

MATERIAL AND METHODS

The material from the “Z. Matic” and “Șt. Negrea” collections was reexamined with the aid of a Zeiss stereoscope (4x to 100x magnification), and the drawings were made on scale using a *camera lucida* “Carl Zeiss-Jena” prism type. The obtained data were noted on cards, one for all specimens of the same species existing in a tube.

All material is preserved in 75% alcohol. The tubes of the “Z. Matic” collection contain also a Museum label (written in China ink) and one or two labels written in crayon by Z. Matic (the most part) or by C. Prunescu (I am acquainted with their handwriting) – to which I added my own label, containing the result of the reexamination presented in this paper.

The acronyms used for the epimorphous stages are: ms – *maturus senior*; mj – *maturus junior*; ps – *pseudomaturus*; pr – *praematurus*; im – *immaturus*; ag – *agenitalis*. Other acronyms: P1 – leg I (P from the latin *pes-pedis*); Cx – coxa; Tr – trochanter; Pf – prefemur; Fe – femur; Ti – tibia; T – tergite.

I was surprised to notice that the anamorphous stages were absent (*foetus*, *larva* I, II, III, IV and *larva media*) from the “Z. Matic” collection. I personally consider that the identification of each specimen’s stage of development is necessary since it provides the certitude of the species identification and eliminates the possibility to describe a juvenile stage as a new species (subspecies), etc.

RESULTS

In this part of the paper I will present the results of the reexamination of the specimens of the *Lithobius validus* Meinert – group species from the “Z. Matic” and “Șt. Negrea” collections which proved to belong to three species: *L. (L.) validus* Meinert, 1872, *L. (L.) moldavicus* Prunescu, 1966 and *L. (L.) matici* Prunescu, 1966. I have reached the conclusion that all the three species are valid and that, at least on the Romanian territory, they have no subspecies.

***Lithobius (Lithobius) validus* Meinert, 1872, sensu Eason, 1974 a**

Lithobius validus Meinert, 1872: 291; Eason, 1974 a: 11; 1974 b: 71; Negrea, 2006: 107.

Lithobius punctulatus Latzel, 1876: 97 (*non vide!*); Matic, 1966: 110.

Lithobius calabrensis Fanzago, 1880 a: 269.

Lithobius brachycephalus Fanzago, 1880 b: 16.

Lithobius molleri Verhoeff, 1893: 317 (*non vide!*).

Lithobius punctulatus punctulatus Prunescu, 1966: 53.

?*Lithobius punctulatus* C. L. Koch, 1847: 147 (**Nomen dubium** cf. Eason, 1974 a: 146).

Non *Lithobius validus* var. *punctulatus* Latzel, 1888: 93 (*non vide!*); Verhoeff, 1900: 156 (*non vide!*).
(Fig. 1 a, b)

Type locality. Rasa (South Tirol).

Type specimens. *Lectotype*: a female selected by D. Schmidt, labeled “*Lithobius validus* Mein. Razzes M.” *Paralectotype*: a male accompanying the lectotype and conspecific with it (preserved at the British Museum N.H., Reg. no 13.6.18.614-615 – vide Eason, 1974 a: 11-12).

Examined material. The “Z. Matic” collection contains 17 tubes of *Lithobius validus* Meinert, numbered: 512-526, 530 and 533. In these tubes I have identified the following specimens: no. 512: Ceahlău, 10.06.1959: 1 ♂ ms, 1 ♂ mj, 2 ♀ ms, 1 ♀ mj; no. 513: Cheile Bicazului, 03.10.1958: 4 ♀ ms (plus 1 ♂ mj of *Eupolybothrus tridentinus*); no. 514: Băile Herculane, 12.11.1960: 2 ♂ mj, 1 ♀ mj; no. 515: Trascău, 09.06.1957: 1 ♂ ms, 1 ♀ ms, 1 ♀ pr (plus 2 ♂ mj and 1 ♀ mj of *Eupolybothrus tridentinus*); no. 516: Cheile Bicazului, 12.07.1960: 1 ♂ ps, 1 ♀ ms; no. 517: Lacu Roșu, 20.05.1961: 1 ♂ ps, 1 ♀ ms; no. 518: Bicaz, 25.04.1962: 1 ♂ ms, 1 ♂ mj, 1 ♀ ms; no. 519: Băile Herculane, 07.05.1961: 1 ♂ ms, 1 ♂ ps, 1 ♀ ps; no. 520: Slănic Moldova, 05.10.1962: 1 ♀ mj; no. 521: Ceahlău, 20.04.1961: 1 ♂ ms, 1 ♀ ms, 2 ♀ ps; no. 522: Târgu Ocna, 21.04.1961: 1 ♂ ps; no. 523: Tarcău, 28.10.1960: 1 ♂ ps, 1 ♀ ms; no. 524: Cheile Bicazului, 15.05.1962: 1 ♀ ms; no. 525: Zagreb (Croatia), 11.05.1969: 27 specimens ♂ and ♀ ms, mj, ps, pr, im; no. 526: Zagreb (Vhorine Dolyi B. Potoh Kriva Draga), 21.08.1961: 11 specimens ♂, ♀, ms, mj, ps; no. 530: Băile Moneasa, 20.04.1961: 1 ♂ pr; no. 533: Stâna de Vale (Bihor), 13.05.1926, leg. R. Jeannel: 1 ♀ ps. It is the only label inscribed with the name of the person who collected the material in the 17 tubes, written in China ink in Jeannel’s handwriting - so this material is part of the “Biospeologica” collection put together by Emil Racovitza.

Note. On the labels placed inside the tubes, *L. validus* Meinert, appears as: *L. punctulatus* (no. 512-526); *L. validus* and *L. punctulatus moldavicus* (on two of the labels placed inside tube no. 530); *L. validus punctulatus* and *L. matici biharicus* (on two of the labels placed inside tube no. 533). On the labels there is no mention of the name or the date of the person that wrote them.

Redescription based on the examined material.

Body length (measured from head to T15 included) of the ms: 25-30 mm; mj: 22-24 mm; ps: 18-21 mm; pr: 14.5-17 mm. Colour: chestnut-brown, darker on the cephalic shield. Long antennae, of 41 to 46 articles (there are teratological cases: ♀ ms with 43+24 articles or with 46+18 articles); the last article is 1.5-2 times longer than the previous. Pigmented ocelli, counting 1+23 up to 1+27 on 6-7 irregular, curved, bent rows, sometimes unarranged in rows. The Tömösváry organ is the size of a middle size ocellus, with a round, slightly convex contour. The forcipular coxosternite presents 6+6 up to 8+8 robust, blunt, black-tipped teeth. The T 6, 7, 9, 11 and present large, broad and pointed-tip triangular projections at the angles. The coxal pores are well shaped: the first proximal one is small and round, the following are increasingly oval and bigger, becoming “buttonhole”-shaped, their number (at the ms and the mj) is between 7 and 9 pores on each of the P12-P15 coxa. The legs 1-15 have a bi-articulated tarsus, with a yellowish-chestnut brown coloration; especially on the P12-P15, the internal side of the prefemur, femur and tibia, there are maculae filled with violaceous pigment. There are no coxolateral spinous setae on P12-P15. The P15 claw is simple.

The adult female gonopods (Fig. 1 a, b) have an apical claw with three denticles: the middle one is the strongest and the longest: the internal one is more developed than the external one. The spurs, 2+2, are cylindrical-conical, relatively short and robust. The first (basal) article presents two irregular rows of bristles, more or less thin, on the internal antero-ventral rim (underneath the spurs), which interconnect at the level of the spur and get smaller towards the base – a total number of 16-22. The second (median) article has 17-25 dorsal bristles, of different

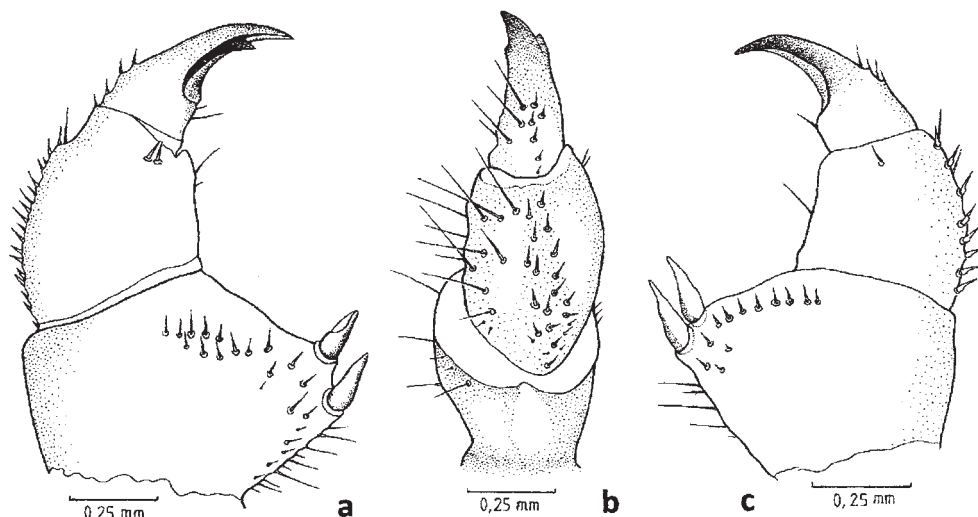


Fig. 1 - *Lithobius validus* Meinert – ♀ gonopod: a, internal side (Ceahlău Mountain, 10.06.1959); b, same gonopod in dorsal view; c: *Lithobius moldavicus* Prunescu – ♀ gonopod, internal side (Cheile Bicazului, 03.09.1962).

lengths, shorter and denser towards the base of the article, not arranged in rows; on the internal side there are 1-2 acute setae; on the external side there are numerous long setae. The third (apical, claw bearer) article has 5-7 bristles smaller and thinner at the base on its dorsal rim, most often forming an irregular row; on the external side there are long setae situated at the base of the claw.

The legs' spinulation is rich, as presented in table 1. The variability of the spinulation on P1-P15 is very low, within the regular limits for this species.

***Lithobius (Lithobius) moldavicus* Prunescu, 1966**

Lithobius moldavicus Negrea, 2006: 103 **stat. nov.**

Lithobius punctulatus moldavicus Prunescu, 1966: 55; Matic, 1966: 112.

Lithobius validus Zapparoli, 1994 a: 249 **nov. syn.**

?*Lithobius validus rotteri* Dobroruka, 1958: 205. It has been described based on 3 specimens from Batumi; the differences are the lack of the triangular projections of the T6, the simpler P15 spinulation: (V: 01321, D: 10200), the lesser number of coxal pores (5-6 on a coxa); the length of the body (18-21 mm) indicates a ps stadia – which would also explain the quantitative differences.

(Figs 1 c, 2)

Type locality. The Ceahlău Mountain (indicated by Prunescu, 1966, as “*terra typica*”).

Type specimens. Due to the fact that, in the present paper, I am elevating Prunescu's subspecies (1966) to the rank of species and because he did not established the type, I am selecting the following lectotypes from the specimens collected by Prunescu and kept in the “Z. Matic” collection: *Lectotype*: the only ♀ ms from the tube no. 527. *Allolectotype*: 1 ♂ pr from the tube no. 528. *Paralectotypes*: the remaining specimens (4 ♀ mj, 1 ♀ ps) from the tube no. 528.

Table 1

The spinulation of the legs 1-15 in *Lithobius validus* Meinert (the spines in parenthesis may lack from one or both legs of that pair).

Leg no.	Ventral					Dorsal				
	Cx	Tr	Pf	Fe	Ti	Cx	Tr	Pf	Fe	Ti
1	-	-	m(p)	amp	m	-	-	amp	a-	(a)-
2	-	-	mp	amp	m	-	-	amp	a-p	a-p
3	-	-	mp	amp	am	-	-	amp	a-p	a-p
4	-	-	mp	amp	am	-	-	amp	a-p	a-p
5	-	-	mp	amp	am	-	-	amp	a-p	a-p
6	-	-	mp	amp	am	-	-	amp	a-p	a-p
7	-	-	mp	amp	am	-	-	amp	a-p	a-p
8	-	-	mp	amp	am	-	-	amp	a-p	a-p
9	-	-	mp	amp	am	-	-	amp	a-p	a-p
10	-	-	mp	amp	am	-	-	amp	a-p	a-p
11	-	-	mp	amp	am	-	-	amp	a-p	a-p
12	-	(m)	amp	amp	am	a	-	amp	a-p	a-p
13	-	m	amp	amp	am	a	-	amp	a-p	a-p
14	-	m	amp	amp	am	a	-	amp	-p	-p
15	-	m	amp	amp	(a)m	a	-	amp	-p	-

Examined material. The “Z. Matic” collection contains the following specimens of *L. moldavicus*, all of them belonging to the series of “type specimens”: no. 527: Cheile Bicazului, 03.09.1962: 1 ♀ ms; no. 528: Tarcău, 07.05.1963: 4 ♀ mj, 1 ps ♀, 1 pr ♂. The “Șt. Negrea” collection contains only one specimen: no. F336 (temporary number): Berteia (The Bend Subcarpathians, Prahova), on a gypsum diacclasis, 4.5 m deep, leg. E. Nitzu, 14.06.2001: 1 ♂ mj.

Note. On the labels inside the “Z. Matic” collection tubes, *L. moldavicus* Prunescu appears as: *L. validus punctulatus* and *L. punctulatus moldavicus* (on the two labels inside the tube no. 527) and as *L. validus* and *L. punctulatus moldavicus* (on the two labels inside the tube no. 528). The following specimens don’t belong to the *L. moldavicus* species although one of the two labels inside the tubes specifies “*L. punctulatus moldavicus*”: 512 (Ceahlău, 10.06.1959); 513 (Cheile Bicazului, 03.10.1958); 515 (Trascău, 09.06.1957); 521 (Ceahlău, 20.04.1961); 529 (Băile Herculane, 27.05.1963); 530 (Băile Moneasa, 20.04.1961); these tubes contain, mainly, *L. validus* Meinert specimens (see the precedent species).

Redescription based on the examined material.

Body length (measured from head to T15 included) of the ♀ ms = 26 mm; ♀ mj = 20-24 mm; ♀ ps = 18 mm; ♂ pr = 14 mm. Colour: yellowish-chestnut brown, relatively uniform, darker on the forehead. Head (Fig. 2 a) slightly wider rather than longer. Long antennae (up to half of the body length): ♀ ms: 49-50 articles, ♀ mj: 47-53, ♀ ps: 18; ♂ pr: 14. The last article is 1.5-1.7 times longer than the previous. The round or oval ocelli (Fig. 2 b), disposed on 4-5 rows, more or less regular: ♀ ms: 1+17 (left) and 1+19 (right); ♀ mj: 1+18-19; ♀ ps: 1+13-14; ♂ pr: 1+9-11 in irregular rows. The Tómosváry organ is the size of a middle size ocellus. The forcipular coxosternite (Fig. 2 c): ♀ ms: 7+7 robust, blunt teeth with the median suture narrow and deep and disposing of 2+2 porodonts, thick-based and pointed-tipped; ♀ mj: 6+6 – 7+7; ♀ ps: 6+6; ♂ pr: 6+6. T6, 7, 9, 11, 13 (Fig. 2 d) presenting triangular projections on the posterior angles at all the epimorphous stages. The

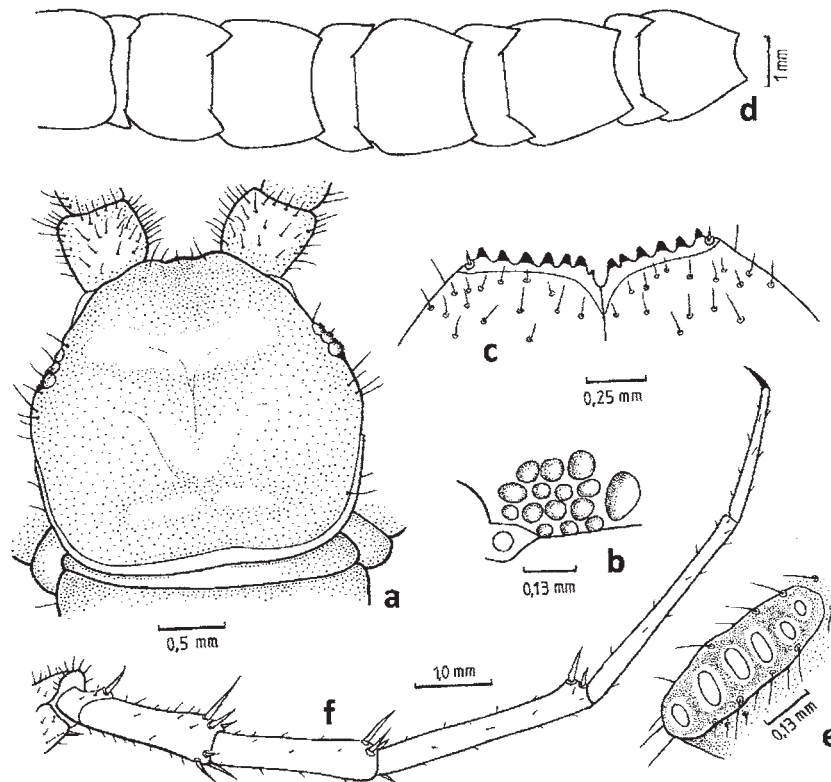


Fig. 2 - *Lithobius moldavicus* Prunescu: a, cephalic shield; b, the ocelli and the Tömösváry organ; c, forcipular coxosternite; d, tergites 5-14; e, P15 coxal pores; f, the right P15, external side. Male from the Bend Subcarpathians, Berteia, 14.06.2001.

coxal pores (Fig. 2 e) from the P1-P15 are buttonhole shaped, excepting the first proximal pore that is round and small, followed by 1-2 oval pores, increasing in size; ♀ ms: 8-9 pores on a single row; ♀ mj: 6-8; ♀ ps: 5-7; ♂ pr: only 5 round or slightly oval pores. The legs 1-15 have a bi-articulated tarsus, light chestnut brown colored. The glandular pores are present on the P12-15, easily noticeable on the internal side, as violaceous maculae, with a clear contour on the P15. The legs 14 and 15 are long and slender; P15 (Fig. 2 f) with a simple apical claw and without coxolateral spinous setae. The female gonopod (Fig. 1 c) with a simple claw and 2+2 spurs 3-3.5 times bigger in length than in width. The ms female presents 10 bristles on the first article of the gonopod on the internal side, relatively thin and almost equal; the last 2 bristles at the spurs level are doubled by shorter setae; the mj females have a row on the internal side of the first article composed of 7+6, 8+10 or 10+10 bristles; the ps female presents a row of only 3-4 bristles. The second article of the ms gonopod presents on the dorsal rim an irregular row of 8 bristles, quasi-equal, the last 2 distal bristles being doubled, on the external side, by two longer bristles; the mj females have the dorsal row composed of 6+7, 8+6 or 7+7 bristles, doubled externally at the distal end by 2-3 longer bristles; the ps female has the dorsal row formed of 4-5

unequal bristles, in an irregular pattern, doubled by 1-2 setae on the external side. The third article of the gonopod presents, on the dorso-external rim, 3-4 bristles, thinner and shorter than those of the second article, that are not disposed in a row; the mj females present 3-4 thinner bristles, situated dorso-externally and not forming a row; the ps female has also 2-3 smaller bristles, situated dorso-externally. In all development stages, on the internal side of the second article a spinuous setae is present (Fig. 1 c). The spinulation of the ms female's legs is presented in table 2. It gets richer from one stadia to another, from the pr to ms. For comparison with the total ms spinulation from the table, I give the spinulation of the P1 and P2 for a ♂ pr: P1: –, –, m, m, m/ –, –, a, a; P2: –, –, mp, amp, m/ –, –, mp, ap, a.

Table 2

The spinulation of the legs 1-15 in *Lithobius moldavicus* Prunescu.

Leg no.	Ventral					Dorsal				
	Cx	Tr	Pf	Fe	Ti	Cx	Tr	Pf	Fe	Ti
1	-	-	mp	amp	am	-	-	amp	a-p	a-
2	-	-	mp	amp	am	-	-	amp	a-p	a-
3	-	-	mp	amp	am	-	-	amp	a-p	a-p
4	-	-	mp	amp	am	-	-	amp	a-p	a-p
5	-	-	mp	amp	am	-	-	amp	a-p	a-p
6	-	-	mp	amp	am	-	-	amp	a-p	a-p
7	-	-	mp	amp	am	-	-	amp	a-p	a-p
8	-	-	mp	amp	am	-	-	amp	a-p	a-p
9	-	-	amp	amp	am	-	-	amp	a-p	a-p
10	-	-	amp	amp	am	-	-	amp	a-p	a-p
11	-	-	amp	amp	am	-	-	amp	a-p	a-p
12	-	-	amp	amp	am	a	-	amp	a-p	a-p
13	-	m	amp	amp	am	a	-	amp	a-p	a-p
14	-	m	amp	amp	am	a	-	amp	a-p	a-p
15	-	m	amp	amp	am	a	-	amp	-p	-

***Lithobius (Lithobius) matici* Prunescu, 1966**

Lithobius validus punctulatus Verhoeff, 1937: 156.

Lithobius matici **nov. nom.** Prunescu, 1966: 57 for *L. validus punctulatus* Verhoeff, 1937.

Lithobius matici matici Prunescu, 1966: 58 **nov. syn.**

Lithobius matici biharicus Prunescu, 1966: 59 **nov. syn.**

Lithobius matici Negrea, 2006: 103.

Non *Lithobius punctulatus* C. L. Koch, 1847: 147; *Lithobius validus* Meinert, 1872.

Type locality. „*L. validus punctulatus* Verhoeff”: Petnicka pecina, province of Valjevo, Bosnia; „*L. matici matici* Prunescu”: Ineu Mountain (Rodna Mountains, Romania); „*L. matici biharicus* Prunescu”: Bihor Mountains (Romania) – see Prunescu (1966).

Type specimens. „*L. validus punctulatus* Verhoeff” (vide Eason, 1974 b: 12): in the Verhoeff collection at the Brithish Museum (NH). (Reg. No. 03.8.25.27-28); „*L. matici matici* Prunescu” and „*L. matici biharicus* Prunescu”: the author had not selected holotypes and allotypes; the syntypes that he disposed of for the description of these „subspecies” are those of the collection „Z. Matic” (the same that I have examined myself – see below „Examined material”); since I established this is a

nomen novum, the type specimens will remain the ones in the Verhoeff collection from the British Museum.

Examined material. The „Z. Matic” collection contains 21 tubes with specimens of *L. matici* Prunesco, numbered: 531, 532, 534-552. In these tubes I have identified the following specimens: no. 531: Pădurea Neagră, 15.06.1959: 1 ♂ ps and 1 ♀ im; no. 532: Ordâncușa, 14.08.1921 (leg. R. Jeannel): 1 ♂ mj; no. 534: Valea Nucșoarei, 02.06.1955: 2 ♂ ps, 1 ♂ pr, 1 ♀ ps, 2 ♀ pr; no. 535: Cheile Turzii, 06.07.1958: 1 ♂ ps, 1 ♂ im; no. 536: Piatra Ceții (Cetea-Teiuș), 05.05.1959: 3 ♂ mj, 1 ♀ mj; no. 537: Detunata, 26.05.1922 (leg. R. Jeannel): 1 ♂ ps; no. 538: Detunata, 07.05.1923 (idem): 1 ♀ ms; no. 539: Detunata, 26.05.1922 (idem): 1 ♀ mj, 1 ♀ ps, 1 ♀ pr, 1 ♂ im; no. 540: Cetățile Rădesei, Izvorul Someșului Cald, 11.07.1960 (leg. B. Stugren): 1 ♂ ps, 1 ♀ mj, 1 ♀ ps; no. 541: Piatra Muncelului, Băița, 10.06.1922 (leg. R. Jeannel): 1 ♂ ps, 1 ♂ pr; no. 542: „Sources du Someș”, 20.06.1922 (idem): 1 ♂ pr; no. 543: Cheile Turzii, 30.06.1958: 1 ♀ ms; no. 544: Scărișoara, 21.05.1957: 1 ♂ pr; no. 545: Piatra Muscelului, Băița –Bihor, 1000 m alt. (leg. R. Jeannel): 1 ♂ pr; no. 546: Poșești, 04.10.1921 (idem): 1 ♂ mj; no. 547: Valea Vinului, 11.09.1959: 1 ♂ pr, 1 ♀ ps; no. 548 Colibița (Ilva Mică, Cluj), 07.07.1954: 1 ♂ pr; no. 549: Valea Vinului (Beni), 24.05.1960: 1 ♀ ps; no. 550: Valea Vinului (Ineu), 25.06.1960: 1 ♀ im; no. 551: Valea Vinului (Saca), 25.06.1960: 1 ♀ ps; no. 552: Valea Vinului, 28.05.1960: 1 ♀ im. The „Șt. Negrea” collection contains 1 tube: no. 9: Stâna de Vale, upstream of Izvorul Minunilor, in the woods, 04.06.1954 (leg. Șt. Negrea): 2 ♂ ms.

Note. On the labels inside the tubes from the „Z. Matic” collection (two in each tube), *L. matici* appears as „*L. validus*” and „*L. matici biharicus*” (no. 531, 532, 534-536, 538, 540, 542-544); as: „*L. validus punctulatus*” and „*L. matici biharicus*” (no. 537, 539, 541, 545, 546) and as: „*L. validus*” and „*L. matici matici*” (no. 547-552). On the labels the name of the person who wrote them is not indicated.

Redescription based on the examined material.

Body length (measured from head to T15 inclusively) of ♂, ♀ ms: 23-24 mm; mj: 20-22.5 mm; ps: 18-20 mm; pr: 15-17.5 mm; im: 11-14.5 mm. Colour: yellow-ochre-chestnut brown, darker on the tergites and the cephalic shield. Short antennae, of 30-37 articles (ms may have 33+34 articles, just as an im!); the last article is 1.2-2 times longer than the previous. The pigmented ocelli, in number of 1+14-17 during the ms, mj and ps stages, and of 1+10-11 during the pr and im stages, have different sizes and are disposed in very irregular pattern, sometimes forming 4-5 imperfect rows of closely packed ocelli. The Tómosváry organ has an elevated brown circular edge, slightly bigger than the middle sized ocellus. The cephalic shield is slightly wider rather than longer. The forcipular coxosternite can present 6+8 teeth at the ms; 7+7 at the mj; 6+6 – 7+7 at the ps; 5+5 – 6+6 at the pr and 5+5 – 5+6 at the im; the porodonts are spine-like, on a small lateral elevation; the median groove is narrow and deep; the teeth are small, with blunt, black tips, more packed near the median groove. The T6, 7, 9, 11, 13 present prominent triangular projections at the posterior angles; among them, the T6 is smaller but more distinct; during the im stadia, the T6 is almost at a right angle, barely distinct. The coxal pores: the proximal one is small and round, than the pores are getting bigger and more oval, without becoming buttonhole like, as in *L. validus*; their contour is thin and brown; their number: 7-9 on each coxa in the case of ms and mj, 6-8 in the case of the ps, 5-7 in the case of the pr and 3-4 in the case of the im stage. The legs 1-15 have a bi-articulated tarsus, in the same colour as the body's, without violaceous

pigment filled maculae as in *L. validus*. The 14th and 15th are shorter and more robust than those of *L. validus* and do not present coxolateral spines. The males do not present secondary sexual characters. The adult female's gonopods present a tridentated claw, the lateral teeth being small or very small; there was an exception for a ♀ps from Valea Vinului (Saca) that presented a bidentated claw, with a well developed external tooth and an absent internal tooth; in an opposite case, a ♀ps from the same Valea Vinului (Beni), the claw was tridentated with two equally developed lateral teeth. The gonopod spurs (2+2) have a cylinder-conic shape, relatively short and pointed, similar to those of *L. validus*. The basal article, without dorsal spines, presents 5-6 bristles on the internal side, forming an irregular row, up to the spurs and continuing with 4-5 bristles beyond them. The second article presents 15-17 dorsal spines, of different sizes, on 2-3 irregular rows, and several very small spines laterally placed in the ms stage and counting 8-15 in the mj and ps stages. The apical article presents 4-6 dorsal setae of different sizes, sometimes organized in 1-2 rows. During all the stages of development, on the internal side of the third article, a spinous seta is present. The legs spinulation in ps ♂ and ♀ of 18-19 mm is presented in table 3. One can notice that the spinulation of *L. matici* is very similar to that of the other species of the *L. validus* group. The individual variability is within the regular limits for this species.

Table 3

The spinulation of the legs 1-15 in *Lithobius matici* PrunESCO (the spines in parenthesis may lack from one or both legs of that pair).

Leg no.	Ventral					Dorsal				
	Cx	Tr	Pf	Fe	Ti	Cx	Tr	Pf	Fe	Ti
1	-	-	mp	amp	am	-	-	(a)mp	a-	a
2	-	-	mp	amp	am	-	-	(a)mp	a-p	(a)-p
3	-	-	mp	amp	am	-	-	amp	a-p	a-p
4	-	-	mp	amp	am	-	-	amp	a-p	a-p
5	-	-	mp	amp	am	-	-	amp	a-p	a-p
6	-	-	mp	amp	am	-	-	amp	a-p	a-p
7	-	-	mp	amp	am	-	-	amp	a-p	a-p
8	-	-	mp	amp	am	-	-	amp	a-p	a-p
9	-	-	mp	amp	am	-	-	amp	a-p	a-p
10	-	-	mp	amp	am	-	-	amp	a-p	a-p
11	-	-	mp	amp	am	-	-	amp	a-p	a-p
12	-	-	amp	amp	am	(a)	-	amp	a-p	a-p
13	-	m	amp	amp	am	a	-	amp	a-p	a-p
14	-	m	amp	amp	am	a	-	amp	-p	-p
15	-	m	amp	am	m	a	-	amp	-p	-

DISCUSSION

The reexaminations of the specimens from the “Z. Matic” and “Șt. Negrea” collections allowed the clarification of the taxonomical status of the species from the *Lithobius validus* Meinert – group in Romania: *L. validus* Meinert, *L. moldavicus* PrunESCO and *L. matici* PrunESCO. I have established new synonymies and the taxonomical status of these species and I have redescribed them based on the specimens from the two collections. I have reached the conclusion that the three species are valid and, at least on the Romanian territory, they have no subspecies.

Regarding the geographical distribution, I consider that there are some remarks to be made - as a consequence of the reevaluation of the "Z. Matic" and "Șt. Negrea" collections. *Lithobius moldavicus* Prunescu is different from *L. validus* Meinert (s.str.) mainly by the claw of the female gonopod (with one tip instead of three tips) and by the bristles number and distribution on the internal side of the first article and on the dorsal rim of the second article (see fig. 1 a-c). This type of gonopod is described and pictured identically by Zapparoli (1994 a) for "*L. validus*" who found it in numerous sites in Turkey, this fact comforting me in saying that it was actually *L. moldavicus*. In consequence I propose a synonymy based on obvious morphological characters: *Lithobius validus* sensu Zapparoli, 1994 = *Lithobius moldavicus* Prunescu nov. syn. I would also emphasize that the description and the *camera lucida* drawings are made by Prunescu and myself based on the same material from the "Z. Matic" collection while the drawing made by Zapparoli based on material from Turkey presents an identical chetotaxy of the female gonopod. Regarding the nomenclature, Eason (1972, 1974) and also Meinert (1872) gave strong arguments in favor of the return to *L. validus* as a valid name, considering *L. punctulatus* a *nomen dubium*.

Regarding my proposal to bring the subspecies "*L. punctulatus moldavicus* Prunescu" to the rank of species, it is based on the following zoogeographical argument: the two species are occupying distinct areas in Europe (Fig. 3): while *L. validus* occupies the western mountain area of Europe (from the Western Pyrenees to the Carpathian Mountains), *L. moldavicus* occupies the eastern area (from the Carpathians to the Caucasus), an interference area existing in the Romanian Carpathians. Since it was not found in the Balkan peninsula (*vide* Stoev, 1997), I presume the geographical area of *L. moldavicus*, presently appearing discontinuous, to have once stretched from the Carpathians through the northern of the Black Sea to the Caucasus, from where Dobroruka (1958) described the species *Lithobius validus rotteri* (possibly *L. moldavicus* as well, so Probable Synonym) and from there to Turkey. It is worth emphasizing that at the interference of the two species' geographical areas - meaning in the Romanian Eastern Carpathians - I have found no hybrids, not even in Bicaz where the two species are cohabiting; this leads us to conclude that these are not subspecies but two valid species. In consequence: *Lithobius punctulatus moldavicus* Prunescu, 1966 = *Lithobius moldavicus* Prunescu, 1966.

It is interesting to notice that all certain sites for the species of the *Lithobius validus* Meinert group are comprised between 40° and 50° lat., where the species prefer mountain areas (Fig. 3). The map is based on information from the following: Eason (1974 a), Dobroruka (1958), Fanzago (1880 a, b), Iorio (2008), C. L. Koch (1847), Latzel (1876, 1880, 1888), Matic (1959, 1966, 1968), Meinert (1872), Negrea (2006), Prunescu (1966), Stoev (1997), Verhoeff (1893, 1900, 1937) and Zapparoli (1994 a); I regret not being able to get the last author's papers from 1994 b and 2006.

Regarding *Lithobius matici*, the author (Prunescu, 1966) has distinguished two subspecies: *L. matici matici* and *L. matici biharicus*. By examining the same specimens from the "Z. Matic" collection that have served him to describe these taxa, I have concluded that there are no important morphological characters to justify the existence of two subspecies. The identification key provided by the author in his paper is based on the gonopod claw: in the case of "*matici*" (endemic to the Rodna Mountains and the surroundings - in the Eastern Carpathians) the claw is

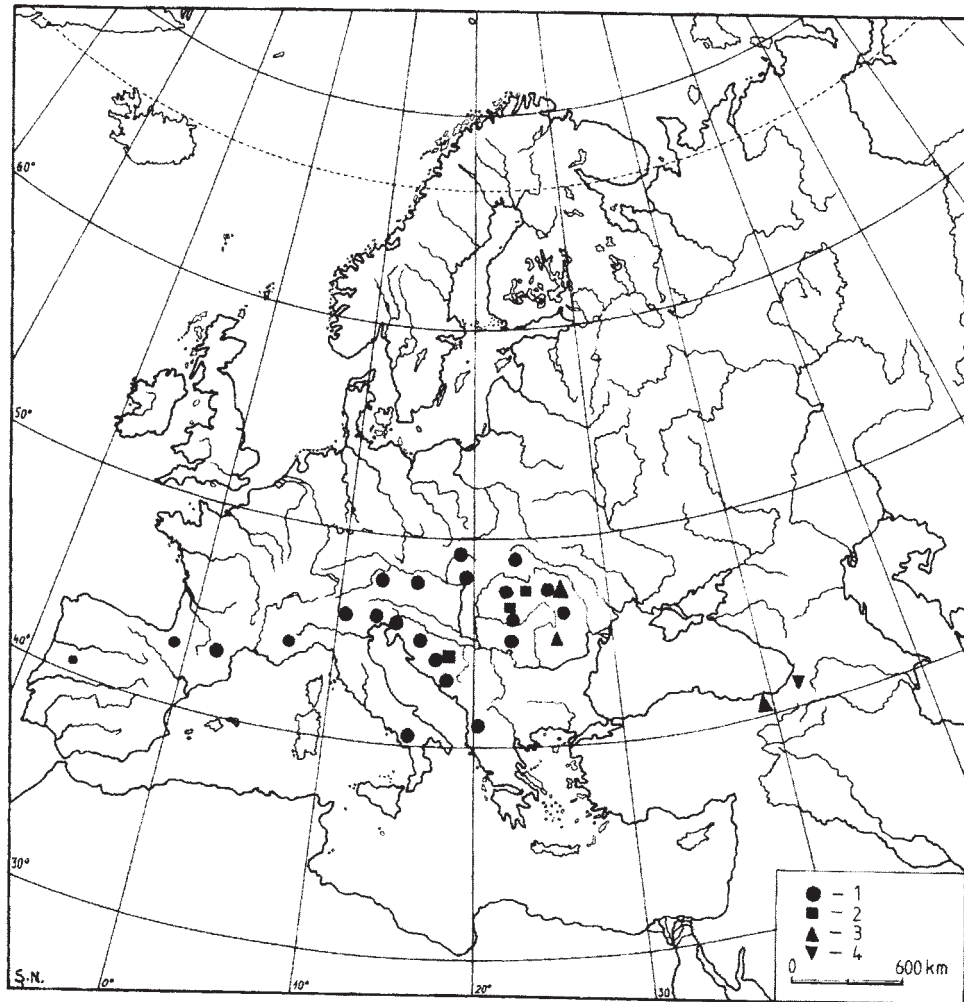


Fig. 3 - Geographical distribution of the *Lithobius validus* – Meinert species group in Europe: 1. Sites in which the presence of the *Lithobius validus* Meinert species is certain (for some authors the species is mentioned as *L. punctulatus*); 2. Sites in which the presence of the *Lithobius matici* Prunescu species is certain (Rodna Mountains and Bihor Mountains in Romania, Valjevo province in Bosnia); 3. Sites in which the presence of the *Lithobius moldavicus* Prunescu species is certain; 4. Batumi, the site for which the *Lithobius validus rotteri* Dobroruka subspecies (orig. Șt. Negrea) was described. Note: The map does not include the sites given by Zapparoli (1994 and 2006, *non vide*), who mentions *L. punctulatus* from the West Alps and Central Apennines.

bidentated and the external tooth is very small; in the case of “*biharicus*” (Bihor Mountains in the Western Carpathians and the Valjevo province in Bosnia) the claw is tridentated. In the redescription of *L. matici*, I have shown that I have identified only one specimen having a bidentated claw in the population from Valea Vinului (Rodna Mountains), all the other specimens possessing a tridentate claw. Nevertheless, I have also identified in this population (Valea Vinului) 1 ♀ ps with a

normally developed external claw of the tooth but a rudimentary internal tooth, noticeable only under a very high magnification. These exceptions show that the Rodna Mountains population registers an important degree of individual variability. In conclusion, I can assess that, from a zoogeographical point of view, there are three known populations of *L. matici* (Fig. 3): a first one in Bosnia (the Valjevo region), from where Verhoeff (1937) has described *L. validus punctulatus*, a second one in the Bihor Mountains (Western Carpathians) and a third one in Rodna Mountains and surroundings (Eastern Carpathians). Why should the populations of Valjevo and Bihor, so far apart one another, should belong to the same subspecies (*biharicus*) and the one in Rodna Mountains, much closer to Bihor, should belong to another subspecies (*matici*), as long as there are no major morphological characters to separate them? In consequence, I propose that *L. matici biharicus* should be considered synonym of *Lithobius matici* Prunescu, 1966, nov. syn.

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I would like to thank my colleague and friend Dr. Carol Prunescu (Bucharest) for his papers in French, Dr. Karin Voigtlander (Goerlitz) and Dr. Jörg Spelda (Petershausen); Mrs. Marinela Năzăreanu for the great quality of the handmade China ink copies of my *camera lucida* drawings; my colleague Dr. Oriana Irimia for the English translation and the computerized edition of this paper; Prof. Delia Ceuca, Director of the Zoological Museum of "Babeş-Bolyai" University from Cluj-Napoca for graciously lending me the *Lithobius validus* Meinert – group species material from the "Z. Matic" collection; most particularly to my colleague and friend Jean-Jacques Geoffroy, CIM Secretary, and Prof. Willi Xylander and his team that have invited me to the 14th International Congress of Myriapodology in Goerlitz (21-25th of July 2008) and thus allowing me to present this paper.

EVALUAREA CRITICĂ A SPECIMENELOR APARTINÂND GRUPULUI DE SPECII *LITHOBIUS VALIDUS* MEINERT (CHILOPODA: LITHOBIIDAE) DIN COLECȚIILE "Z. MATIC" ȘI "ȘT. NEGREA" (ROMÂNIA)

REZUMAT

Colecția "Z. Matic", păstrată la Muzeul Zoologic al Universității "Babeş-Bolyai" din Cluj-Napoca, și colecția "Șt. Negrea", păstrată la Institutul de Speologie "Emil Racoviță" din București (singurele colecții de Chilopode existente în România) conțin trei specii de *Lithobius validus*-group Meinert: *L. (L.) validus* Meinert, 1872 (*sensu* Eason, 1974 a), *L. (L.) moldavicus* Prunescu, 1966 (*sensu* Negrea în prezentul articol) și *L. (L.) matici* Prunescu, 1966. Sunt propuse noi sinonime: *Lithobius punctulatus moldavicus* Prunescu, 1966 = *Lithobius moldavicus* Negrea în acest articol = *Lithobius validus validus* Zapparoli, 1994 nov. syn.; *Lithobius matici* Prunescu, 1966 = *Lithobius matici biharicus* Prunescu, 1966 nov. syn. Subspecia *Lithobius punctulatus moldavicus* Prunescu, 1966 este ridicată la rang de specie, *Lithobius moldavicus* Prunescu, stabilindu-i-se aria geografică cunoscută până în prezent. Sunt redescrie speciile: *Lithobius validus* Meinert, 1872 pe baza populațiilor din Carpații românești; *Lithobius moldavicus* Prunescu, 1966 pe baza specimenelor din Carpații Orientali - inclusiv din seria tipică, stabilindu-se un *lectotypus* și un *allolectotypus*; *Lithobius matici* Prunescu, 1966 pe baza populațiilor din Carpații Orientali și Munții Apuseni.

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**ON THE SPECIMENS OF *EUPOLYBOTHRUS*
(*LEPTOPOLYBOTHRUS*) *TRIDENTINUS* (FANZAGO, 1874)
(CHILOPODA: LITHOBIIDAE) FROM THE “Z. MATIC”
AND “ȘT. NEGREA” COLLECTIONS (ROMANIA)**

ȘTEFAN NEGREA

Abstract. This work is the second of the series dedicated to the critical evaluation of the Chilopod specimens from the “Z. Matic” and “Șt. Negrea” collections – the only ones existing in Romania (*vide* “Literature cited”). The history of the study of *Eupolybothrus tridentinus* (Fanzago, 1874), the synonymies, the examined material, the redescription of the species based on specimens found in the two collections are presented. A nomenclatural updating of two old records is proposed: *Eupolybothrus tridentinus* (Fanzago) = *Polybothrus leptopus sensu* Matic, 1958; *Eupolybothrus tridentinus* (Fanzago) = *Eupolybothrus leptopus* f. *brolemanni sensu* Negrea, 1964. The paper concludes on some taxonomical and ecological remarks regarding the *Eupolybothrus tridentinus* (Fanzago) species.

Résumé. Cet article est le second d’une série dédiée à l’évaluation critique des spécimens de Chilopodes des collections “Z. Matic” et “Șt. Negrea” – les seules existant en Roumanie (*vide* “Literature cited”). Sont présentées l’historique de l’étude d’*Eupolybothrus tridentinus* (Fanzago, 1874), les synonymies, le matériel examiné, la redescription de l’espèce en base des spécimens trouvées dans les deux collections. Une mise à jour de la nomenclature est aussi proposée : *Eupolybothrus tridentinus* (Fanzago) = *Polybothrus leptopus sensu* Matic, 1958; *Eupolybothrus tridentinus* (Fanzago) = *Eupolybothrus leptopus* f. *brolemanni sensu* Negrea, 1964. L’article se conclue avec quelques remarques taxonomiques et écologiques à propos de l’espèce *Eupolybothrus tridentinus* (Fanzago).

Key words: collections, re-description, geographical distribution, habitats, “Z. Matic” and “Șt. Negea” collections, Romania.

INTRODUCTION

The genus *Eupolybothrus* Verhoeff, 1907 has a western-Palaeartic distribution, being particularly familiar in Central Europe and the circum-Mediterranean area (Zapparoli, 2006). Until the ’60s, the only species of this genus considered certain in Romania was *E. transsylvanicus* (Latzel, 1882) described from Caransebeș (Banat); it has a SE European distribution, meaning Bosnia and Herzegovina, Croatia, Greece, Hungary, Serbia, Montenegro, Romania and Bulgaria (Matic, 1966; Stoev, 2002; Zapparoli, 2006). The second species, *E. fasciatus* (Newport, 1845), was not found in Romanian territory yet; this trans-Adriatic species, described from Florence (*vide* Stoev, 2002: 29), was erroneously cited by Daday (1889) from Mehadia, as also mentioned by Matic (1966: 69). According to Zapparoli (2006), *E. fasciatus* is an endemic species to Apennines (Italy) and the records from the other side of Adriatic sea are probably wrong. The third species, *E. tridentinus* (Fanzago, 1874), was mentioned for the first time in the present Romanian territory at Divici (Banat) by Daday (1889: 103 and 105) under “*Lithobius leptopus* Latzel”. According to Stoev (2002), the chorotype of the *E.*

English version by Oriana Irimia-Hurdugan.

tridentinus species is “SE-European”. It has been found in Greece, Bulgaria, the ex-Yugoslavia, Albania, Italy, Austria, Hungary and even in Germany (Bavaria). In Romania, it was collected in 1928 in several caves in the Mehedinți Mountains (the Southern Carpathians) and, only in 1999, from the SSE (Superficial Subterranean Environment) in the same mountains (the slope of the Motrul Mare Valley at Steiul Roșu, upstream of Cloșani). Matic (1958: 81) identified it under “*Polybothrus leptopus* Latzel 1880” in the material collected from two caves of the Southern Carpathians: Peștera de la Poiana Rușchiului, 500 m alt., Sohodol-Gorj village (1 ♂, leg. Chappuis and Winkler, 15.06.1928); Peștera de la Vârful Înalt, 800 m alt., Nadanova-Mehedinți village (3 ♀♀, leg. Chappuis and Winkler, 03.06.1928). This material is now part of the “Biospeologica” collection, the 8th series, at the Speleological Institute of Cluj-Napoca – unlike the rest of the chilopods of this collection that have been integrated to the “Z. Matic” collection and received inventory numbers. Negrea (1964: 343) published this species under “*Eupolybothrus (P.) leptopus* f. *brolemanni* Verhoeff”, based on the material from Mehedinți Mountains (Southern Carpathians), more precisely, the caves no. 6, 9, 12 and 13 of the Valea Lupșei, Motrul Mare basin (leg. A. & V. Decu in July and October 1960 and April and September 1961); the paper contains a differential diagnostic accompanied by the description of the coxal pores and of the 6-9 tergites. All these cave captures were cited by Matic (1966). Although “forma *brolemanni* Verhoeff” has no taxonomical and zoogeographical value (it has no important morphological characters and no specific area). I have also mentioned it in Negrea (1965) and Negrea (1966), after which, in the following papers (Matic & Negrea, 1967; Negrea et al., 1993; Negrea, 1994) referring it as *E. leptopus* Latzel, and more recently, in the Romanian Chilopod Catalogue (Negrea, 2006) as *E. (Leptopolybothrus) tridentinus* (Fanzago, 1874). In other words, I stepped in Eason’s and Minelli’s footsteps (1976) who examined the Fanzago and Fedrizzi collection, preserved at the Istituto di Biologia Animale, Università di Padova.

In the above cited paper, the two authors are referring, among other things, to “*Lithobius tridentinus*”. By examining the previously mentioned collection, they have found in tube 176, labelled “*Lithobius tridentinus* Fanz. (Silv.) Salerno”, two specimens of the species commonly known as *E. leptopus* (Latzel). Concluding that the female specimen is Fanzago’s holotype, they described it as such in their paper (*vide* Eason & Minelli, 1976: 187). Thus, they established a new synonymy: *E. leptopus* (Latzel, 1880) is a junior synonym of *E. tridentinus* Fanzago, 1874. Following this synonymisation, *E. leptopus*, identified in Romania by Matic (1958) and by Negrea (1964) in several caves in NW Oltenia, must be considered as *E. tridentinus* (Fanzago, 1874) from now on.

The present paper is the second in the series dedicated to the critical evaluation of the Chilopod specimens from “Z. Matic” and “Șt. Negrea” collections – the only Chilopod collections existing in Romania. Since in this introduction I have emphasized the history of the studies, in the following part I will present the old and the new synonymies, the species’ redescription based on the specimens from the two collections and, in the end, some taxonomical, zoogeographical and ecological observations regarding *E. tridentinus*.

MATERIAL AND METHODS

The specimens in the “Z. Matic” (Zoological Museum of the “Babeș-Bolyai” University, Cluj-Napoca) and “Șt. Negrea” (“Emil Racovitza” Speleological Institute, Bucharest) collections were re-examined with the aid of a Zeiss

stereoscope (4x – 100x magnification). The drawings were made by the author at scale using a *camera lucida* “Carl Zeiss-Jena” prism type. The obtained data were noted on cards, one for all the specimens of the same species existing in a tube.

All the material is preserved in 75% alcohol.

The acronyms used for the epimorphous stages are: ms – *maturus senior*; mj – *maturus junior*; ps – *pseudomaturus*; pr – *praematurus*; im – *immaturus*; ag – *agenitalis*. Other acronyms: P1 – P15 – leg 1 – leg 15; T – tergite; Cx – coxa; Tr – trochanter; Pf – prefemur; Fe – femur; Ti – tibia.

“Peștera” (in Romanian) = Cave; “Valea” (in Romanian) = Valley.

RESULTS AND DISCUSSIONS

Eupolybothrus (Leptopolybothrus) tridentinus (Fanzago, 1874)

Lithobius tridentinus: Fanzago, 1874: 36; ?Daday, 1889: 102.

Lithobius (Neolithobius) tridentinus: Fanzago, 1876: 79.

Lithobius (Eulithobius) tridentinus: Fedrizzi, 1877: 200, 1878: 54; Latzel, 1880: 49 *vide* Eason & Minelli, 1976: 186.

Lithobius leptopus: Latzel, 1880: 53.

Polybothrus tridentinus: Attems, 1902: 543; ?1929: 306 *vide* Eason & Minelli, 1976: 186.

Bothropolys sp.: Manfredi, 1939: 54 *vide* Eason & Minelli 1976: 186.

Polybothrus leptopus: Matic, 1958: 81.

Eupolybothrus leptopus (Latzel): Matic & Negrea, 1967: 156.

Eupolybothrus leptopus f. *brolemanni*: Verhoeff, 1895: 297; Negrea, 1964: 343; Matic, 1966: 75; Negrea, 1965: 290, Negrea et al., 1993: 139; Negrea, 1994: 275; Negrea, 2006: 96; Zapparoli, 2006: (Fig. 2)

Type locality: Valle di Non, Trentino, Italy.

Type specimen (*apud* Eason & Minelli, 1976: 187 and 201): the tube no. 176, labelled “*Lithobius tridentinus* Fanz. (Silv.) Salorno” contains the single female on which Fanzago based the description of “*L. tridentinus*” and is believed to be the holotype. In the table at the page 201 it is specified that this holotype originated in Trentino, Italy and that the species named by Fanzago (1874) “*Lithobius tridentinus*” is valid: “*Eupolybothrus tridentinus* (Fanzago, 1874) comb. nov. = *Eupolybothrus leptopus* (Latzel, 1880) Syn. nov.” (*vide* Eason & Minelli, 1976: 201).

Examined material: The “Z. Matic” collection contains 6 tubes with the *Eupolybothrus tridentinus* specimens, numbered: 513, 515, 529, 1097, 1098 and 1099. In these tubes I have identified the following specimens: no. 513, Cheile Bicazului, 03.10.1958, leg. C. Prunescu: 1 ♂ mj (plus 4 ♀ ms of *Lithobius validus*) (see Negrea, 2010); no. 515, Trascău, 09.06.1957, leg. Z. Matic: 2 ♂ mj, 1 ♀ mj (plus 1 ♂ ms, 1 ♀ ms, 1 ♀ pr of *Lithobius validus*); no. 529, Băile Herculane, 27.05.1963, leg. C. Prunescu: 1 ♀ ps; no. 1097, Peștera de la Vârful Înalt, 04.05.1956, leg. Z. Matic: 1 ♂ mj (plus 1 ♂ and 1 ♀ of *Eupolybothrus* sp. missing the P14-P15); no. 1098, Peștera Rușchiului, 10.09.1957, leg. Z. Matic: 1 ♂ ms, 1 ♂ mj (plus 1 ♀ im of *Eupolybothrus* cf. *tridentinus*, with only one P15 undetected from the body and presenting projections on the posterior corners of T6); no. 1099, Valea Lupșei, 03.08.1955, leg. Z. Matic: 1 ♂ ms, 1 ♂ ps, 3 ♀ mj (all presenting projections on the posterior angles of the T6) (Fig. 1).

The “Șt. Negrea” collection contains 6 tubes with *Eupolybothrus tridentinus* specimens, numbered: 112, 116, 118, 124, 129, 132, plus 1 tube without number – a total of 7 tubes. In these tubes I have identified the following specimens: no. 112, Peștera no. 6 din Valea Lupșei, 13.09.1961, leg. A. & V. Decu: 1 ♀ mj; no. 116,

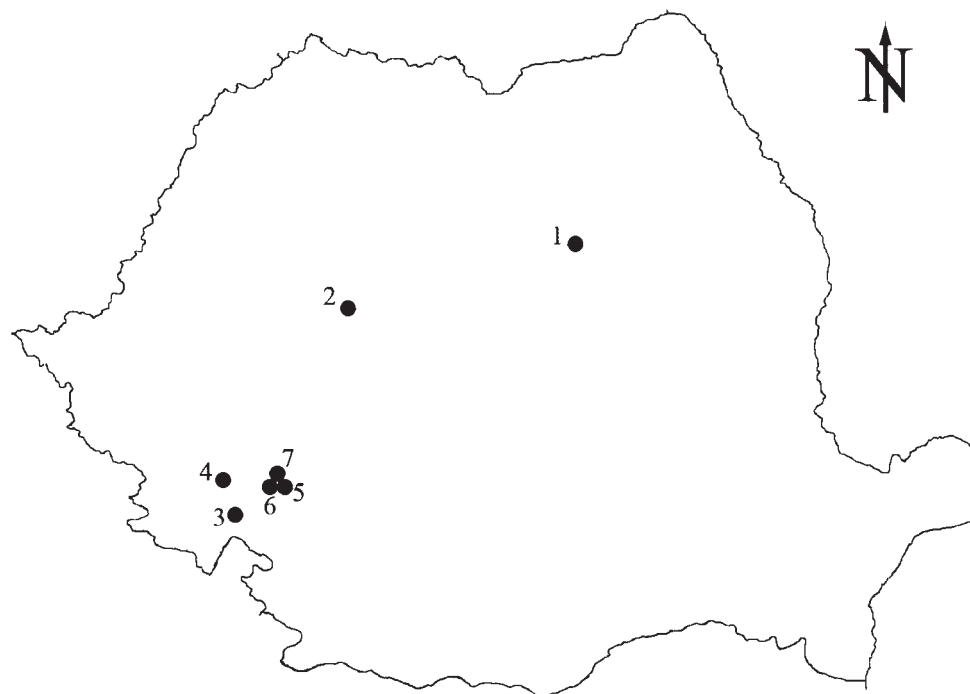


Fig. 1 - The distribution of the origin points of *Eupolybothrus tridentinus* specimens from “Z. Matic” and “Șt. Negrea” collections, in Romania. 1 – Cheile Bicazului; 2 – Trascău; 3 – Băile Herculane; 4 – Peștera de la Vârful Înalt; 5 – Peștera Rușchiului; 6 – Valea Lupșei; 7 – Valea Motrului upstream of Cloșani (Gorj county) at Steiul Roșu.

Peștera no. 9 din Valea Lupșei, 14.10.1960, leg. A. & V. D.: 1 ♀ mj, 1 ♂ pr; no. 118, Peștera no. 9 din Valea Lupșei, 27.04.1961, leg. A. & V. D.: 1 ♂ mj; no. 124, Peștera no. 12 din Valea Lupșei, 15.10.1960, leg. A. & V. D.: 1 ♂ ms; no. 129, Peștera no. 13 din Valea Lupșei, 19.07.1960, leg. A. & V. D.: 1 ♀ mj; no. 132, Peștera no. 13 din Valea Lupșei, 15.10.1960, leg. A. & V. D.: 1 ♀ mj; unnumbered tube: Valea Motrului upstream of Cloșani (Gorj) at Steiul Roșu, in the 0-15 cm horizon, 16.10.1999, leg. Victoria Ilie: 1 ♀ ps (Fig. 1). It is the first specimen found in the Southern Carpathians outside the caves, in a SSE (Superficial Subterranean Environment) borehole.

Note. On the labels placed inside the tubes no. 513 (Cheile Bicazului = Bicaz Gorges) and no. 515 (Trascău) from the “Z. Matic” collection, in which specimens of *E. tridentinus* are found together with those of *Lithobius validus*, only the second species is mentioned as *L. punctulatus* (on one label) and as *L. punctulatus moldavicus* (on another label) – from which one can assume that the *E. tridentinus* specimens have been placed in the tube subsequent to a maintenance manipulation of the collection.

The tubes no. 1097-1099 are labelled *Eupolybothrus leptopus* Latzel – a junior synonym of *E. tridentinus*, used by myriapodologists at that time. On the labels of the “Șt. Negrea” collection only one name appears: *Eupolybothrus* (*P.*) *leptopus* f. *brolemanni* Verhoeff, used in the '60s by the most part of the European chilopodologists.

Redescription.

Body length (measured from head to end of the last tergite): ♂ ms: 18-20 mm; ♀ ps: 13-15 mm; ♂ pr: 11-12.5 mm. Width (T10): ♂ ms: 3 mm; ♂ and ♀ mj: 2.7 mm. Body colour: yellowish chestnut brown, darker on the extremities and with a black median strip on the tergites. Antennae: ♂ ms: 10.5 mm, ♂ and ♀ mj: 8-9 mm. The number of the articles of the antennae varies according to the development stage: ♂ ms: 46+49 (at the same specimen); ♂ and ♀ mj: 39+39; 40+41 or 40+43; ♀ ps: 31+33; ♂ pr: broken. The last article of the antenna is 1.5 times longer than the previous one. The ocelli are disposed on 3-4 irregular rows. The first ocellus after the posterior one is almost as big as the latter. At the ♂ ms: 1+17 ocelli on 4 rows (1+3,5,5,3); ♂ and ♀ mj: 1+11-16 on 3-4 rows (1+4,4,4,3; 1+4,3,3; 1+3,5,3,3); ♀ ps: 1+10-16 (1+4,5,4,3; 1+3,4,4,2); ♂ pr: 1+8 (1+2,4,2). The Tómosváry organ is situated near the rim of the cephalic shield, being either equal, slightly smaller or bigger than the nearby ocelli, well contoured, but can also be indistinct. The cephalic shield is slightly wider than longer. The forcipular coxosternite (prosteron) is provided with numerous small, robust, teeth, black and blunt-tipped, disposed in a regular pattern as follows: ♂ ms: 8+8; ♂ and ♀ mj: 7+6, 7+7, 7+8 or 8+8; ♂ and ♀ pr: 7+7 or 8+8. The median groove is small. The porodonts are spine-like, short, with thick bases and sharp tips. The T7, T9, T11 and T13 present obvious triangular projections at the posterior corners (Fig. 2 a). T6 with rounded posterior angles; sometimes, in the adult forms, they are straight or even slightly prominent, but without forming real triangular projections. An exception is made in the case of the specimens identified as *Eupolybothrus* cf. *tridentinus*, collected in Peștera Rușchiului and Valea Lupșei, presenting large projections. It might be a new species. The coxal pores of P12-P15 (Fig. 2 b) are round, disposed on three irregular rows in the ms, mj and ps stages placed at uneven distances between them, 8-16 pores for one coxa: the internal row is formed of 4-7 glandular pores remarkably larger than the others; the median row has 6-11 smaller pores, while the external row has 2-3 very small pores, situated at the very edge of the poriferous area. The ♂ pr has 8-9 pores disposed in two rows. The femur and the tibia of P1-P12 are diffusely coloured in a brown-violaceous pigment. If P1 is barely coloured on the femur, the colour intensifies towards the rear extremity of the body, so that P12 and P13 are very well coloured, with pigment concentrations without forming maculae; the other articles (coxa, trochanter, prefemur and tarsus) are yellow, without the pigment. P14-P15 have a violaceous pigmentation, from the trochanter to the tibia, but only on the internal side of the femur and tibia, there are small, packed maculae (glandular pores) on an intense violaceous background; the tarsus has a dirty yellow colour, presenting on the internal side some violet maculae, rare and blurred. The metatarsus is also dirty yellow coloured, lacking the maculae and having the distal part pale yellow coloured. P15 are long and thin, without any particular conformations; the apical claw is simple. Sometimes a small rudimentary claw is present, not longer than ½ of the width of the main claw. P1-P14 have a secondary claw. The P12-P15 coxae have no coxolateral spines. The female gonopods (Fig. 2 c) are hunched and present 2+2 conical spurs, relatively short, slightly curved and sharp-tipped. The apical claw is simple, strongly curved, sickle shaped. All three articles present long setae on the external side; on the internal side, several setae are present. The dorsal rim of the three articles is provided with bristles disposed in one more or less regular row and having different lengths for each article, as follows: 3-6 bristles on the first (basal) article; 7-13 bristles on the second (middle) article; 0-1

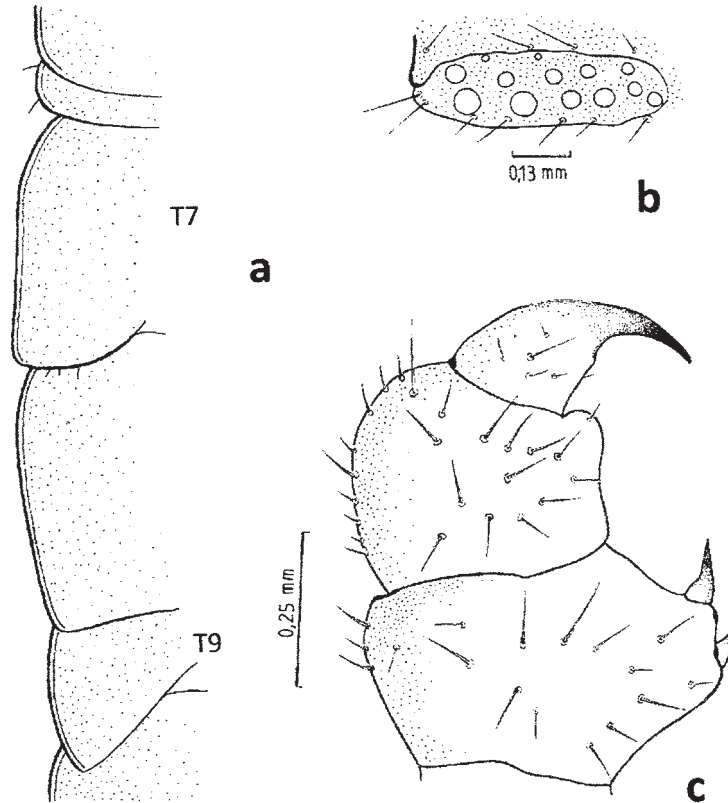


Fig. 2 - a, ♀ mj of *Eupolybothrus tridentinus* (Fanzago, 1874) collected on the 13th of Sept. 1961 from the Peștera no. 6 din Valea Lupșei, NW Oltenia – T6 to T9, left side - (reproduced from Negrea, 1964: 344); b, ♀ ps from Steiul Roșu, Valea Motrului, Gorj county, collected on the 16th of Oct. 1999 - P13 coxal pores (right); c, same, female gonopod, external side.

bristles on the third (apical) article. The male gonopods are long and curved distally, presenting setae only on the distal half. In the *praematurus* stage, the gonopods are bud-like. P1-P15 spinulation of mature stage is presented in the table 1. This spinulation is much poorer in the *praematurus* stage. For the same specimen, the same spines can be present on one leg and missing on the other leg of the same pair.

Taxonomical remarks

From the description made by Eason & Minelli (1976), it results that the holotype of the species *E. tridentinus* is quite deteriorated, missing taxonomically important appendages and body parts. This is the reason why the complete description presented in this paper – including data on the development stages – made on material from the Southern Carpathians is more than welcomed. It completes Matic's data (1958, 1966) on "*Polybothrus leptopus* Latz." respectively on *E. leptopus* Latz.

Ecological remarks

In the Mediterranean countries, *E. tridentinus* is common to the beech woods, in humid, shaded places, especially on the creek banks and seldom in drier, rockier

Table 1

The spinulation of the 1-15 legs in mature stage of *Eupolybothrus tridentinus* (Fanzago, 1874) (the spine in parenthesis may be missing).

Leg no.	Ventral					Dorsal				
	Cx	Tr	Pf	Fe	Ti	Cx	Tr	Pf	Fe	Ti
1	-	-	m(p)	(a)m	(a)m	-	-	am(p)	a(p)	a(p)
2	-	-	mp	am	am	-	-	amp	a-p	a(p)
3	-	-	mp	am	am	-	-	amp	a-p	a-p
4	-	-	mp	am	am	-	-	amp	a-p	a-p
5	-	-	mp	am	am	-	-	amp	a-p	a-p
6	-	-	mp	am	am	-	-	amp	a-p	a-p
7	-	-	mp	am	am	-	-	amp	a-p	a-p
8	-	-	mp	am	am	-	-	amp	a-p	a-p
9	-	-	amp	am	am	-	-	amp	a-p	a-p
10	-	-	amp	am	am	-	-	amp	a-p	a-p
11	-	-	amp	am	am	-	-	amp	a-p	a-p
12	-	-	amp	amp	am	-	-	amp	a-p	a-p
13	-	-	amp	amp	am	-	-	amp	a-p	p
14	-	m	amp	amp	(a)m	(a)	-	amp	(a)p	p
15	-	m	amp	amp	(a)m	a	-	(a)mp	p	-

places (Matic, 1958). According to Stoev (2002), in Bulgaria this species lives at the altitude of 120-1600 m where its habitat includes coniferous and deciduous forests in mountain area but it is also present in open areas (bush, lawn, meadow, rocky fields or slopes). To these habitats I added the caves and the superficial soil under the hemiedaphon. The different habitats are preferred in the following order: *Fagus sylvatica*, *Picea abies*, *Salix* sp., *Corylus avelana*, *Tilia* sp., *Quercus* sp., *Pinus* sp. and caves. Regarding the latter, Negrea (1965, 1966) emphasizes that, in the caves from Valea Lupșei, the specimens were collected in the photic zone, in the leaves at the base of the caves' walls, knowing that the caves are small and damp and situated in rare beech woods, and specifies that *E. tridentinus* must be considered a subtroglophile species. In another paper, Matic & Negrea (1967) have identified, for the first time in Romania, some specimens of *E. tridentinus* in the superficial environments: in Valea Iaunei (one of Cerna's tributaries) under beech dote; at Vârtoape (in Oltenia) under the bark, in beech dote and in the soil underneath the litter, from July to October. Finally, Negrea et al. (1993) added a first cave from Banat Mountains: Peștera Albă din Valea Comarnicului, in the floor fauna.

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ASUPRA SPECIMENELOR DE *EUPOLYBOTHRUS* (*LETOPOLYBOTHRUS*)
TRIDENTINUS (FANZAGO, 1874) (CHILOPODA: LITHOBIIDAE) DIN COLECȚIILE
 “Z. MATIC” ȘI “ȘT. NEGREA” (ROMÂNIA)

REZUMAT

Acest articol este al doilea dintr-o serie dedicată evaluării critice a specimenelor de Chilopode din colecțiile “Z. Matic” și “Șt. Negrea” – singurele existente în România (*vide* “Literature cited”). Articolul conține istoricul studiului speciei *Eupolybothrus tridentinus* (Fanzago, 1874), sinonimiile, materialul examinat, redescoperirea speciei pe baza specimenelor găsite în cele două colecții. Este propusă și o actualizare a nomenclaturii: *Eupolybothrus tridentinus* (Fanzago) = *Polybothrus leptopus sensu* Matic, 1958; *Eupolybothrus tridentinus* (Fanzago) = *Eupolybothrus leptopus* f. *brolemanni sensu* Negrea, 1964. Articolul se încheie cu câteva remarci taxonomice și ecologice despre specia *Eupolybothrus tridentinus* (Fanzago).

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CHECKLIST OF SPRINGTAILS (COLLEMBOLA) FROM THE REPUBLIC OF MOLDOVA

GALINA BUȘMACHIU

Abstract. The checklist of Collembola from the Republic of Moldova including 223 species is presented. The list is based on literature sources and personal collecting.

Résumé. Ce travail présente la liste des 223 espèces de collemboles de la République de Moldova. Cette liste fut réalisée en utilisant des références littéraires et des collections personnelles.

Key words: Collembola, checklist, Republic of Moldova.

INTRODUCTION

The records on Collembola from the Republic of Moldova started about 50 years ago with the first two species included by Martynova in “The key to insects of the European part of the USSR. Collembola” (1964). Some more information on species diversity of Collembola from the soil of Moldavian vineyards was included in Stegărescu’s work (1967).

During the last twenty years, this group has been studied more systematically, with more than 200 species recorded (Bușmachi 2001, 2004, 2006 a, b, 2008). Since 2002, eleven species new to science were described from the Republic of Moldova by da Gama & Bușmachi (2002, 2004); Bușmachi & Deharveng (2008) and Bușmachi & Weiner (2008).

Until now, the faunistic data on Collembola from the Republic of Moldova have not been summarised in the form of a checklist. The present paper includes the complete list of Collembola from the Republic of Moldova using the modern nomenclature.

Totally, 223 species are listed. Some problematic and dubious species, such as *Pseudanurida clysmæ* Jackson, 1927, *Onychiurus fimetarius* (Linnaeus, 1758) and *Orchesella divergens* Handschin, 1929 recorded by Stegărescu (1967) and *Pseudosinella wahlgrei* Börner, 1907, are not included in the list. According to Mari Mutt (1978), the species *Heteromurus tetrophthalmus* Börner, 1903 is a synonym of *H. nitidus* Templeton, 1835, therefore it was excluded from list, too.

The checklist is based on the published information thus being open to be completed by further new species records for Moldova. Used nomenclature follows Zimdars & Dunger (1994), Pomorski (1998), Bretfeld (1999), Fjellberg (1998, 2007), Potapov (2001), Thibaud et al., (2004) and some recent taxonomic studies: Bernard (2008), Kaprus & Weiner (2009), Vargovitsh (2009), Rusek (2010).

CHECKLIST OF SPRINGTAILS FROM THE REPUBLIC OF MOLDOVA

Family Poduridae
Podura Linnaeus, 1758

Podura aquatica Linnaeus, 1758

Family Hypogastruridae

Choreutinula Paclt, 1944*Choreutinula inermis* (Tullberg, 1871)*Schoettella* Schäffer, 1896*Schoettella unungiculata* (Tullberg, 1869)*Hypogastrura* Bourlet, 1839*Hypogastrura assimilis* (Krausbauer, 1898)*Hypogastrura crassaegranulata* (Stach, 1949)*Hypogastrura manubrialis* (Tullberg, 1869)*Hypogastrura purpurescens* (Lubbock, 1867)*Hypogastrura socialis* (Uzel, 1891)*Hypogastrura vernalis* (Carl, 1901)*Hypogastrura viatica* (Tullberg, 1872)*Ceratophysella* Börner, 1932*Ceratophysella armata* (Nicolet, 1841)*Ceratophysella bengtssoni* (Ågren, 1904)*Ceratophysella denticulata* (Bagnall, 1941)*Ceratophysella engadinensis* (Gisin, 1949)*Ceratophysella granulata* Stach, 1949*Ceratophysella succinea* (Gisin, 1949)*Xenylla* Tullberg, 1869*Xenylla andrzeji* Buşmachi & Weiner, 2008*Xenylla boernerii* Axelson, 1905*Xenylla brevicauda* Tullberg, 1869*Xenylla brevisimilis brevisimilis* Stach, 1949*Xenylla corticalis* Börner, 1901*Xenylla maritima* Tullberg, 1869*Xenylla uniseta* Gama, 1963*Willemia* Börner, 1901*Willemia intermedia* Mills, 1934*Willemia scandinavica* Stach, 1949*Orogastrura* Deharvend & Gers, 1979*Orogastrura parva* (Gisin, 1949)

Family Odontellidae

Superodontella Stach, 1949*Superodontella empodialis* (Stach, 1934)*Superodontella lamellifera* (Axelson, 1903)*Superodontella montemaceli* Arbea & Weiner, 1992

Axenyllodes Stach, 1949*Axenyllodes bayeri* (Kseneman, 1935)*Stachia* Folsom, 1932*Stachia populosa* (Selga, 1963)

Family Brachystomellidae

Brachystomella Ågren, 1903*Brachystomella curvula* Gisin, 1948*Brachystomella parvula* (Schäffer, 1896)

Family Neanuridae

Friesea Dalla Torre, 1895*Friesea afurcata* (Denis, 1926) sensu Denis, 1927*Friesea mirabilis* (Tullberg, 1871)*Friesea octooculata* Stach, 1949*Friesea truncata* Cassagnau, 1958*Pseudachorutella* Stach, 1949*Pseudachorutella asigillata* (Börner, 1901)*Pseudachorutes* Tullberg, 1871*Pseudachorutes boernerii* Schött, 1902*Pseudachorutes dubius* Krausbauer, 1898*Pseudachorutes janstachi* Kaprus & Weiner, 2009*Pseudachorutes parvulus* Börner, 1901*Pseudachorutes pratensis* Rusek, 1973*Pseudachorutes subcrassus* Tullberg, 1871*Micranurida* Börner, 1901*Micranurida anophthalmica* Stach, 1949*Micranurida pygmaea* Börner, 1901*Anurida* Laboulbène, 1865*Anurida ellipsoides* Stach, 1920*Anurida tullbergi* Schött, 1891*Morulina* Börner, 1906*Morulina verrucosa* (Börner, 1903)*Neanura* Mac Gillivray, 1893*Neanura minuta* Gisin, 1963*Neanura moldavica* Buşmachiu & Deharveng, 2008*Neanura muscorum* (Templeton, 1835)

Deutonura Cassagnau, 1979

- Deutonura albelli* (Stach, 1920)
Deutonura conjuncta (Stach, 1926)
Deutonura stachi (Gisin, 1952)

Endonura Cassagnau, 1979

- Endonura gracilirostris* Smolis, Skarzynski, Pomorski & Kaprus, 2007

Thaumanura Börner, 1932

- Thaumanura carolii* (Stach, 1920)

Lathriopyga Caroli, 1910

- Lathriopyga nistru* Buşmachi, Deharveng & Weiner, 2010

Family Onychiuridae

Tetrodontophora Reuter, 1882

- Tetrodontophora bielensis* (Waga, 1842)

Kalaphorura Absolon, 1901

- Kalaphorura paradoxa* (Schäffer, 1900)

Hymenaphorura Bagnall, 1948

- Hymenaphorura polonica* Pomorski, 1990

Micraphorura Bagnall, 1949

- Micraphorura absoloni* (Börner, 1901)
Micraphorura uralica (Khanislamova, 1986)

Dimorphaphorura Bagnall, 1949

- Dimorphaphorura irinae* (Thibaud & Taraschuk, 1997)

Protaphorura Absolon, 1901

- Protaphorura armata* (Tullberg, 1869)
Protaphorura campata (Gisin, 1952)
Protaphorura cancellata (Gisin, 1956)
Protaphorura fimata (Gisin, 1952)
Protaphorura gisini (Haybach, 1960)
Protaphorura pannonica (Haybach, 1960)
Protaphorura sakatoi (Yosii, 1966)
Protaphorura subarmata (Gisin, 1957)

Thalassaphorura Bagnall, 1949

- Thalassaphorura alborufescens* (Volger, 1895)
Thalassaphorura encarpata (Denis, 1931)
Thalassaphorura tovtrensis (Kaprus & Weiner, 1994)

Agraporura Pomorski, 1998

Agraporura naglitschi (Gisin, 1960)

Deuteraporura Absolon, 1901

Deuteraporura silvaria (Gisin, 1952)

Orthonychiurus Stach, 1954

Orthonychiurus rectopapillatus (Stach, 1933)

Orthonychiurus stachianus (Bagnall, 1939)

Onychiuroides Bagnall, 1948

Onychiuroides granulosus (Stach, 1930)

Jevania Rusek, 1978

Jevania weineriae Rusek, 1978

Doutnacia Rusek, 1974

Doutnacia xerophila Rusek, 1974

Mesaporura Börner, 1901

Mesaporura critica Ellis, 1976

Mesaporura hygrophila (Rusek, 1971)

Mesaporura hylophila Rusek, 1982

Mesaporura italica (Rusek, 1971)

Mesaporura jarmilae Rusek, 1982

Mesaporura krausbaueri Börner, 1901

Mesaporura macrochaeta Rusek, 1976

Mesaporura sylvatica (Rusek, 1971)

Mesaporura yosii (Rusek, 1967)

Metaporura Stach, 1954

Metaporura affinis (Börner, 1902)

Neotullbergia Bagnall, 1935

Neotullbergia crassiscuspis (Gisin, 1944)

Stenaporura Absolon, 1900

Stenaporura denisi (Bagnall, 1935)

Stenaporura quadrispina (Börner, 1901)

Karlstejnia Rusek, 1974

Karlstejnia rusekiana Weiner, 1983

Family Isotomidae

Tetracanthella Schött, 1891*Tetracanthella pilosa* Schött, 1891*Tetracanthella wahlgreni* Axelson, 1907*Anurophorus* Nicolet, 1842*Anurophorus cuspidatus* Stach, 1920*Pseudanurophorus* Stach, 1922*Pseudanurophorus octoculatus* Martynova, 1971*Folsomides* Stach, 1922*Folsomides angularis* (Axelson, 1905)*Folsomides marchicus* (Frenzel, 1941)*Folsomides parvulus* Stach, 1922*Subisotoma* Stach, 1947*Subisotoma pusilla* (Schäffer, 1900)*Isotomodes* Linnaniemi, 1907*Isotomodes productus* (Axelson, 1906)*Isotomodes sexsetosus sexsetosus* Gama, 1963*Folsomia* Willem, 1902*Folsomia candida* (Willem, 1902)*Folsomia manolachei* Bagnall, 1939*Folsomia penicula* Bagnall, 1939*Folsomia quadrioculata* (Tullberg, 1871)*Proisotoma* Börner, 1901*Proisotoma minima* (Absolon, 1901)*Proisotoma minuta* (Tullberg, 1871)*Ballistura* Börner, 1906*Ballistura schoetti* (Dalla Torre, 1895)*Cryptopygus* Willem, 1901*Cryptopygus bipunctatus* (Axelson, 1903)*Cryptopygus thermophilus* (Axelson, 1900)*Isotomiella* Bagnal, 1939*Isotomiella minor* (Schäffer, 1896)

Vertagopus Börner, 1906*Vertagopus arboreus* (Linnaeus, 1758)*Vertagopus cinereus* (Nicolet, 1841)*Parisotoma* Bagnal, 1940*Parisotoma notabilis* (Schäffer, 1896)*Desoria* Nicolet, 1841*Desoria fennica* (Reuter, 1895)*Desoria germanica* (Hüther & Winter, 1961)*Desoria nivea* (Schäffer, 1896)*Desoria olivacea* (Tullberg, 1871)*Desoria propinqua* (Axelson, 1902)*Desoria tigrina* Nicolet, 1842*Desoria trispinata* (Mac Gillivray, 1896)*Desoria violacea* (Tullberg, 1876)*Isotoma* Bourlet, 1839*Isotoma anglicana* Lubbock, 1862*Isotoma riparia* (Nicolet, 1842)*Isotoma viridis* Bourlet, 1839*Isotomurus* Börner, 1903*Isotomurus palustris* (Müller, 1776)

Family Tomoceridae

Tomocerus Nicolet, 1842*Tomocerus minor* (Lubbock, 1862)*Tomocerus vulgaris* (Tullberg, 1871)*Pogonognathellus* Paclt, 1944*Pogonognathellus flavescens* (Tullberg, 1871)*Pogonognathellus longicornis* (Müller, 1776)*Tomocerina* Yosii, 1955*Tomocerina minuta* (Tullberg, 1876)

Family Entomobryidae

Orchesella Templeton, 1835*Orchesella albofasciata* Stach, 1960*Orchesella cincta* (Linnaeus, 1758)*Orchesella disjuncta* Stach, 1960*Orchesella flavescens* (Bourlet, 1839)*Orchesella frontimaculata* Gisin, 1946*Orchesella maculosa* Ionesco, 1915

Orchesella multifasciata Stscherbakow, 1898
Orchesella orientalis Stach, 1960
Orchesella pontica (Ionesco, 1915)
Orchesella pseudobifasciata Stach, 1960
Orchesella spectabilis Tullberg, 1871
Orchesella xerothermica Stach, 1960

Heteromurus Wankel, 1860

Heteromurus major (Moniez, 1889)
Heteromurus nitidus (Templeton, 1835)

Entomobrya Rondany, 1861

Entomobrya arborea (Tullberg, 1871)
Entomobrya atrocincta Schött, 1896
Entomobrya corticalis (Nicolet, 1842)
Entomobrya handschini Stach, 1922
Entomobrya lanuginosa (Nicolet, 1842)
Entomobrya marginata (Tullberg, 1871)
Entomobrya multifasciata (Tullberg, 1871)
Entomobrya muscorum (Nicolet, 1842)
Entomobrya nivalis (Linnaeus, 1758)
Entomobrya pazaristei Denis, 1933 (sensu Denis, 1936)
Entomobrya puncteola Uzel, 1891
Entomobrya quinquelineata Börner, 1901
Entomobrya spectabilis Reuter, 1890
Entomobrya violaceolineata Stach, 1963

Entomobryoides Maynard, 1951

Entomobryoides myrmecophilus (Reuter, 1886)

Willowsia Shoebotham, 1917

Willowsia buski (Lubbock, 1869)
Willowsia nigromaculata (Lubbock, 1873)

Seira Lubbock, 1869

Seira domestica (Nicolet, 1841)
Seira ferrarii Parona, 1888

Lepidocyrtus Bourlet, 1839

Lepidocyrtus curvicollis Bourlet, 1839
Lepidocyrtus cyaneus Tullberg, 1871
Lepidocyrtus lanuginosus (Gmelin, 1788)
Lepidocyrtus lignorum (Fabricius, 1775)
Lepidocyrtus paradoxus Uzel, 1890
Lepidocyrtus violaceus (Geoffroy, 1762) Lubbock, 1873
Lepidocyrtus weidneri Hüther, 1971

Pseudosinella Schäffer, 1897

- Pseudosinella alba* (Packard, 1873)
Pseudosinella albida (Stach, 1930)
Pseudosinella codri Gama & Buşmachi, 2002
Pseudosinella imparipunctata Gisin, 1953
Pseudosinella ioni Gama & Buşmachi, 2002
Pseudosinella gruiae Gama & Buşmachi, 2002
Pseudosinella octopunctata Börner, 1901
Pseudosinella horaki Rusek, 1985
Pseudosinella larisae Gama & Buşmachi, 2002
Pseudosinella moldavica Gama & Buşmachi, 2002
Pseudosinella noseki Rusek, 1985
Pseudosinella pygmaea Gama & Buşmachi, 2004
Pseudosinella sexoculata Schött, 1902
Pseudosinella simpatica Gama & Buşmachi, 2002
Pseudosinella variabilis Gama & Buşmachi, 2004

Family Cyphoderidae
Cyphoderus Nicolet, 1842

- Cyphoderus albinus* Nicolet, 1842
Cyphoderus bidenticulatus (Parona, 1888)
Cyphoderus gisini Gruia, 1967

Family Neelidae
Megalothorax Willem, 1900

- Megalothorax minimus* Willem, 1900

Neelus Folsom, 1896

- Neelus murinus* Folsom, 1896

Neelides Caroli, 1912

- Neelides minutus* (Folsom, 1901)

Family Sminthuridae
Sminthurides Börner, 1900

- Sminthurides aquaticus* (Bourlet, 1842)

Stenacidia Börner, 1906

- Stenacidia violacea* (Reuter, 1881)

Sphaeridia Linnaniemi, 1912

- Sphaeridia pumilis* (Krausbauer, 1898)

Family Arrhopalitidae
Arrhopalites Börner, 1906

- Arrhopalites caecus* (Tullberg, 1871)

Pygmarrhopalites Vargovitsh, 2009*Pygmarrhopalites pygmaeus* (Wankel, 1860)*Pygmarrhopalites secundarius* Gisin, 1958

Family Katiannidae

Sminthurinus Börner, 1901*Sminthurinus aureus* (Lubbock, 1862)*Sminthurinus bimaculatus* Axelson, 1902*Sminthurinus elegans* (Fitch, 1863)*Sminthurinus niger* (Lubbock, 1868)*Sminthurinus signatus* (Krausbauer, 1902)*Gisinianus* Betsch, 1977*Gisinianus flammeolus* (Gisin, 1957)

Family Dicyrtomidae

Dicyrtomina Börner, 1903*Dicyrtomina minuta* (Fabricius, 1783)*Dicyrtomina ornata* (Nicolet, 1842)*Dicyrtoma* Bourlet, 1842*Dicyrtoma fusca* (Lubbock, 1873)*Ptenothrix* Börner, 1906*Ptenothrix atra* (Linnaeus, 1758)*Ptenothrix leucostrigata* Stach, 1957

Family Sminthuridae

Caprainea Dallai, 1970*Caprainea marginata* (Schött, 1893)*Lipothrix* Börner, 1906*Lipothrix lubbocki* (Tullberg, 1872)*Allacma* Börner, 1906*Allacma fusca* (Linnaeus, 1758)*Sminthurus* Latreille, 1804*Sminthurus viridis* (Linnaeus, 1758)*Sminthurus wahlgreni* Stach, 1920*Spatulosminthurus* Betsch & Betsch-Pinot, 1984*Spatulosminthurus flaviceps* (Tullberg, 1871)

Family Bourletiellidae
Deuterosminthurus Börner, 1901

Deuterosminthurus bicinctus (Koch, 1840)
Deuterosminthurus pallipes (Bourlet, 1843)

Bourletiella Banks, 1899

Bourletiella viridescens Stach, 1920

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LISTA SPECIILOR DE COLEMBOLE (COLLEMBOLA)
 DIN REPUBLICA MOLDOVA

REZUMAT

Lucrarea prezintă prima listă a celor 223 specii de colembole din Republica Moldova. Lista este întocmită pe baza datelor din literatură și a colectărilor proprii efectuate pe parcursul a două decenii.

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A NEW SPECIES OF *ISOPHYA* (ORTHOPTERA: PHANEROPTERIDAE) FROM THE ROMANIAN CARPATHIAN MOUNTAINS

IONUȚ ȘTEFAN IORGU, ELENA IULIA IORGU

Abstract. A new morphologically cryptic species from the genus *Isophya* Brunner von Wattenwyl is described from Ciucaș Mountains in Romania: *Isophya ciucasi* n. sp. Diagnosis, images and a bioacoustic analysis are presented for the new species and compared with *Isophya camptoxypha* (Fieber), the species with a very similar morphology.

Résumé. Une nouvelle espèce cryptique d'*Isophya* Brunner von Wattenwyl est décrite des monts Ciucaș en Roumanie: *Isophya ciucasi* n. sp. On présente la diagnose, des images et le comportement acoustique pour la nouvelle espèce, qui est comparée à *Isophya camptoxypha* (Fieber), une espèce très proche du point de vue morphologique.

Key words: *Isophya ciucasi* n. sp., morphology, bioacoustics.

INTRODUCTION

Isophya Brunner von Wattenwyl, 1878 is one of the richest in species Orthoptera genera, with 91 currently recognized species (Eades & Otte, 2010). The distribution area of this genus expands from the Pyrenees Mountains in the West, Southern Germany and Poland in the North, the Caucasus Mountains in the East, the Balkan region in the South - West, following the Mediterranean shore to Israel and Asia Minor to Iran in the South - East (Sevgili et al., 2006; Warchalowska - Sliwa et al., 2008). A few species are reported from South America (Eades & Otte, 2010). The generic radiation center for this genus is considered Anatolia (La Greca, 1999) due to the fact that more than one third of the *Isophya* species are reported from this area (Sevgili et al., 2006). Several distinct *Isophya* species - groups were recognized and they include species with relatively uniform morphology (Heller et al., 2004; Sevgili et al., 2006; Warchalowska - Sliwa et al., 2008).

The *Isophya* species are phytophagous, with low dispersal ability (Bauer & Kenyeres, 2006). The wings are reduced in both sexes and only the proximal part of the tegmina, required for stridulation, is developed.

Genus *Isophya* is one of the most problematic groups of European Orthoptera from the taxonomical point of view (Sevgili et al., 2006). The identification of *Isophya* species is very difficult because of their high morphological similarity and the lack of male sclerotized genitalia (Heller et al., 2004; Sevgili et al., 2006). The identification criteria are present mainly on males, and consists of subtle differences in the shape and size of the pronotum and its correlation with the size and shape of tegminae, the length and the number of pegs on the stridulatory file, the size of the ovipositor etc. (Heller et al., 2004; Sevgili et al., 2006; Warchalowska - Sliwa et al., 2008). All known *Isophya* are stridulating species, male calling song being the most important tool for the identification and separation of new species. Also, in recent studies, the duet male - female has been recorded (Orci & Heller, 2004; Orci, 2007).

There are fifteen *Isophya* species in Romania, two of them being endemic: *Isophya harzi* Kis, 1960 and *Isophya dobrogensis* Kis, 1994 (Iorgu et al., 2008). In 1960, Kis shows that *Isophya camptoxypha* from Romania has a high morphological variability and Heller et al. (2004) hypothesized that there could be several new unidentified species within this genus in the Carpathian Mountains.

MATERIAL AND METHODS

In the summer of 2008, during authors' field work in Ciucaș Mountains, several Orthoptera species have been collected alive for bioacoustic studies. A surprising result was revealed by the oscillographic analysis of the song in 2 males of *Isophya* captured on some nettles' leaves (*Urtica*) from a valley near the old chalet Ciucaș. These are described here as *Isophya ciucasi* n. sp.

Males and females have been recorded indoors using the digital recorders SONY ICD SX56 and EDIROL R-09HR. The second recorder has a sound frequency response between 20 - 40000 Hz. The analysis of the sound was made with Audacity 1.2 and Batsound 4 software. All the studied adult specimens were caught in the wild, transported in plastic containers and recorded in laboratory at a temperature of 24 - 27°C.

Song terminology follows Heller et al. (2004): *calling song* - song produced by an isolated male; *syllable*: the sound produced by one complete up (opening) and down (closing) stroke of the forewings; *impulse*: the highly damped sound impulse arising as the impact of one tooth of the stridulatory file; *after-click*: click produced with considerable delay after the main impulse group.

Photos were taken with a Canon EOS digital camera; a 100 mm 1:1 macro lens was used for habitus photos and a 65 mm 5:1 macro lens was mounted to camera in order to take photos of the morphological details. Subject lit was provided by a ring macro flash attached in front of the lenses. Insects' wing movements during the song have been video recorded with the same camera.

The type material of *Isophya ciucasi* n. sp. is deposited at "Grigore Antipa" National Museum of Natural History, Bucharest.

RESULTS AND DISCUSSION

Order Orthoptera
Suborder Ensifera
Family Phaneropteridae
Subfamily Phaneropterinae

Isophya ciucasi nov. spec.

(Figs 1 B, C; 2; 3 A, C, E; 4 A, C; 5 A, C, E)

Material

Holotype: male, Romania, Ciucaș Mountains, 45°30'35"N, 25°56'43"E, 1585 m a.s.l., 27.06.2008, coll. "Grigore Antipa" National Museum of Natural History, Bucharest, No. 182511.

Paratypes: 1 ♂, 1 ♀, same data as holotype, ♂ No. 182512, ♀ No. 182516; 3 ♂♂, 3 ♀♀, Romania, Ciucaș Mountains, 45°30'39"N, 25°56'42"E, 1600 m a.s.l.,

17.07.2009, ♂♂ No. 182513, 182514, 182515, ♀♀ No. 182517, 182518, 182519. In the collection of "Grigore Antipa" National Museum of Natural History, Bucharest.

Audio recordings: 2 ♂♂, 27.06.2008 (wav files, 24 bits/96 kHz, temperature 24°C); 3 ♂♂, 3 ♀♀, 17.07.2009 (wav files, 24 bits/96 kHz, temperature 27°C).

Description of the male

Fastigium of vertex with lateral margins convergent towards tip, about 2 times narrower than scapus, with a dorsal groove. Pronotal disc 3.58 - 4.57 mm long, slightly constricted at midlength in the transverse sulcus area, with posterior area raised; lateral carinae slightly distinct; paranotum with ventral edge almost straight and posterior edge slightly rounded (Fig. 2 F). Wings with reticulate venation, reach the hind edge of first abdominal tergite; Cu₂ vein about 2/3 times as long as posterior margin of pronotum and angle between cubital veins of about 90°; mirror large and quadrangular (Fig. 2 A); stridulatory file arcuate and counts 69 - 83 teeth on 1.69 - 1.88 mm length; distal teeth larger and rarer than proximal ones (Fig. 2 E). Subgenital plate elongated, with a triangular apical incision (Fig. 2 C). Cercus long, tapering towards tip, slightly curved in apical 1/4 (Fig. 2 I), with many small hairs; terminal denticle located in middle of cercus apex. Hind femur about 4 times pronotum length.

Coloration: body colour greenish, densely punctuated with dark green. Antennae brown or reddish-brown, with light brown or green scapus. Compound eyes usually bicolor, with upper part brownish-red and lower one green. A yellow or white narrow band starts from behind the eye and ends at the posterolateral angle of wing; in the distal third of pronotum above the white band there is a brown band which merges with wings colour. Wings brown, with apical area green and greenish - white costal margin. In some males and females, there are 2 parallel dorsal bands on pronotum and abdomen, of orange, red or yellow colour. Cerci brown or reddish - brown, green at base. In many individuals, tibiae and tarsi brownish or reddish. Ventral part yellowish (Fig. 1 B).

Description of the female

Fastigium as in male. Pronotum 3.72 - 4.71 mm long, with dorsal area slightly enlarged in posterior part; lateral carinae faded. Wings with dense reticulate venation, about 3 times shorter than pronotum (Fig. 2 B, G). Stridulatory apparatus formed by Cu₂ vein on the left tegmen ventral side and denticles located on cubital veins from the right tegmen dorsal side (Fig. 2 J). Subgenital plate narrow, about 2 times as wide as long (Fig. 2 D). Ovipositor short, upcurved, 2.2 - 2.3 times longer than pronotum. The upper margin with 8 - 9 denticles, lower margin with 7 - 8 denticles (Fig. 2 H). Cercus hairy, 1.33 - 1.57 mm in length, conical, 1.2 times longer than epiproct (Fig. 2 K).

Coloration: females are also green, usually paler than in males, with fine dark punctuation. As in males, antennae are reddish - brown and there is a white band between the bicoloured compound eyes and the posterolateral angle of wings. Wings green, with the basal area brownish and the costal margin white. Tip of cercus light brown; ovipositor green, with terminal denticles dark brown (Fig. 1 C).

Measurements

Males (n = 5): body length 22.21 - 27.39 mm (mean ± SD: 24.98 ± 2.09); head width 3.3 - 3.75 mm (mean ± SD: 3.51 ± 0.16); pronotum length 3.58 - 4.07 mm (mean ± SD: 3.77 ± 0.2); pronotum maximum width 3.65 - 4.28 mm (mean ± SD:

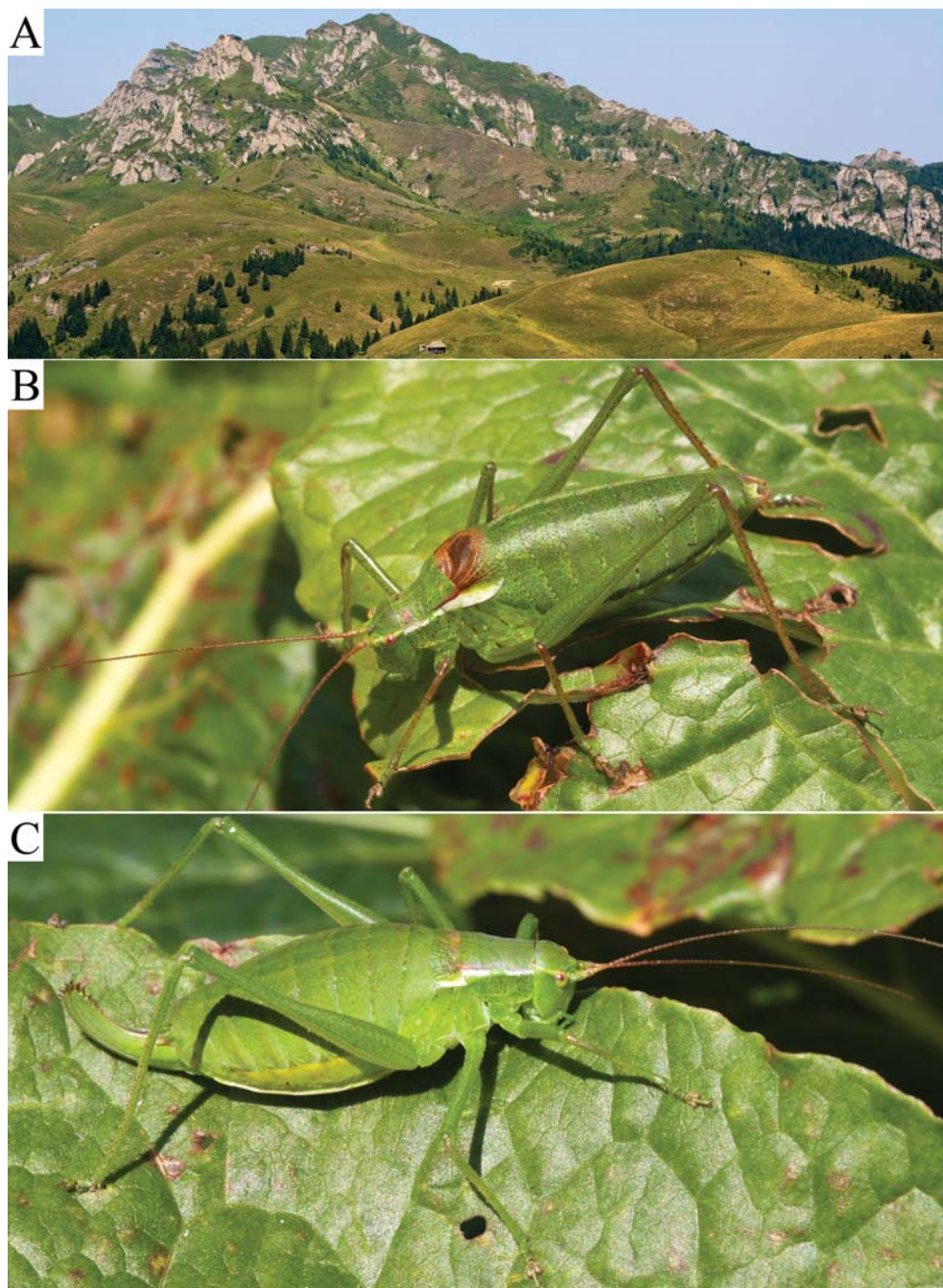


Fig. 1 - A, Ciucaș Mountains (Eastern Carpathians); B, *Isophya ciucasi* n. sp. ♂; C, *Isophya ciucasi* n. sp. ♀ (17.07.2009) (Photos: I. Șt. Iorgu).

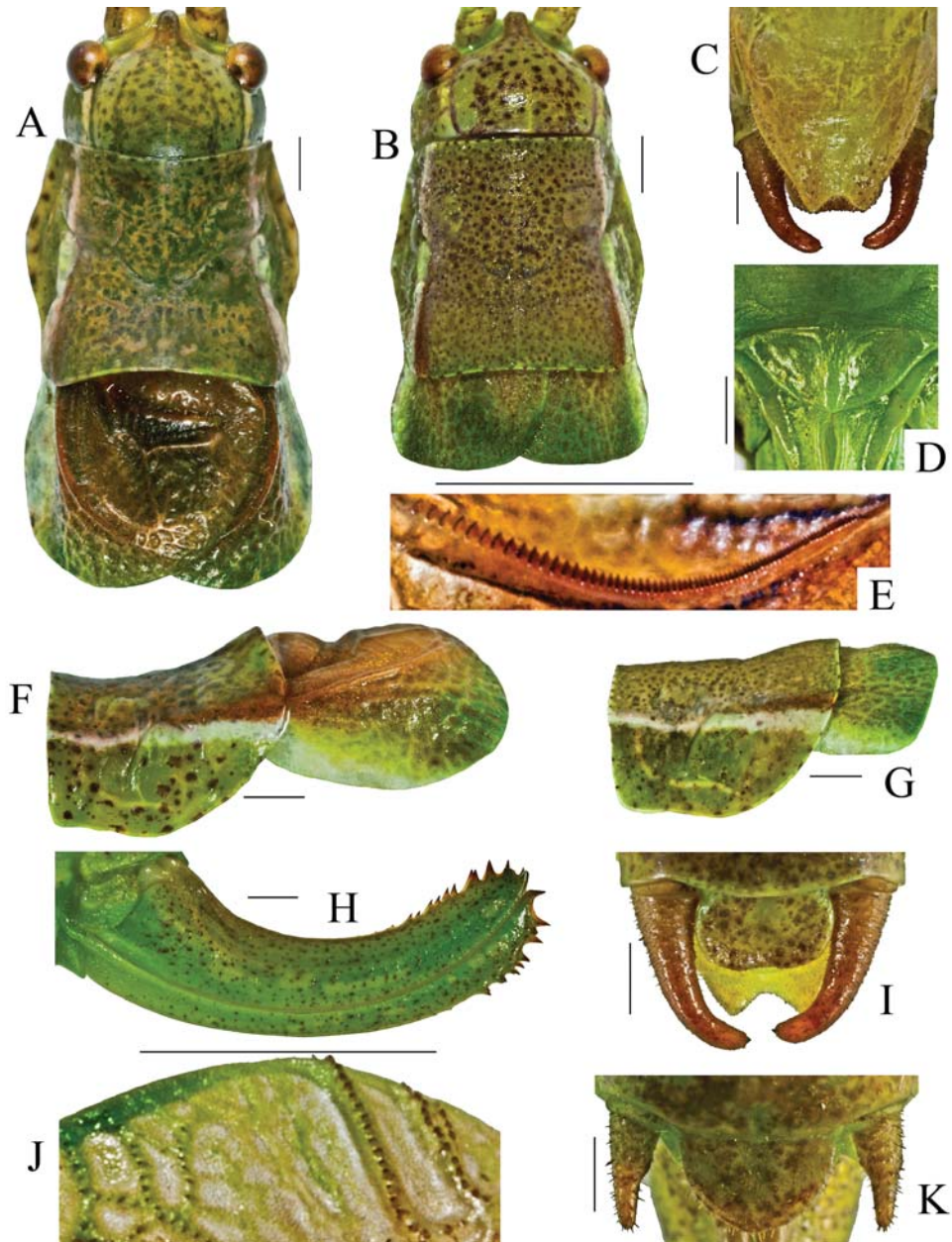


Fig. 2 - *Isophya ciucasi* n. sp.: A, male head, pronotum and tegminae (dorsal view); B, female head, pronotum and tegminae (dorsal view); C, male subgenital plate; D, female subgenital plate; E, male stridulatory file; F, male paranotum and wing (lateral view); G, female paranotum and wing (lateral view); H, ovipositor; I, male cerci; J, female stridulatory pegs; K, female cerci. Scale: 1 mm. (Photos: I. Șt. Iorgu).

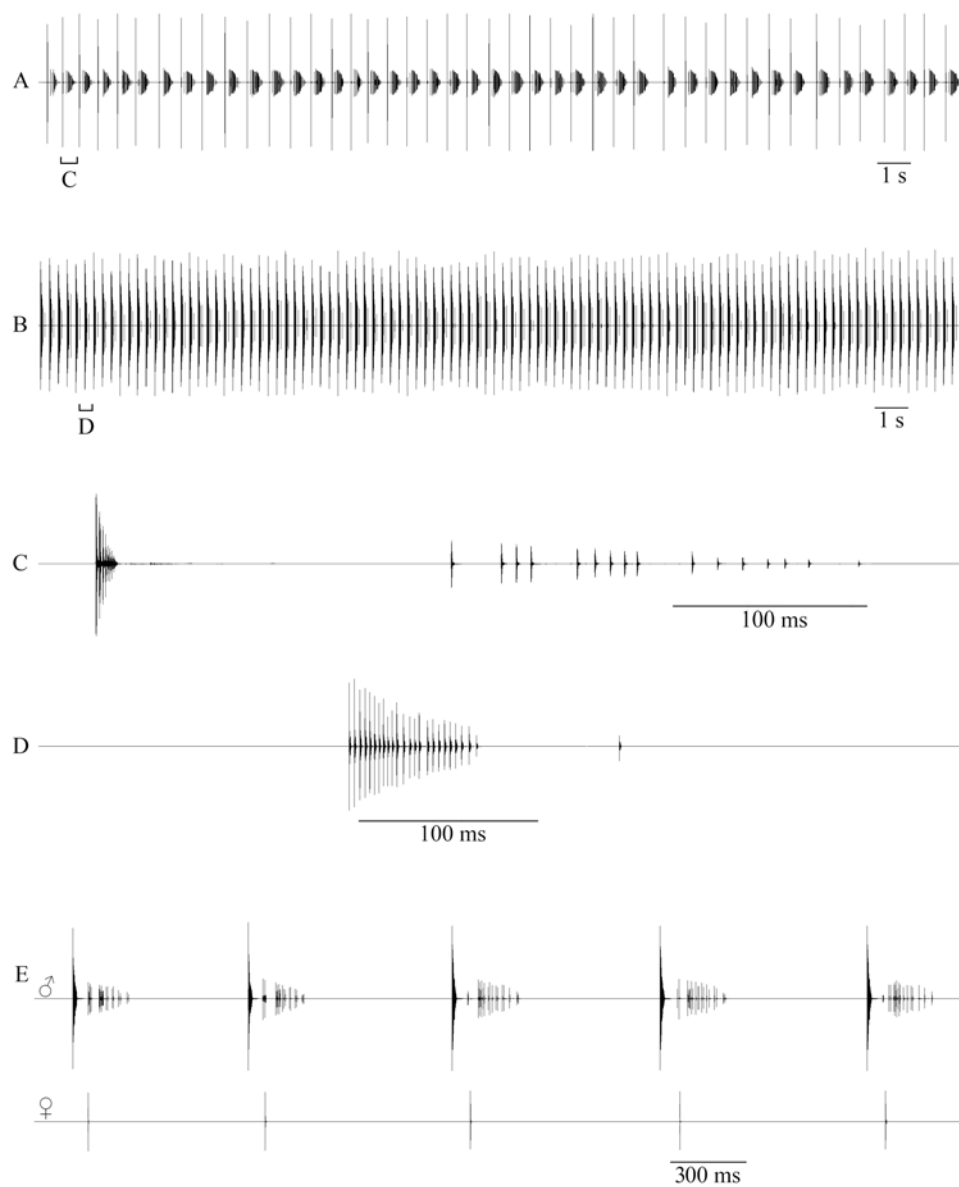


Fig. 3 - Oscillographic analysis of the song: A, *Isophya ciucasi* n. sp.; B, *Isophya camptoxypha* (Muntele Roșu, 18.07.2009); C, detailed syllable in *Isophya ciucasi* n. sp.; D, detailed syllable in *Isophya camptoxypha*; E, *Isophya ciucasi* n. sp. female response as mating acceptance with male (all recordings at 27°C).

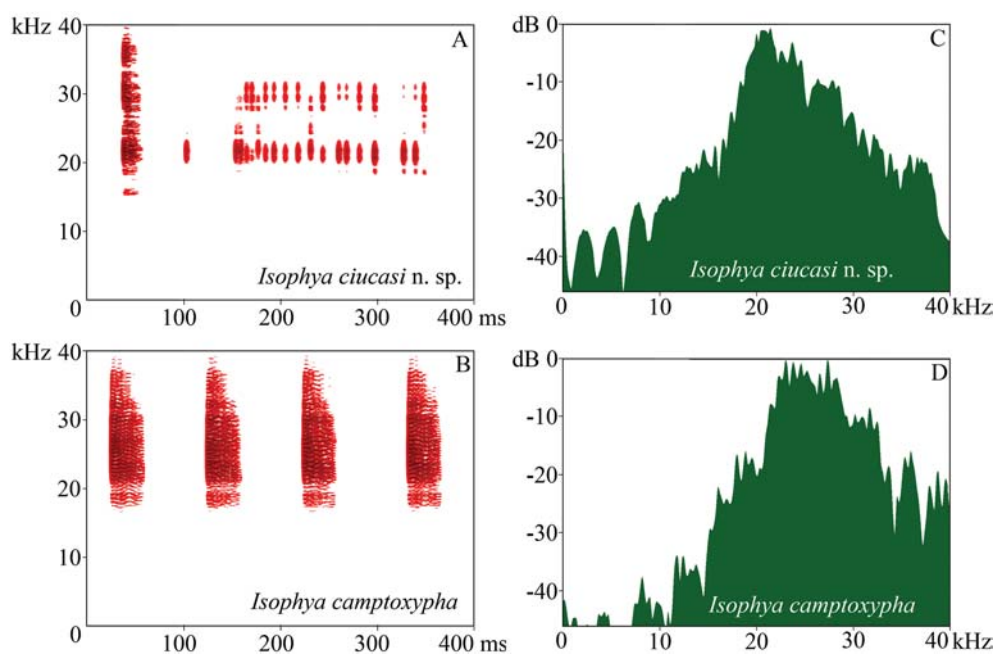


Fig. 4 - Spectrographic analysis of the song frequencies between 0 - 40 kHz: A, B, spectrogram (Batsound); C, D, plot spectrum (Audacity) (FFT: Hanning window 512).

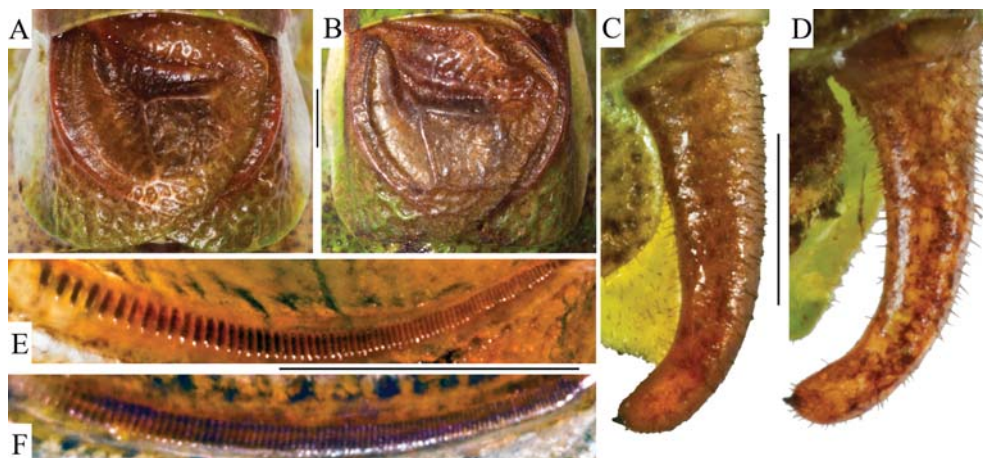


Fig. 5 - *Isophya ciucasi* n. sp. (A, C, E) and the closely related *Isophya camptoxypha* (B, D, F), males: A, B - tegmina (dorsal view); C, D - right cercus; E, F - stridulatory file. Scale: 1mm. (Photos: I. Șt. Iorgu).

3.98 \pm 0.22); wing length 4.01 - 4.58 mm (mean \pm SD: 4.2 \pm 0.23); wing maximum width 3.38 - 3.82 mm (mean \pm SD: 3.59 \pm 0.19); number of stridulatory pegs 69 - 83 (mean \pm SD: 76.2 \pm 6.06); stridulatory file length (area with stridulatory pegs) 1.69 - 1.88 mm (mean \pm SD: 1.79 \pm 0.08); cercus length 2.06 - 2.52 mm (mean \pm SD: 2.37 \pm 0.19); hind femur 14.45 - 17.01 mm (mean \pm SD: 15.64 \pm 0.94).

Females (n = 4): body length 26.77 - 31.86 mm (mean \pm SD: 28.42 \pm 2.36); head width 3.38 - 3.99 mm (mean \pm SD: 3.64 \pm 0.26); pronotum length 3.72 - 4.71 mm (mean \pm SD: 4.15 \pm 0.41); pronotum maximum width 3.68 - 4.58 mm (mean \pm SD: 4.05 \pm 0.44); wing length 1.9 - 2.3 mm (mean \pm SD: 2.11 \pm 0.17); wing maximum width 2.96 - 3.82 mm (mean \pm SD: 3.33 \pm 0.37); subgenital plate length 1.07 - 1.14 mm (mean \pm SD: 1.12 \pm 0.03); subgenital plate width (proximally) 2.32 - 2.89 mm (mean \pm SD: 2.69 \pm 0.26); cercus length 1.33 - 1.57 mm (mean \pm SD: 1.45 \pm 0.11); ovipositor 8.77 - 9.2 mm (mean \pm SD: 8.98 \pm 0.21); hind femur 13.99 - 16.4 mm (mean \pm SD: 15.12 \pm 1.01).

Bioacoustics

If undisturbed, males can sing for more than 3 minutes a song that consists of a long series of syllables (Fig. 3 A), but smaller groups of 8 - 23 syllables have also been recorded. Each syllable is formed by a compact series of 10 - 22 impulses (mean \pm SD: 18.4 \pm 4.82), lasting for 11 - 22 ms (mean \pm SD: 18.2 \pm 4.32). After about 52 - 73 ms (mean \pm SD: 63.8 \pm 9.44), the syllable is always followed by 13 - 23 after - clicks (mean \pm SD: 17.6 \pm 3.71), which last for 200 - 314 ms (mean \pm SD: 228 \pm 25.31). The time interval between the successive syllables is about 347 - 516 ms (mean \pm SD: 423.6 \pm 44.16). The signal amplitude in a syllable decreases fast and it is much higher in the first impulses than in the last ones. Also in the series of after - clicks the amplitude decreases from the first to the last impulse; the first after - clicks have the same signal amplitude as impulses from the middle part of the syllable (Fig. 3 C). Female response as mating acceptance with the singing male is a single impulse produced after the first part of male's syllable, sometimes overlapping with the after - clicks (Fig. 3 E). This impulse is emitted about 44 - 54 ms (mean \pm SD: 51 \pm 2.82) after the main part of male syllable. We have recorded duets male - female that lasted for more than 2 minutes in which females replied to all male's syllables. Nevertheless, female response is not always constant, so she doesn't reply for each male syllable.

In both males and females, sounds are produced only when the insect closes the tegminae. Spectrogram analysis shows the main frequency in a syllable between 15 - 40 kHz, with a maximum at about 22 kHz. Due to recording conditions, it is very probable that the frequency highest limit is above 40 kHz. The sound frequency is lower in the after - clicks, between 18 - 33 kHz (Fig. 4).

Etymology

The species is named after the type locality: Ciucaș Mountains, in the Southern part of the Eastern Carpathians, Romania.

Type locality, distribution, habitat

The species is known only from the subalpine plateau of the Ciucaș Mountains, Carpathian Mountains, Romania (Fig. 1 A). In the high altitude meadows of the type locality, at about 1600 m above sea level, the newly discovered *Isophya* species occurs on different plant species, usually *Urtica*, *Rumex*, *Rubus*, *Juniperus*, *Senecio*, *Vaccinium* etc. Most of the individuals are adults in mid July.

The other Orthoptera species that occur sympatrically with *Isophya ciucasi* n. sp. are: *Poecilimon affinis* (Frivaldszky, 1867), *Polysarcus denticauda* (Charpentier, 1825), *Pholidoptera transsylvanica* (Fischer, 1853), *Metrioptera brachyptera* (Linnaeus, 1761), *Miramella ebneri* Galvagni, 1953, *Euthystira brachyptera* (Ocskay, 1826), *Stenobothrus stigmaticus* (Rambur, 1838), *Omocestus viridulus* (Linnaeus, 1758), *Chorthippus parallelus* (Zetterstedt, 1821) etc.

Remarks

Isophya ciucasi n. sp. resembles very much *Isophya camptoxypha* (Fieber, 1853) but by comparing the bioacoustics of these two species with similar morphology, their identity is easily verified. The songs of the males in these two species follow the same pattern - a long series of short syllables. While in *Isophya camptoxypha* the syllable is usually followed by only one after - click (Fig. 3 B, D), in *Isophya ciucasi* n. sp. the syllable is followed by a series of 13 - 23 after - clicks (Fig. 3 A, C). Even if in both species the syllables have almost the same number of impulses, the syllable duration is shorter in *Isophya ciucasi* n. sp., 11 - 22 ms, compared with 25 - 42 ms in *Isophya camptoxypha*. The frequency spectrum is similar in both species, from about 15 to more than 40 kHz, with the highest peak between 20 - 30 kHz (Fig. 4).

Comparing some morphological details in males of these two species, only small differences could be noticed: angle between cubital veins has almost 90° in *I. ciucasi* n. sp. and about 70° in *I. camptoxypha* (Fig. 5 A, B), cercus slightly more curved in *I. camptoxypha* than in the new species (Fig. 5 C, D) and teeth are rarer in the distal part of stridulatory file in *I. ciucasi* n. sp. (Fig. 5 E, F). In order to separate these two species, the mentioned morphological characters are not very reliable due to the high intra - and interpopulation high variability. As an already known fact, the combination between morphological description, bioacoustics and DNA analysis is the only correct method to decide on the real status of the Orthopteran populations.

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O NOUĂ SPECIE DE *ISOPHYA* (ORTHOPTERA: PHANEROPTERIDAE) DIN CARPAȚII ROMÂNEȘTI

REZUMAT

O nouă specie criptică morfologic din genul *Isophya* Brunner von Wattenwyl este descrisă din Munții Ciucaș: *Isophya ciucasi* n. sp. Diagnoză, imagini și o analiză a bioacusticii sunt prezentate pentru această specie care este comparată cu *Isophya camptoxypha* (Fieber), specia cea mai apropiată morfologic de *Isophya ciucasi* n. sp. Stridulația celor două specii înrudite diferă prin tipul de silabă specific. Comparând unele elemente de morfologie la mascul, am observat că unghiul dintre nervurile cubitale, curbura cercilor și poziționarea dințișorilor în regiunea distală a carenei stridulante diferă foarte puțin la cele două specii.

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FAUNISTIC DATA ON SOME TRUE BUGS SPECIES (INSECTA: HETEROPTERA) FROM WEST TURKEY [Results of the “Taurus” - 2005 and „Focida“ - 2006 expeditions]

CECILIA ȘERBAN

Abstract. The paper presents a list of Heteroptera species (except Miroidea) collected during the scientific expeditions carried out in Western Turkey between 2005-2006 by “Grigore Antipa” National Museum of Natural History (Bucharest) and NGO – “Oceanic Club” Society of Oceanographical Exploration and Protection of the Marine Environment of Constanța. Out of 516 true bug specimens, I identified 73 species grouped in 56 genera, belonging to 4 infraorders and 12 families. *Tarisa flavescens* is new record for Turkey.

Résumé. Le travail présente une liste des espèces de Hétéroptères (sauf Miroidea) recueillies au cours des expéditions scientifiques menées dans l'Ouest de la Turquie entre 2005-2006 par le Musée National d'Histoire Naturelle «Grigore Antipa» (Bucarest) et les ONG – «Oceanic Club» Société d'exploration océanographique et la protection du milieu marin de Constanța. Parmi les 516 exemplaires de Hétéroptères nous avons identifié 73 espèces regroupées en 56 genres, appartenant à 4 infra-ordres et 12 familles. *Tarisa flavescens* est une nouvelle espèce pour la Turquie.

Key words: Insecta, Heteroptera, Western Turkey, distribution, “Taurus” and “Focida” expeditions.

INTRODUCTION

The scientific project “*Romanian Contributions on the Mediterranean fauna research*” conducted by the “Grigore Antipa” National Museum of Natural History (Bucharest), in collaboration with NGO „Oceanic Club” Society of Oceanographical Exploration and Protection of the Marine Environment of Constanța resulted in a series of scientific expeditions made by specialists within partner institutions from countries of the Mediterranean basin. During these expeditions many specimens have been collected that enriched the scientific heritage of “Grigore Antipa” National Museum of Natural History of Bucharest.

True bugs (Heteroptera) presented in this paper were collected during expeditions “Focida” in 2005 and “Taurus” in 2006. Both expeditions were conducted in North-West, West and South-western parts of Turkey. Although the material received from the survey, it also included numerous specimens of the superfamily Miroidea, which are the subject of the subsequent paper.

MATERIAL AND METHOD

The material of Heteroptera was collected from 21 sites (Fig. 1) in Turkey during July-August, 2005 and 2006.

Collecting sites:

- Edirne region: Pehlivan köy;
- Kırklareli region: Kanlı Dere;
- Çanakkale region: Troy Fortress (39°57'23''N, 26°14'51''E); 33 km North of Eceabat; 2 km West of Küçükkuyu; 10 km West of Küçükkuyu;

- Izmir region: Yenifoça, the coast of Aegean Sea (38°43'51''N, 26°44'32''E); Aliğa, the coast of Aegean Sea; Efes; Bergama, Bakır Çayı River (39°07'12''N, 27°11'27''E);
- Denizli region: Koruçuk (37°50'41''N, 29°08'29''E); Pamukkale (37°50'41''N, 29°08'29''E); Buharkent (37°54'45''N, 28°43'43''E); Menderes;
- Antalya province: Karaman River; Patara (Ova Gölü); Tekirova, Kemer area;
- Burdur region: Salda Lake; Karamanlı Barajı; Kizildere River;
- Muğla region: Ortaca, Dalaman Çayı River; Köyceğiz Lake, western shore.

The species were identified using keys made by Wagner (1966), Kis (1984, 2001), Moulet (1995), Derjanschi & Pericart (2005) and Rabitsch (2005). The nomenclature, systematics and information on the general distribution of the species are presented after Aukema & Rieger (1995, 1996, 1998, 2001, 2006), with respect to later changes.

The studied material is preserved in the Heteroptera collection of "Grigore Antipa" National Museum of Natural History, Bucharest.

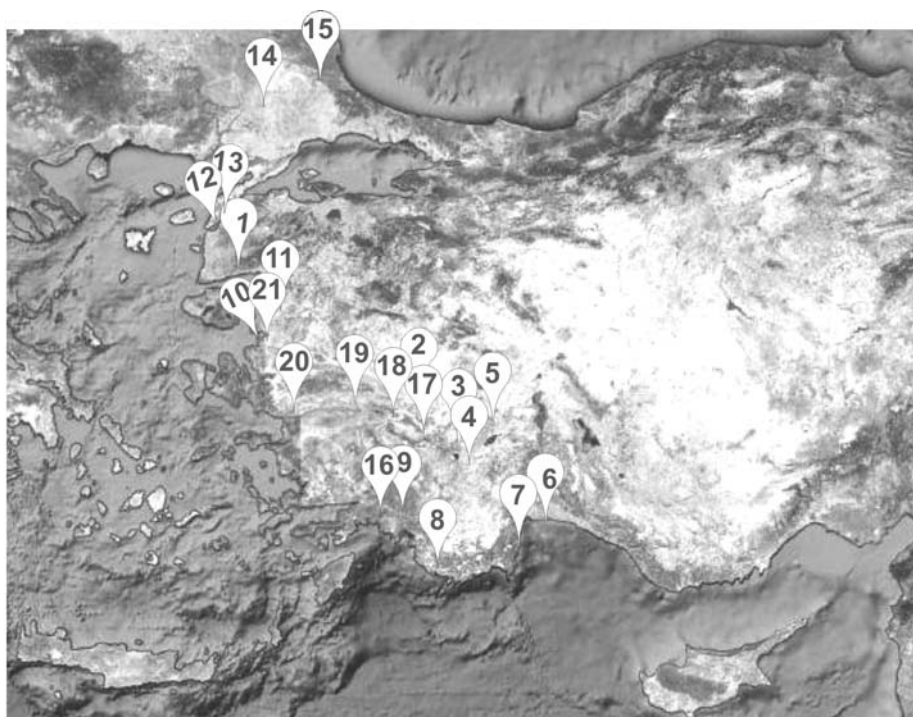


Fig. 1 - Heteroptera collecting sites from Western Turkey: 1, Küçükkuşu; 2, Pamukkale; 3, Salda Gölü; 4, Karamanlı Barajı; 5, Kizildere River; 6, Karaman River; 7, Tekirova; 8, Patara (Ova Gölü); 9, Dalaman Çayı River; 10, Yenifoça; 11, Bergama; 12, Troy; 13, Eceabat; 14, Pehlivanlık; 15, Kanlı Dere; 16, Köyceğiz Gölü; 17, Koruçuk; 18, Buharkent; 19, Menderes; 20, Efes; 21, Aliğa.

Abbreviations:

Names of the collectors: Corneliu Pârvu – C.P.; Gabriel Chișamera – G.C.; Răzvan Popescu-Mirceni – R.P.M.; Răzvan Zaharia – R.Z.; Robert Bojor – R.B.; Sorin Grigore – S.G.

spec. (s) - specimen / s; reg. - region.

RESULTS AND DISCUSSIONS

All the 516 identified specimens belong to 73 species grouped in 56 genera, 12 families, 7 superfamilies and 4 infraorders. Although the diversity of Heteroptera fauna in Turkey is relatively well studied, one new species for Turkish fauna was discovered (Stichel, 1957-1962, cf. Önder et al., 2006; Aukema & Rieger, 1995, 1996, 1998, 2001, 2006).

Infraorder Cimicomorpha Leston, Pendergrast & Southwood, 1954
Superfamily Reduvioidea Börner, 1910
Family Reduviidae Latreille, 1807

Coranus (Coranus) tuberculifer Reuter, 1881: 1 spec., Izmir Bergama reg., Bakir Çayı River, 01.08.2006, leg. C.P.

Rhynocoris (Rhynocoris) punctiventris (Herrich-Schaeffer, 1846): 13 specs: 4 ♀♀, 10 km West of Küçükkuyu, Çanakkale reg., 10.07.2005, leg. C.P., G.C.; 2 ♂♂, Patara - Ova Gölü, Antalya reg., 17.07.2005, leg. G.C.; 2 ♀♀, 1 ♂, 15 km West of Tekirova, Antalya reg., 16.07.2005, leg. C.P.; 1 spec., Salda Gölü, Burdur reg., 14.07.2005, leg. C.P.; 3 ♀♀, Yenifoça, Aydın reg., leg. C.P.

Rhynocoris (Rhynocoris) erythropus (Linnaeus, 1767): 3 specs: 1 ♀, 1 ♂, Bakir Çayı River, Izmir Bergama reg., 01.08.2006, leg. C.P.; 1 ♀, Buharkent, Denizli reg., 04.08.2006, leg. Z.R.

Infraorder Leptopodomorpha Stys & Kerzhner, 1975
Superfamily Saldoidea Amyot & Serville, 1843
Family Saldidae Amyot & Serville, 1843

Chartoscirta cincta cincta (Herrich-Schaeffer, 1841): 1 spec., Kizildere River, Burdur reg., 15.07.2006, leg. C.P.

Saldula arenicola arenicola (Scholtz, 1847): 6 specs: Menderes River, Koruçuk, Denizli reg., 13.07.2005, leg. C.P.

Saldula pallipes (Fabricius, 1794): 5 specs: 1 spec., Pehlivan köyü, Edirne reg., 28.07.2005, leg. C.P.; 1 ♂ 2 km West of Küçükkuyu, Çanakkale reg., 11.07.2005, leg. C.P.; 3 specs, Menderes, Koruçuk, Denizli reg., 13.07.2005, leg. C.P.

Infraorder Nepomorpha Popov, 1968
Superfamily Gerroidea Leach, 1815
Family Gerridae Leach, 1815

Aquarius ventralis (Fieber, 1861): 10 specs: 15 km West of Tekirova, Antalya reg., 16.07.2005, leg. C.P.

Superfamily Ochteroidea Kirkaldy, 1906
Family Ochteridae Kirkaldy, 1906

Ochterus (Ochterus) marginatus (Latreille, 1804): 4 specs: 4 ♀♀, Dalaman Çayı River, Muğla reg., Ortaca, 18.07.2005, leg. C.P.

Infraorder Pentatomomorpha Leston, Pendergrast & Southwood, 1954

Superfamily Coreoidea Leach, 1815

Family Alydidae Amyot & Serville, 1843

Alydus calcaratus (Linnaeus, 1758): 1 spec.: 1 ♂, Köyceğiz Lake, Muğla reg., 19.07.2005, leg. C.P.

Camptopus lateralis (Germar, 1817): 7 specs: 1 ♂, Koruçuk, Denizli reg., 03.08.2006, leg. C.P.; 1 ♀, Bakir Çayı River, Izmir Bergama reg., 01.08.2006, leg. C.P.; 2 ♂♂, 2 ♀♀, Pehlivan köyü, Edirne reg., 28.07.2005, leg. C.G; 1 ♂, 33 km North of Eceabat, Çanakkale reg., 28.07.2005, leg. C.P.

Family Coreidae Leach, 1815

Centrocoris spiniger (Fabricius, 1781): 4 specs: 1 ♀, 1 ♂, Kizildere River, Burdur reg., 15.07.2005, leg. C.P.; 1 ♀, 1 ♂, 10 km West of Küçük kuyu, Çanakkale reg., 10.07.2005, leg. C.P.

Centrocoris variegatus Kolenati, 1845: 6 specs: 3 ♀♀, 1 ♂, Buharkent, Denizli reg., 04.08.2006, leg. C.P.; 2 ♀♀, Bakir Çayı River, Izmir Bergama reg., 01.08.2006, leg. C.P.

Coreus marginatus (Linnaeus, 1758): 43 specs: 14 ♀♀, 20 ♂♂, Salda Gölü, Burdur reg., 14.07.2005, leg. C.P., C.G; 2 ♀♀, 1 ♂, 33 km North of Eceabat, Çanakkale reg., 28.07.2005, leg. C.P.; 1 ♂ 10 km West of Küçük kuyu, Çanakkale reg., 10.07.2005, leg. C.P.; 1 ♂, Buharkent, Denizli reg., 4.08.2006, leg. C.P.; 2 ♀♀, 2 ♂♂, Bakir Çayı River, Izmir Bergama reg., 01.08.2006, leg. C.P.

Coriomeris hirticornis (Fabricius, 1794): 9 specs: 1 ♂, Troy Fortress, Çanakkale reg., 07.08.2006, leg. C.P.; 4 ♂♂, Köyceğiz Lake, Muğla reg., 19.07.2005, leg. C.G; 2 ♂♂, 10 km West of Küçük kuyu, Çanakkale reg., 10.07.2005, leg. C.P.; 2 ♂♂, 33 km North of Eceabat, Çanakkale reg., 28.07.2005, leg. C.P.

Coriomeris vitticollis Reuter, 1900: 2 specs: 1 ♂, 10 km West of Küçük kuyu, Çanakkale reg., 10.07.2005, leg. C.P.; 1 ♂, Yenifoça, Aydın reg., 23.07.2005, leg. C.P.

Gonocerus acuteangulatus (Goeze, 1778): 1 spec.: 1 ♀, Salda Gölü, Burdur reg., 14.07.2005, leg. C.P.

Family Rhopalidae Amyot & Serville, 1843

Agraphopus lethierryi Stål, 1872: 2 specs: 1 ♀, Buharkent, Denizli reg., 04.08.2006, leg. C.P.; 1 ♂, Koruçuk, Denizli reg., 03.08.2006, leg. C.P.

Brachycarenum tigrinus (Schilling, 1829): 3 specs: 2 ♂♂, Koruçuk, Denizli reg., 03.08.2006, leg. C.P.; 1 ♀, 10 km West of Küçük kuyu, Çanakkale reg., 10.07.2005, leg. C.P.

Corizus hyoscyami (Linnaeus, 1758): 6 specs: 1 ♂, Ortaca, Dalaman Çayı River, Muğla reg., 18.07.2005, leg. G.C.; 1 ♀, 10 km West of Küçük kuyu, Çanakkale reg., 10.07.2005, leg. G.C.; 1 ♂, Köyceğiz Lake, Muğla reg., 19.07.2005; 1 ♀, 33 km North of Eceabat, Çanakkale reg., 28.07.2005, leg. C.P.; 1 ♂, Yenifoça, Aydın reg., 23.07.2006, leg. C.P.; 1 ♀, Bakir Çayı River, Izmir Bergama reg., 01.08.2006, leg. C.P.

Liorhyssus hyalinus (Fabricius, 1794): 26 specs: 2 ♀♀, 2 ♂♂, Ortaca, Dalaman Çayı River, Muğla reg., 18.07.2005, leg. C.P., C.G.; 6 ♀♀, 7 ♂♂, Kizildere River, Burdur reg., 15.07.2005, leg. C.P., G.C.; 2 ♀♀, 1 ♂, Menderes River, Koruçuk, Denizli reg., 13.07.2005, leg. C.P., G.C.; 1 ♂, Patara - Ova Gölü, Antalya reg., 17.07.2005, leg. C.P.; 1 ♀, 2 ♂♂, Buharkent, Denizli reg., 04.08.2006, leg. C.P.; 1 ♂, Bakir Çayı River, Izmir Bergama reg., 27.08.2006, leg. C.P.; 1 ♀, Burhanli, Çanakkale reg., 07.08.2006, leg. C.P.

Maccevethus errans caucasicus (Kolenati, 1845): 2 specs: 1 ♀, Buharkent, Denizli reg., 04.08.2006, leg. C.P.; 1 ♂, 10 km West of Küçükkuyu, Çanakkale reg., 10.07.2005, leg. C.P.

Rhopalus (Rhopalus) subrufus (Gmelin, 1790): 4 specs: 1 ♀, Pehlivan köyü, Edirne reg., 28.07.2005, leg. G.C.; 2 ♂♂, Köyceğiz Lake, Muğla reg., 19.07.2005, leg. G.C.; 1 spec., Kanli Dere Koprusu, Kırklareli reg., 29.07.2005, leg. G.C.

Rhopalus (Rhopalus) rufus Schilling, 1829: 1 spec.: 1 ♂, Ortaca, Dalaman Çayı River, Muğla reg., 18.07.2005, leg. C.P.

Rhopalus (Rhopalus) parumpunctatus Schilling, 1829: 1 spec.: 1 ♂, Kizildere River, Burdur reg., 15.07.2005, leg. C.P.

Stictopleurus crassicornis (Linnaeus, 1758): 1 spec. AT: 1 ♀, Köyceğiz Lake, Muğla reg., 19.07.2006, leg. G.C.

Stictopleurus punctatonevrosus (Goeze, 1778): 2 specs: 1 ♀, Yenifoça, Aydın reg., 23.07.2005, leg. C.P.; 1 ♂, Buharkent, Denizli reg., 04.08.2006, leg. C.P.

Stictopleurus pictus (Fieber, 1861): 1 spec.: 1 ♀, Köyceğiz Lake, Muğla reg., 19.07.2005, leg. C.P.

Superfamily Lygeoidea Schilling, 1829

Family Berytidae Fieber, 1851

Gampsocoris punctipes (Germar, 1822): 1 spec., Pehlivan köyü, Edirne reg., 28.07.2005, leg. G.C.

Family Lygaeidae Schilling, 1829

Caenocoris nerii (Germar, 1847): 1 spec., Dalaman Çayı River, Muğla reg., Ortaca, 18.07.2005, leg. C.P.

Cymophyes ochroleuca Fieber, 1870: 4 specs: 1 ♂, 3 ♀♀, Troy Fortress, Çanakkale reg., 07.08.2006, leg. C.P.

Eremocoris fenestratus (Herrich-Schaeffer, 1839): 2 specs: 1 ♀, Salda Gölü, Burdur reg., 14.07.2005, leg. C.P.; 1 ♀, Köyceğiz Lake, Muğla reg., 19.07.2005, leg. G.C.

Geocoris (Piocoris) erythrocephalus (Lepelletier & Serville, 1825): 8 specs: 1 ♂, Düzlerçami, Karaman River, Antalya reg., 15.07.2005, leg. G.C.; 1 spec., Menderes River, Koruçuk, Denizli reg., 13.07.2005, leg. C.P.; 2 specs, Bakir Çayı River, Izmir Bergama reg., 27.08.2006, leg. C.P.; 1 spec., Bakir Çayı River, Izmir Bergama reg., 01.08.2006, leg. C.P.; 2 specs, Buharkent, Denizli reg., 04.08.2006, leg. C.P.; 1 spec., Denizli reg., Pamukkale, 12.07.2005, leg. C.P. (Çakir & Önder, 1990)

Geocoris (Geocoris) lineola (Rambur, 1839): 1 spec.: 1 ♀, Buharkent, Denizli reg., 04.08.2006, leg. C.P. (Çakir & Önder, 1990)

Kleidocerys ericae (Horváth, 1908): 1 spec.: 1 ♂, Köyceğiz Lake, Muğla reg., 19.07.2005, leg. G.C.

Lygaeosoma sardeum Spinola, 1837: 1 spec.: 1 ♂, 10 km West of Küçükkuyu, Çanakkale reg., 10.07.2005, leg. C.P.

Lygaeus equestris (Linnaeus, 1758): 14 specs: 1 ♀, 1 ♂, Yenifoça, Aydın reg., 23.07.2006, leg. C.P.; 2 ♀♀, 10 km West of Küçükkuyu, Çanakkale reg., 10.07.2005, leg. C.P., G.C.; 1 spec., Kizildere River, Burdur reg., 15.07.2005, leg. C.P.; 2 ♂♂, 1 spec., Salda Gölü, Burdur reg., 14.07.2005, leg. C.P.; 2 ♂♂, Ortaca, Dalaman Çayı River, Muğla reg., 18.07.2005, leg. C.P.; 1 spec., Köyceğiz Lake, Muğla reg., 19.07.2005, leg. G.C.; 4 ♂♂, Bakir Çayı River, İzmir Bergama reg., 01.08.2006, leg. C.P.

Oxycarenus hyalinipennis (Costa, 1843): 3 specs: Burhanli, Çanakkale reg., 07.08.2006, leg. C.P.

Nysius senecionis (Schilling, 1829): 28 specs: 1 ♀, 1 ♂, 33 km North of Eceabat, Çanakkale reg., 28.07.2005, leg. C.P.; 1 ♀, 1 ♂, Pehlivan köyü, Edirne reg., 28.07.2005, leg. G.C.; 1 ♀, Yenifoça, Aydın reg., 23.07.2005, leg. C.P.; 12 specs, Bakir Çayı River, İzmir Bergama reg., 01.08.2006, leg. C.P.; 4 specs, Bakir Çayı River, İzmir Bergama reg., 27.08.2006, leg. C.P.; 1 ♂, 6 specs, Buharkent, Denizli reg., 04.08.2006, leg. C.P.

Rhyparochromus vulgaris (Schilling, 1829): 1 spec., Menderes River, Koruçuk, Denizli reg., 13.07.2005, leg. C.P.

Spilostethus pandurus (Scopoli, 1763): 3 specs: 3 ♂♂, Buharkent, Denizli reg., 04.08.2006, leg. C.P.

Tropidothorax leucopterus (Goeze, 1778): 3 specs: 1 ♂, Patara - Ova Gölü, Antalya reg., 17.07.2005, leg. G.C.; 1 ♂, 2 km West of Küçükkuyu, Çanakkale reg., 11.07.2005, leg. C.P.; 1 ♂, Buharkent, Denizli reg., 04.08.2006, leg. C.P.

Family Pyrrhocoridae Amyot & Serville, 1843

Pyrrhocoris apterus (Linnaeus, 1758): 1 spec.: 1 ♀, Kizildere River, Burdur reg., 15.07.2005, leg. C.P.

Superfamily Pentatomoidea Leach, 1815

Family Pentatomidae Leach, 1815

Aelia acuminata (Linnaeus, 1758): 10 specs: 3 ♀♀, 33 km North of Eceabat, Çanakkale reg., 28.07.2005, leg. C.P.; 2 ♀♀, Pehlivan köyü, Edirne reg., 28.07.2005, leg. G.C.; 1 ♀, Ortaca, Dalaman Çayı River, Muğla reg., 18.07.2005, leg. C.P.; 1 ♀, Kizildere River, Burdur reg., 15.07.2005, leg. C.P.; 2 ♀♀, 1 ♂, Burhanli, Çanakkale reg., 07.08.2006, leg. C.P.

Ancyrosoma leucogrammes (Gmelin, 1790): 12 specs: 3 ♀♀, 1 ♂, Pehlivan köyü, Edirne reg., 28.07.2005, leg. C.P., G.C.; 2 ♀♀, 33 km North of Eceabat, Çanakkale reg., 28.07.2005, leg. C.P.; 2 ♀♀, 1 ♂, 10 km West of Küçükkuyu, Çanakkale reg., 10.07.2005, leg. C.P.; 1 ♀, Köyceğiz Lake, Muğla reg., 19.07.2005, leg. G.C.; 1 ♀, Buharkent, Denizli reg., 04.08.2006, leg. S.G.; 1 ♂, Troy Fortress, Çanakkale reg., 07.08.2006, leg. C.P. (Karsavuran et al., 2008)

Anthemina lunulata (Goeze, 1778): 2 specs: 1 ♀, 1 ♂, Salda Gölü, Burdur reg., 14.07.2005, leg. C.P.

Apodiphus amygdali (Germar, 1817): 1 spec.: 1 ♀, Köyceğiz Lake, Muğla reg., 19.07.2005, leg. G.C.

Carpocoris (Carpocoris) fuscispinus (Boheman, 1850): 1 spec. AT: 1 ♂, 10 km West of Küçükkuşu, Çanakkale reg., 10.07.2005, leg. C.P.

Carpocoris (Carpocoris) mediterraneus Tamanini, 1959: 20 specs: 3 ♀♀, 1 ♂, 2 km West of Küçükkuşu, Çanakkale reg., 11.07.2005, leg. C.P.; 1 ♂, Dalaman Çayı River, Muğla reg., Ortaca, 18.07.2005, leg. C.P.; 4 ♀♀, Köyceğiz Lake, Muğla reg., 19.07.2005, leg. G.C.; 3 ♀♀, Troy Fortress, Çanakkale reg., 07.08.2006, leg. C.P.; 5 ♀♀, 2 ♂♂, Burhanlı, Çanakkale reg., 07.08.2006, leg. C.P.; 1 ♀, Buharkent, Denizli reg., 04.08.2006, leg. C.P.

Carpocoris (Carpocoris) pudicus (Poda, 1761): 2 specs: 1 ♂, Köyceğiz Lake western shore, Muğla reg., 19.07.2005, leg. G.C.; 1 ♀, 2 km West of Küçükkuşu, Çanakkale reg., 11.07.2005, leg. C.P.

Carpocoris (Carpocoris) purpureipennis (De Geer, 1773): 9 specs: 2 ♂♂, 3 ♀♀, 10 km West of Küçükkuşu, Çanakkale reg., 10.07.2005, leg. C.P.; 1 ♂, Yenifoça, Aydın reg., 23.07.2006, leg. C.P.; 2 ♂♂, 1 ♀, 2 km West of Küçükkuşu, Çanakkale reg., 11.07.2005, leg. C.P.

Codophila varia (Fabricius, 1787): 5 specs: 1 ♀, 2 km West of Küçükkuşu, Çanakkale reg., 11.07.2005, leg. C.P.; 1 ♂, Buharkent, Denizli reg., 04.08.2006, leg. C.P.; 1 ♂, Bakır Çayı River, İzmir Bergama reg., 01.08.2006, leg. C.P.; 1 ♀, Aliaga (Aegean Sea), İzmir reg., 06.08.2006, leg. R.P.M.; 1 ♂, Salda Gölü, Burdur reg., 14.07.2005, leg. C.P. (Karsavuran et al., 2008)

Dolycoris baccarum (Linnaeus, 1758): 3 specs: 1 ♀, 33 km North of Eceabat, Çanakkale reg., 28.07.2005, leg. G.C.; 1 ♀, 1 ♂, 2 km West of Küçükkuşu, Çanakkale reg., 11.07.2005, leg. C.P.

Eurydema (Rubrodorsalium) spectabilis Horváth, 1882: 14 specs AT: 7 ♀♀, 7 ♂♂, Düzlerçami, Karaman River, Antalya reg., 15.07.2005, leg. G.C.

Eurydema (Eurydema) ornata (Linnaeus, 1758): 9 specs: 4 ♀♀, 1 ♂, Karamanlı Barajı, Burdur reg., 15.07.2005, leg. G.C.; 1 ♂, Patara - Ova Gölü, Antalya reg., 17.07.2005, leg. G.C.; 1 ♀, Buharkent, Denizli reg., 04.08.2006, leg. C.P.; 1 ♀, Koruçuk, Denizli reg., 03.08.2006, leg. C.P.; 1 ♂, Bakır Çayı River, İzmir Bergama reg., 01.08.2006, leg. C.P. (Karsavuran et al., 2008)

Eurydema (Rubrodorsalium) ventralis Kolenati, 1846: 1 spec.: 1 ♂, Karamanlı Barajı, Burdur reg., 15.07.2005, leg. G.C.

Eysarcoris venustissimus (Schrank, 1776): 1 spec.: 1 ♀, Buharkent, Denizli reg., 04.08.2006, leg. C.P.

Eysarcoris ventralis (Westwood, 1837): 6 specs: 1 ♀, Salda Gölü, Burdur reg., 14.07.2005, leg. C.P.; 2 ♀♀, 1 ♂, Köyceğiz Lake, Muğla reg., 19.07.2005, leg. G.C.; 1 ♀, Patara - Ova Gölü, Antalya reg., 17.07.2005, leg. G.C.; 1 ♀, Menderes River, Koruçuk, Denizli reg., 13.07.2005, leg. C.P.

Graphosoma lineatum (Linnaeus, 1758): 85 specs: 7 ♀♀, 7 ♂♂, 10 km West of Küçükkuşu, Çanakkale reg., 10.07.2005, leg. C.P.; 4 ♀♀, Yenifoça, Aydın reg., 23.07.2005, leg. C.P.; 1 ♀, 33 km North of Eceabat, Çanakkale reg., 28.07.2005, leg. C.P.; 3 ♀♀, 4 ♂♂, Menderes River, Koruçuk, Denizli reg., 13.07.2005, leg. C.P.; 3 ♀♀, 2 ♂♂, Patara - Ova Gölü, Antalya reg., 17.07.2005, leg. G.C.; 1 ♀, Patara Beach (instead of Esen Cayiriver), 18.07.2005, leg. G.C.; 8 ♀♀, 6 ♂♂, 2 km West of Küçükkuşu, Çanakkale reg., 11.07.2005, leg. C.P.; 1 ♀, 5 ♂♂, Köyceğiz Lake, Muğla reg., 19.07.2006, leg. G.C.; 1 ♂, 15 km West of Tekirova, Antalya reg., 16.07.2005, leg. C.P.; 11 ♀♀, 14 ♂♂, Buharkent, Denizli reg., 04.08.2006, leg. C.P.; 1 ♂, Pamukkale, Denizli reg., 03.08.2007, leg. R.B.; 2 ♂♂, Bakır Çayı River, İzmir Bergama reg., 01.08.2006, leg. C.P.

Graphosoma semipunctatum (Fabricius, 1775): 16 specs: 2 ♀♀, 8 ♂♂, 2 km West of Küçükkuyu, Çanakkale reg., 11.07.2005, leg. C.P.; 3 ♀♀, 3 ♂♂, Troy Fortress, Çanakkale reg., 07.08.2006, leg. C.P.

Peribalus strictus strictus (Fabricius, 1803): 1 spec.: 1 ♂, Karamanli Baraji, Burdur reg., 15.07.2005, leg. G.C.

Mustha spinosula (Lefebvre, 1831): 3 specs: 1 ♂, Efes, Izmir reg., 02.08.2006, leg. C.P.; 1 ♀, 1 ♂, Pamukkale, Denizli reg., 03.08.2007, leg. R.B.

Neottiglossa pusilla (Gmelin, 1790): 2 specs AT: 1 ♂, 1 ♀, Düzlerçami, Karaman River, Antalya reg., 15.07.2005, leg. G.C.

Nezara viridula (Linnaeus, 1758): 1 spec. AT: 1 ♀, Köyceğiz Lake, Muğla reg., 19.07.2005, leg. G.C.

Palomena prasina (Linnaeus, 1761): 2 specs: 2 ♀♀, Buharkent, Denizli reg., 04.08.2006, leg. C.P.

Sciocoris (*Aposciocoris*) *macrocephalus* Fieber, 1851: 1 spec.: 1 ♀, Salda Gölü, Burdur reg., 14.07.2005, leg. C.P.

Stagonomus (*Dalleria*) *bipunctatus bipunctatus* (Linnaeus, 1758): 1 spec.: 1 ♀, Köyceğiz Lake, Muğla reg., 19.07.2005, leg. G.C.

Staria lunata (Hahn, 1835): 1 spec.: 1 ♀, Bakir Çayı River, Izmir Bergama reg., 01.08.2006, leg. C.P.

Tarisa flavescens Amyot & Serville, 1843: 1 spec.: 1 ♀, Salda Gölü, Burdur reg., 14.07.2005, leg. C.P. (Fig. 1).

Comment. Species distributed in France, Greece, Poland, Spain; North Africa: Canary Isles, Morocco, Madeira, Tunisia (Aukema & Rieger, 2006; Stichel, 1957-1962). *New record for Turkey.*

Tholagus flavolineatus (Fabricius, 1798): 5 specs: 2 ♂♂, 33 km North of Eceabat, Çanakkale reg., 28.07.2005, leg. C.P., G.C.; 1 ♀, 1 ♂, Burhanlı, Çanakkale reg., 07.08.2006, leg. C.P.; 1 ♀, Buharkent, Denizli reg., 04.08.2006, leg. C.P. (Karsavuran et al., 2008)

Ventocoris (*Ventocoris*) *trigonus* (Krynicky, 1871): 43 specs: 1 ♂, 10 km West of Küçükkuyu, Çanakkale reg., 10.07.2005, leg. C.P.; 1 ♂, Pehlivan köy,

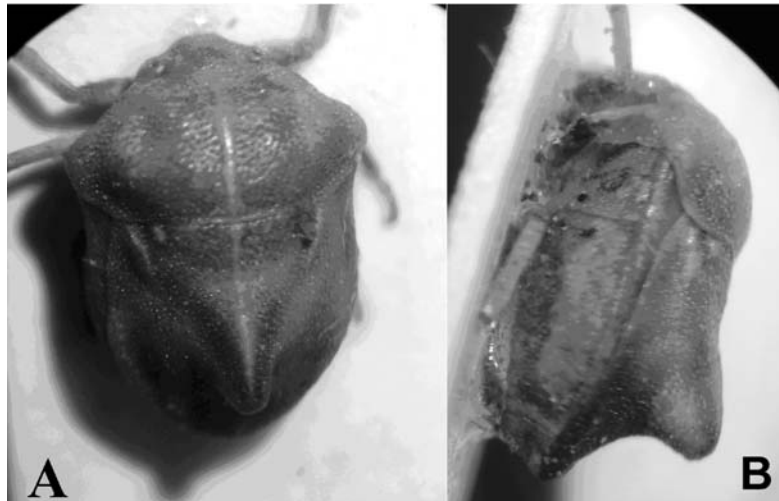


Fig. 1 - *Tarisa flavescens*. A, dorsal view; B, lateral view (original).

Edirne reg., 28.07.2005, leg. G.C.; 15 ♀♀, 26 ♂♂, Troy Fortress, Çanakkale reg., 07.08.2006, leg. C.P.

Zicrona caerulea (Linnaeus, 1758): 1 spec.: 1 ♀, Ortaca, Dalaman Çayı River, Muğla reg., 18.07.2005, leg. C.P.

Family Scutelleridae Leach, 1815

Odontotarsus purpureolineatus (Rossi, 1790): 1 spec.: 1 ♂, 10 km West of Küçükkuyu, Çanakkale reg., 10.07.2005, leg. C.P.

Odontotarsus robustus Jakovlev, 1884: 3 specs: 2 ♀♀, 1 ♂, Salda Gölü, Burdur reg., 14.07.2005, leg. C.P.

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DATE FAUNISTICE ASUPRA UNOR HETEROPTERE (INSECTA: HETEROPTERA) DIN VESTUL TURCIEI

[Rezultatele expedițiilor „Taurus” – 2005 și „Focida” – 2006]

REZUMAT

Lucrarea prezintă o listă a speciilor de heteroptere colectate în timpul expedițiilor efectuate în vestul Turciei, între 2005-2006, de către specialiști din cadrul Muzeului Național de Istorie Naturală „Grigore Antipa” (București) în colaborare cu Societatea de Explorări Oceanografice și Protecție a Mediului Marin „Oceanic-Club” din Constanța. Din cele 516 exemplare heteroptere investigate am identificat 73 specii grupate în 56 genuri, aparținând la 4 infraordine, 7 suprafamilii și 12 familii. Deși studii privind diversitatea faunei de heteroptere în Turcia sunt numeroase, în materialul investigat am identificat o specie nouă pentru teritoriul Turciei, *Tarisa flavescens* Amyot & Serville, 1843.

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FAUNISTIC AND ECOLOGICAL CHARACTERIZATION OF AQUATIC AND SEMIAQUATIC HETEROPTERA (INSECTA) COMMUNITIES IN PERMANENT SWAMPS SITUATED IN FĂGĂRAȘ DEPRESSION AND SIBIU DEPRESSION (ROMANIA)

DANIELA MINODORA ILIE, CRISTINA BAN-CALEFARIU

Abstract. This paper assesses the biodiversity of aquatic and semiaquatic Heteroptera in permanent swamps situated in two contact depressions between Făgăraș Mountains and the Transylvania Plateau, and performs a species association and a species monthly dynamics analysis. We have identified 30 species of Heteroptera, of which 18 species are aquatic (Infraorder Nepomorpha) and 12 are semiaquatic (Infraorder Gerromorpha). The α -biodiversity analysis reveals values between 0.379–3.475 for the investigated stations, which indicate a uniform distribution of individuals on species, both within stations and in each of the two depressions. The monthly sampling, in 2004, enabled us to analyze the species dynamics.

Résumé. Le travail a pour but l'évaluation de la biodiversité de communautés de Hétéroptères aquatiques et semiaquatiques des mares permanentes situées dans deux dépressions de contact entre les Monts Făgăraș et le Plateau de Transylvanie, ainsi que la réalisation de l'analyse d'association des espèces et la surveillance de la dynamique mensuelle des espèces. On y a identifié 30 espèces de Hétéroptères, dont 18 sont aquatiques (Infrasuborder Nepomorpha) et 12 semiaquatiques (Infrasuborder Gerromorpha). L'analyse de biodiversité α offre des valeurs comprises entre 0,379–3,475 pour les stations investiguées, et indique une distribution relativement uniforme des individus par espèces, tant dans le cadre des stations, que pour le niveau de chaque dépression. Les collectes périodiques, mensuelles, au cours de l'année 2004 ont permis la surveillance de la dynamique des espèces.

Key words: Nepomorpha, Gerromorpha, α -biodiversity, ecologic affinity, monthly dynamics, contact depressions between Făgăraș Mountains and the Transylvania Plateau, Romania.

INTRODUCTION

Făgăraș Depression and Sibiu Depression, situated between the Făgăraș Mountains and Cindrel Mountains at South, Târnava Plateau and Secaș Plateau at North and Perșani Mountains at East (South of Transylvania Plateau, Romania), are typical contact depressions that were formed by corrosion. There are morphologic units having an average height of 450 m, layered to the contact to the mountains (piedmont field). The relief was formed on a crystalline fundament, on which clay was deposited as well as gravels and sands bearing rich aquifer strata (Dobros, 1999).

The aquatic and semiaquatic Heteroptera populates a great variety of aquatic habitats (Andersen, 1982; Davideanu, 1999). Within these two depressions they were collected from different lakes, swamps and from the shore habitats of some brooks and rivers.

The swamp is a kind of still water, very much alike with the lake, but the difference consists in the surface and the quite small depth of the swamp which favors the development of aquatic and swampy vegetation. Other factors were the great variability of the physical and chemical factors as well as the lack of the

thermic stratification (Pora & Oros, 1974). This notion of swamp is given to permanent or temporary aquatic basins.

MATERIAL AND METHODS

The aquatic and semiaquatic Heteroptera were studied within a complex study that took place during 2001 – 2002 and 2004 in the middle basin of the Olt River. In this paper data regarding the Heteroptera collected from permanent swamps situated in the Făgăraș Depression and Sibiu Depression are presented, in 8 stations, 4 being in the Făgăraș Depression (noted F1 – F4) and 4 being in the Sibiu Depression (noted S1 – S4) whose briefly characterization are presented as follows:

F1: Mândra (45°49'30"N, 25°02'20"E, altitude 440 m)

This is a small swamp (the surface round 3 m² and the depth of 50 cm). It is situated in the major riverbed of the Olt River in an area of ballast exploitation. In the middle of the swamp grows *Alisma plantago-aquatica*, and around it the vegetation is that one characteristic to the temporary wet soils (*Cyperus flavescens* etc.)

F2: Sâmbăta Abbey (45°41'31"N, 24°47'51"E, altitude 685 m)

This swamp is provided with water from superficial leaks and springs being placed on piedmont hills. There is no characteristic vegetation, the plants on its banks are those specific for the wood in which the swamp was formed.

F3: Sărata (45°44'10"N, 24°30'28"E, altitude 436 m)

This swamp is a result of the winding of the Nicula brook, provided with water from the brook to bigger waters as well as underground contribution. The swamp surface is around 35 m² and a depth of 30 cm and a mud deposit on the bottom. The immerse vegetation is represented by *Agrostietum stoloniferae* with *Juncus conglomeratus* and the vegetation within the swamp occupies approximately 20% of the water surface, being formed of algae.

F4: Porumbacu de Jos (45°45'30"N, 24°29'53"E, altitude 396 m)

This is a swamp within the area having a dam resulted from the hydro technical works that has been done. It is provided with water from the phreatic waters of the Olt River at high levels. The vegetal associations on the bank of the swamp are, as follows: *Salicetum albae - fragilis*, *Typhaetum latifoliae* with *Alisma plantago - aquatica*, *Lythrum salicaria*, *Glyceria plicata*, *Phragmites australis* and *Salix purpurea*. The vegetation within the water consists of *Potamogeton natans*, which occupies quite a lot of space. The underwater vegetation is represented by *Ceratophyllum demersum*, *C. submersum*, *Myriophyllum spicatum*, *Elodea canadensis* and *Potamogeton crispus*.

S1: Sadu (45°39'12"N, 24°09'21"E, altitude 487 m)

The swamp is formed by the water of the springs situated in the terminal area of the diluvia glacis as well as by rain. Its level varies, it is a degraded swamp due to the cattle which walk on it and as a result the vegetation which hardly develops.

S2: Tocile (45°40'50"N, 24°09'45"E, altitude 528 m)

The swamp basin is situated at the starting point of the Tocile Brook and it was formed by the waters of the springs at the base of the hill dejection cone and by the accumulation of rainy waters. The bottom with clay and the little salty water allows the development of some cenosis belonging to *Agrostio-Caricetum distantis* and of the bushes of *Deschampsia caespitosa* on the banks and on little islands.

S3: Sibiu (45°47'19"N, 24°07'44"E, altitude 429 m)

Being situated in the major meadow of the Cibin River the swamp is a result of the shallow underground interferences especially during the rainy periods of the year (floods of the big waters and maintaining them by underground support during the drought period). The immerse vegetation is made up of: *Typha latifolia*, *Phragmites australis*, *Butomus umbellatus*, *Alisma plantago-aquatica*, *Juncus articulatus*, *J. conglomeratus* etc., and the submerse vegetation by: *Ceratophyllum demersum*, *Myriophyllum spicatum*, *Lemna trisulca* etc.

S4: Tâlmăciu (45°39'23"N, 24°16'08"E, altitude 370 m)

This swamp is a result of the superficial leaks, not permanent ones, with the phreatic water situated very close to the major riverbed of the Cibin River. By clogging, this swamp having good conditions, it goes to a march full of reeds (*Phragmitetum australis*).

For the characterization of the thermic and pluvial regime of the researched area we used the data from two weather forecast stations in Sibiu and Făgăraș. Taking into consideration the data we had, we calculated the average temperature for many years that proved to be higher in Sibiu (8.9⁰ C) than in Făgăraș (8.2⁰ C). On the other hand the average of the rain for many years showed higher values in Făgăraș (691.0 mm) than in Sibiu (662.0 mm). In comparison with the average values for many years, in 2004, a yearly higher average value for temperature and less rains was registered; so we can draw to the conclusion that 2004 was a hot and dry year.

The data obtained as a result of the identification were analyzed from the biodiversity point of view, using the Margalef index (for general aspects, such as species and individual richness) and Lloyd – Ghelardi (for the heterogeneity evaluation). The dichotomic Jaccard index was used for the association analysis for the species (Sîrbu & Benedek, 2004).

During 2004 we collected periodically, monthly, from three stations in Făgăraș Depression and in Sibiu Depression. Therefore we could analyze the dynamic of the aquatic and semiaquatic Heteroptera in the researched area.

For each and every collecting station the Margalef and Lloyd-Ghelardi indexes were calculated as well as for each depression.

There was done the dendro graphic for ecologic affinity for the identified species in the swamp in Sibiu (Fig. 1).

There were done graphics for the species of aquatic and semiaquatic Heteroptera that were present in our samples in every month during 2004 (Figs 2, 3).

RESULTS AND DISCUSSIONS

Totally, there were identified 30 species (Tab. 1) of aquatic and semiaquatic Heteroptera, 18 of them belonging to Nepomorpha and 12 to Gerromorpha, falling into 10 families, meaning that within this kind of habitat there are representatives from all the Heteroptera families present in the middle basin of the Olt River (Ilie, 2009). Systematic order, used in table 1, is according to the catalogue published by Aukema & Rieger (1995). From Corixidae family there were identified 12 species (from 13 species identified in the basin), from Gerridae family, 5 species (from 7 species identified in the basin), from Velidae family, 1 species (from 2 identified in the basin), and from other families there were identified all the representatives that were recorded at the level of the middle basin of the Olt River. We want to draw attention to the fact that many species considered rare, according to the reports in Romania (Davideanu, 1999), occur in this kind of habitat: *Gerris asper*, *Hebrus*

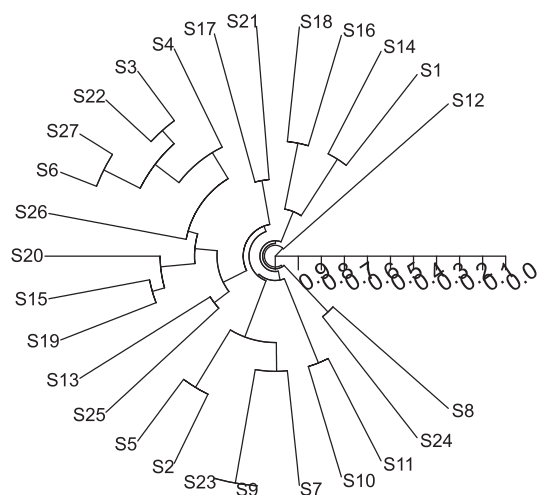


Fig. 1 - The cenotic affinity of the species identified in S3.

S1 - *Gerris asper*; S2 - *Gerris thoracicus*; S3 - *Gerris argentatus*;
 S4 - *Gerris odontogaster*; S5 - *Gerris lacustris*; S6 - *Microvelia reticulata*;
 S7 - *Hebrus pussilus*; S8 - *Hebrus ruficeps*; S9 - *Hydrometra gracilentia*;
 S10 - *Mesovelia furcata*; S11 - *Mesovelia vittigera*; S12 - *Micronecta scholtzi*;
 S13 - *Cymatia coleoptrata*; S14 - *Corixa punctata*; S15 - *Hesperocorixa linnaei*;
 S16 - *Hesperocorixa sahlbergi*; S17 - *Sigara nigrolineata*; S18 - *Sigara limitata*;
 S19 - *Sigara striata*; S20 - *Sigara iactans*; S21 - *Sigara lateralis*;
 S22 - *Ilyocoris cimicoides*; S23 - *Nepa cinerea*; S24 - *Ranatra linearis*;
 S25 - *Notonecta viridis*; S26 - *Notonecta glauca*; S27 - *Plea minutissima*.

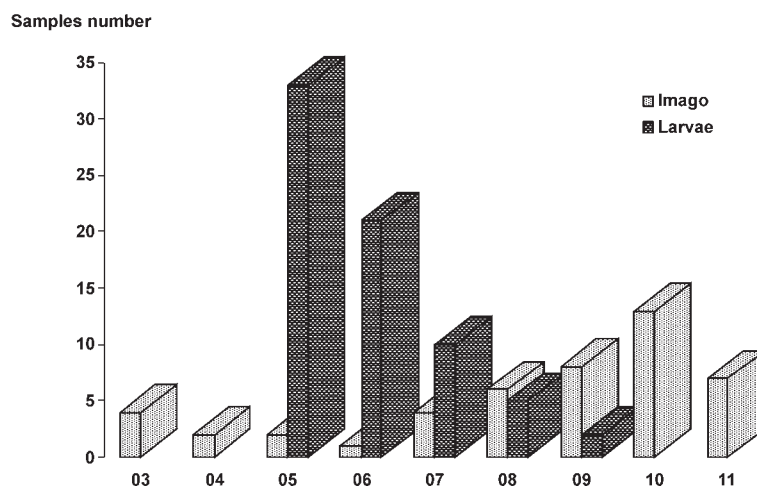


Fig. 2 - The dynamics of the species *Notonecta glauca* in the year 2004, in the station F3 (on the base of the number of imago and collected larvae).

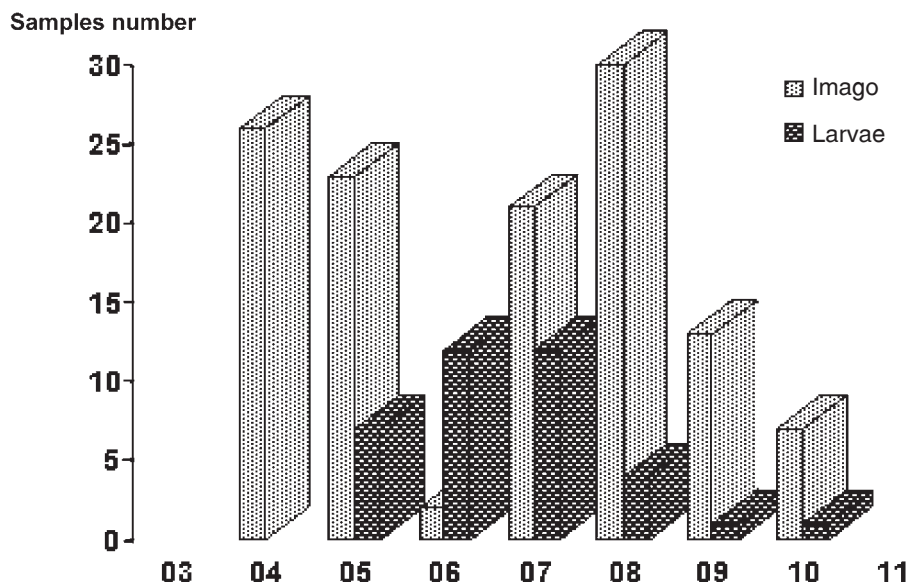


Fig. 3 - The dynamics of the species *Microvelia reticulata* in the year 2004, in the station F4 (on the base of the number of imago and collected larvae).

pussilus, *H. ruficeps*, *Hydrometra gracilentia*, *Micronecta scholtzi*, *Cymatia coleoptrata*, *Callicorixa praeusta*, *Hesperocorixa sahlbergi* and *Sigara semistriata*.

In Mândra (F1), we collected 170 samples, belonging to 11 species, the majority being Corixidae (9 species). We noticed the low presence of Gerridae (1 species with one sample), this being the consequence of the small surface of the swamp. We identified the species *Callicorixa praeusta* that is considered rare in Romania (Davideanu, 1999), this being the only recording in Transylvania. Having large population we can notice the species *Sigara lateralis* followed by *S. striata*, *S. limitata* and *S. nigrolineata* at a great distance. The other species were collected in very small number of samples leading to the conclusion that they had small population.

In the swamp in Sâmbăta (F2) there were identified two species of semiaquatic Heteroptera, being collected 14 samples. The lack of a characteristic vegetation (the plants on the banks of the swamp belong to the wood where the swamp was formed, and inside the swamp there is a lot of litter) explains the low number of Heteroptera species. In the same time the station was placed on the piedmont hills, with a lower average temperature, this being another restrictive factor for the aquatic and semiaquatic Heteroptera.

In Sărata (F3), we collected 1051 samples belonging to 20 species. The Corixidae family was represented by 8 species and the Gerridae family by 4 species. In this station we identified the species *Sigara semistriata* that is rare in Romania. *Plea minutissima* and *Microvelia reticulata* are noticed having a high number of samples. The development of these populations was encouraged, among other factors by the presence of algae that created a favorable micro habitat for these species.

Table 1

Species of aquatic and semiaquatic Heteroptera identified in permanent swamps situated in Făgăraș Depression and Sibiu Depression.

	Taxon	Station / Number of samples							
		F1	F2	F3	F4	S1	S2	S3	S4
Infraorder Nepomorpha Popov, 1971									
Fam. Nepidae Latreille, 1802									
1	<i>Nepa cinerea</i> (Linnaeus, 1758)			26	2			1	1
2	<i>Ranatra linearis</i> (Linnaeus, 1758)				3			10	
Fam. Corixidae Leach, 1815									
3	<i>Micronecta (Dichaetonecta) scholtzi</i> (Fieber, 1860)	2			88			11	
4	<i>Cymatia coleoptrata</i> (Fabricius, 1777)							32	
5	<i>Callicorixa praeusta praeusta</i> (Fieber, 1848)	1							
6	<i>Corixa punctata</i> (Illiger, 1807)	1		31	1			4	
7	<i>Hesperocorixa linnaei</i> (Fieber, 1848)	1		1				67	
8	<i>Hesperocorixa sahlbergi</i> (Fieber, 1848)			3				1	
9	<i>Sigara (Pseudovermicorixa) nigrolineata nigrolineata</i> (Fieber, 1848)	21		10	5	98	59	21	
10	<i>Sigara (Retrocorixa) limitata limitata</i> (Fieber, 1848)	29		17	1			2	
11	<i>Sigara (Retrocorixa) semistriata</i> (Fieber, 1848)			7					
12	<i>Sigara (Sigara) striata</i> (Linnaeus, 1758)	32		12	51			297	
13	<i>Sigara (Subsigara) iactans</i> Jansson, 1983	3		2	31			26	
14	<i>Sigara (Vermicorixa) lateralis</i> (Leach, 1817)	78			2		3	3	
Fam. Naucoridae Leach, 1815									
15	<i>Ilyocoris cimicoides cimicoides</i> (Linnaeus, 1758)			52	91			302	1
Fam. Notonectidae Latreille, 1802									
16	<i>Notonecta viridis</i> Delcourt, 1909			1				4	
17	<i>Notonecta glauca glauca</i> (Linnaeus, 1758)	1		51	2	1	2	19	
Fam. Pleidae Fieber, 1851									
18	<i>Plea minutissima minutissima</i> Leach, 1817			456	757			482	4
Infraorder Gerromorpha Popov, 1971									
Fam. Mesoveliidae Douglas & Scott, 1867									
19	<i>Mesovelia furcata</i> (Mulsant & Rey, 1852)				25			17	7
20	<i>Mesovelia vittigera</i> (Horváth, 1895)				25			24	21
Fam. Hebridae Amyot & Serville, 1843									
21	<i>Hebrus pusillus pusillus</i> (Fallén, 1807)			4				5	
22	<i>Hebrus (Hebrusella) ruficeps</i> (Thomson, 1871)							1	
Fam. Hydrometridae Billberg, 1820									
23	<i>Hydrometra stagnorum</i> (Linnaeus, 1758)		3	13	20				
24	<i>Hydrometra gracilentia</i> (Horváth, 1899)							1	
Fam. Veliidae Brullé, 1836									
25	<i>Microvelia reticulata</i> (Burmeister, 1835)			319	123			264	2
Fam. Gerridae Leach, 1815									
26	<i>Gerris (Gerriselloides) asper</i> Fieber, 1860							1	
27	<i>Gerris thoracicus</i> (Schummel, 1832)	1		17	21	1		10	
28	<i>Gerris argentatus</i> Schummel, 1832			1	101			120	
29	<i>Gerris odontogaster</i> (Zetterstedt, 1828)			5	5			43	
30	<i>Gerris lacustris</i> (Linnaeus, 1758)		11	23	48			6	1
	TOTAL	170	14	1051	1402	100	64	1774	37

In the swamp of Porumbacu de Jos (F4) 20 species of aquatic and semiaquatic Heteroptera were identified from which 7 are Corixidae and 4 are Gerridae. The number of collected samples was of 1402, the largest population belonging to: *Plea minutissima*, *Microvelia reticulata*, *Gerris argentatus*, *Ilyocoris cimicoides* and *Micronecta scholtzi*.

In the swamp at the springs of Tocile Brook (S2) only 3 species of aquatic Heteroptera were identified, but in a quite large number of samples (64 samples), and this fact is due to the population of *Sigara nigrolineata*, which is very well adapted to this kind of habitat.

Regarding the swamp of Sadu (S1) there was noticed a resemblance with the swamp of Tocile because there were identified 3 species having a great number of samples (100); the largest population belong to the species *Sigara nigrolineata*. This similarity is not at random, it is due to the ecologic conditions in these habitats (still waters, little depth and muddy).

In Sibiu (S3), we collected 1774 samples, belonging to 27 species of aquatic and semiaquatic Heteroptera. 10 species belong to the Corixidae family and 5 species belong to the Gerridae family. The other families had 1- 2 species present in this swamp. We noticed the fact that in this station the largest number of Gerridae species were present, being identified *Gerris asper*, rare species in Romania. At the same time there were other 6 species of aquatic and semiaquatic Heteroptera that are considered rare in Romanian fauna. There are more species represented by large populations: *Plea minutissima*, *Ilyocoris cimicoides*, *Sigara striata*, *Microvelia reticulata* but at the same time the number of species with low population was as numerous as those having large populations: *Gerris asper*, *Hebrus ruficeps*, *Hydrometra gracilenta*, *Hesperocorixa sahlbergi*, *Nepa cinerea*.

In the swamp in Tâlmaciu (S4) there were identified 7 species of aquatic and semiaquatic Heteroptera, being collected 37 samples. The population of the species *Mesovelia vittigera* was the biggest one.

None of the species was present in all stations. This is due to the different conditions from the researched habitats as well as to the preferences and the degree of adaptability of each and every species. From this point of view *Sigara nigrolineata*, *Notonecta glauca*, *Gerris thoracicus* and *G. lacustris* are to be remarked for a more ample ecologic valence.

The values of Margalef index (Tab. 2) are between 0.379 and 2.731 for the stations in the Făgăraș Depression. The lowest value of the biodiversity was registered in the station F2 where the ecologic conditions are not good for Heteroptera. The values for the stations F3 and F4 are the biggest ones (2.731, respectively 2.622) because the quality of the habitats is a better one (regarding the size of the aquatic basins, their location and the development of the vegetation); the number of the identified species is the same, the difference between the values of the index coming from the difference between the numbers of the collected samples. For the stations of Sibiu Depression the Margalef index of biodiversity varies between 0.434 and 3.475, reflecting in this way the quality of the habitats. Remarkable is the high value registered in station S3 in spite of men's activities that are quite frequent, suggesting once again the fact that the aquatic and semiaquatic Heteroptera are not disturbed by these activities. The comparison of the α biodiversity from two relief units neighboring each other shows a less high value for the Sibiu Depression (3.426 comparatively to 3.174) this being connected to the fact that this is characterized by higher temperatures.

Table 2

Biodiversity indexes values for the study area.

Index / Station	F1	F2	F3	F4	S1	S2	S3	S4	Făgăraș Depression	Sibiu Depression
Margalef	1.947	0.379	2.731	2.622	0.434	0.481	3.475	1.662	3.174	3.426
Lloyd-Ghelardi	0.628	0.750	0.571	0.590	0.102	0.297	0.657	0.682	0.627	0.691

The values of the index Lloyd – Ghelardi (Tab. 2) indicates a relatively uniform distribution of the individuals taking into account their species within the stations as well as for each depression (representing 57% - 75% from the ideal value). As an exception we quote the stations S1 and S2 where only 3 species were identified but having large populations.

From the analysis of the dendro graphic of ecologic affinity (Fig. 1) done for the identified species in the swamp of Sibiu, there was established that the species *Nepa cinerea* and *Hydrometra gracilena* had a maximum degree of affinity, as they were collected from the same micro habitats. The dendrogram indicated a powerful affinity between the Heteroptera species *Plea minutissima* and *Microvelia reticulata*, respectively between *Gerris argentatus* and *Ilyocoris cimicoides*, there being affinity also between the two groups of species. This situation is similar to that registered in the natural lake – Oltul Mic, as well as in the artificial lake of Sebeș Olt. In this station it was established that there were relatively powerful relations of cenotic affinity between the different species of aquatic Heteroptera (*Hesperocorixa sahlbergi* and *Sigara limitata*, *Hesperocorixa linnaei* and *Sigara striata*) but also between different species of semiaquatic Heteroptera (*Gerris lacustris* and *G. thoracicus*, *Mesovelia furcata* and *M. vittigera*), different from what was established in the case of the lakes Oltul Mic and Sebeș Olt (Ilie, 2009).

From the species *Notonecta glauca* we collected adults starting in March till November, in the station F3 (permanent swamp in the locality Sărata). The largest number of adults was collected in October (Fig. 2). The graphic showed a decrease in number till June, due to the mortality of the adults from the previous year. After that it began to grow, due to the new generation of adults, reaching its top in October. In November, there was a smaller number of individuals due to the bad weather that would lead to the pause - in order to hibernate. The number of larvae was maximum in May and then decreasing successively, as larva became adults, till September, when the last larvae were collected. This figure draw to the conclusion that *Notonecta glauca* had only one generation in 2004, being in agreement with the theoretic possibility of multiplying this species in the climate condition of the area (Rabitsch, 2005). Another comment that has to be made is that there is a large number of larvae that are eaten by the predatory animals, belonging to different trophic chains (among others, in the respectively swamp there were amphibians and also storks that fed from there, being a well known fact that both category of predatory animals had this species of Heteroptera included in their diet).

The same kind of graphics (Fig. 3) was made for the species *Microvelia reticulata*, which was a constant presence in the collected samples from the station F4 (permanent swamp in Porumbacu de Jos) during 2004. From this habitat we collected adults beginning in April till October. In April there were a larger number of adults that passed through the winter, after that the population began to decrease; then there was an important raise in July reaching its maximum in August. The high

number of larvae in July, very much alike that in June, suggested the possibility of the development of two generations in that summer (at the beginning of July appeared the first generation of *Microvelia reticulata*, which had time, during the same month, to give birth to a new set of larvae, which in its turn to be the second generation till the end of August). The development of a second generation was possible under the specific conditions of 2004 and particularly in July (warmer and wetter than the average value taken in many years).

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We want to thank to Prof. Ph. D. Constantin Drăgulescu for the identification of same species of plants. We also want to thank to Mr. Univ. Lecturer Mihai Buiuc for the climate data that he had put to our disposal and the discussions regarding the influence of the weather conditions upon the insects' biology; and also to Univ. Reader Ph. D. Ioan Sirbu for the help he gave us in processing on the computer of the statistic data. The authors owe gratitude and sincere regards to all those mentioned, as well as to the referees of this paper, namely Dr. Ljiljana Protić and Dr. Ana Davideanu.

CARACTERIZAREA FAUNISTICĂ ȘI ECOLOGICĂ A COMUNITĂȚILOR DE HETEROPTERE (INSECTA) ACVATICE ȘI SEMIACVATICE DIN BĂLȚI PERMANENTE SITUATE ÎN DEPRESIUNEA FĂGĂRAȘULUI ȘI DEPRESIUNEA SIBIULUI (ROMÂNIA)

REZUMAT

Lucrarea își propune evaluarea biodiversității comunităților de heteroptere acvatice și semiacvatice din bălți permanente situate în două depresiuni de contact între Munții Făgărașului și Podișul Transilvaniei, realizarea analizei de asociere a speciilor și urmărirea dinamicii lunare a speciilor. Pentru atingerea scopului au fost colectate probe din opt stații din bazinul hidrografic al râului Olt, patru localizate în Depresiunea Făgărașului și patru în Depresiunea Sibiului. Prelevarea probelor s-a desfășurat în perioada 2001-2002 și 2004. Au fost identificate 30 specii de heteroptere, dintre care 18 specii sunt acvatice (Infraordin Nepomorpha) iar 12 sunt semiacvatice (Infraordin Gerromorpha). Analiza de biodiversitate α oferă valori cuprinse între 0,379-3,475 pentru stațiile investigate, valori apropiate pentru cele două depresiuni (3,174 pentru Depresiunea Făgărașului, respectiv 3,426 pentru Depresiunea Sibiului) și indică o distribuție relativ uniformă a indivizilor pe specii, atât în cadrul stațiilor, cât și la nivelul fiecărei depresiuni. Analiza de asociere între speciile identificate în balta din lunca Cibinului, în localitatea Sibiu, relevă grad maxim de afinitate între *Nepa cinerea* și *Hydrometra stagnorum*, precum și o afinitate cenotică puternică între *Plea minutissima* și *Microvelia reticulata*, respectiv între *Gerris argentatus* și *Ilyocoris cimicoides*. Colectările periodice, lunare, în decursul anului 2004 au permis urmărirea dinamicii speciilor. *Notonecta glauca* a avut o perioadă de activitate extinsă în anul 2004 (martie-noiembrie) și a dezvoltat o singură generație. *Microvelia reticulata* a fost observată din aprilie până în octombrie, numărul larvelor sugerând posibilitatea dezvoltării a două generații.

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REMARKS ON SOME EUROPEAN ALEOCHARINAE, WITH DESCRIPTION OF A NEW *RHOPALETES* SPECIES FROM CROATIA (COLEOPTERA: STAPHYLINIDAE)

LÁSZLÓ ÁDÁM

Abstract. Based on an examination of type and non-type material, ten species-group names are synonymised: *Atheta mediterranea* G. Benick, 1941, *Aloconota carpathica* Jeannel et Jarrige, 1949 and *Atheta carpatensis* Tichomirova, 1973 with *Aloconota mihoki* (Bernhauer, 1913); *Amischa jugorum* Scheerpeltz, 1956 with *Amischa analis* (Gravenhorst, 1802); *Amischa strupii* Scheerpeltz, 1967 with *Amischa bifoveolata* (Mannerheim, 1830); *Atheta tricholomatobia* V. B. Semenov, 2002 with *Atheta boehmei* Linke, 1934; *Atheta palatina* G. Benick, 1974 and *Atheta palatina* G. Benick, 1975 with *Atheta dilaticornis* (Kraatz, 1856); *Atheta degenerata* G. Benick, 1974 and *Atheta degenerata* G. Benick, 1975 with *Atheta testaceipes* (Heer, 1839). A new name, *Atheta velebitica* nom. nov. is proposed for *Atheta serotina* Ádám, 2008, a junior primary homonym of *Atheta serotina* Blackwelder, 1944. A revised key for the Central European species of the *Aloconota sulcifrons* group is provided. Comments on the separation of the males of *Amischa bifoveolata* and *A. analis* are given. A key for the identification of *Amischa* species occurring in Hungary and its close surroundings is presented. Remarks are presented about the relationships of *Alevonota* Thomson, 1858 and *Enalodroma* Thomson, 1859. The taxonomic status of *Oxypodera* Bernhauer, 1915 and *Mycetota* Ádám, 1987 is discussed. The specific status of *Pella hampei* (Kraatz, 1862) is debated. Remarks are presented about the relationships of *Alevonota* Thomson, 1858, as well as *Mycetota* Ádám, 1987, *Oxypodera* Bernhauer, 1915 and *Rhopaletes* Cameron, 1939. The publication date of several *Atheta* species described by G. Benick is discussed. *Aloconota mihoki*, *Amischa forcipata*, *A. filum* and *Atheta boehmei* are reported from Hungary, Croatia and Romania, respectively, for the first time. A new species, *Rhopaletes slavoniae* sp. n. is described from Croatia.

Résumé. Se basant sur un examen du matériel de types et de non-types, dix noms d'espèces-groupe sont synonymisés: *Atheta mediterranea* G. Benick, 1941, *Aloconota carpathica* Jeannel et Jarrige, 1949 et *Atheta carpatensis* Tichomirova, 1973 avec *Aloconota mihoki* (Bernhauer, 1913); *Amischa jugorum* Scheerpeltz, 1956 avec *Amischa analis* (Gravenhorst, 1802); *Amischa strupii* Scheerpeltz, 1967 avec *Amischa bifoveolata* (Mannerheim, 1830); *Atheta tricholomatobia* V. B. Semenov, 2002 avec *Atheta boehmei* Linke, 1934; *Atheta palatina* G. Benick, 1974 et *Atheta palatina* G. Benick, 1975 avec *Atheta dilaticornis* (Kraatz, 1856); *Atheta degenerata* G. Benick, 1974 et *Atheta degenerata* G. Benick, 1975 avec *Atheta testaceipes* (Heer, 1839). Un nouveau nom, *Atheta velebitica* nom. nov. est proposé pour *Atheta serotina* Ádám, 2008, un homonyme primaire junior d'*Atheta serotina* Blackwelder, 1944. Une clé révisée pour les espèces de l'Europe Centrale du groupe *Aloconota sulcifrons* est offerte. Les commentaires de la séparation des mâles de *Amischa bifoveolata* et *A. analis* sont donnés. Une clé pour l'identification des espèces d'*Amischa* qui existent en Hongrie et ses environs est présentée. Des remarques sont présentées sur les rapports entre *Alevonota* Thomson, 1858 et *Enalodroma* Thomson, 1859. Le statut taxonomique de *Oxypodera* Bernhauer, 1915 et *Mycetota* Ádám, 1987 est discuté. Le statut spécifique de *Pella hampei* (Kraatz, 1862) est discuté. Des remarques sont présentées sur les rapports d'*Alevonota* Thomson, 1858, aussi bien que de *Mycetota* Ádám, 1987, *Oxypodera* Bernhauer, 1915 et *Rhopaletes* Cameron, 1939. La date de parution de plusieurs espèces d'*Atheta* décrites par G. Benick est discutée. *Aloconota mihoki*, *Amischa forcipata*, *A. filum* et *Atheta boehmei* sont annoncés de la Hongrie, la Croatie et la Roumanie, respectivement, pour la première fois. Une nouvelle espèce, *Rhopaletes slavoniae* sp. n. est décrite de la Croatie.

Key words: Coleoptera, Staphylinidae, Aleocharinae; new species, new synonymies, new records, key to species, systematics.

INTRODUCTION

Our current knowledge of the staphylinid fauna of Hungary and its close surroundings has not yet reached completion. This can be inferred from various recent taxonomic studies, which have led to the discovery of several new species (e.g. Ádám, 2008), and it is also shown by numerous new records only in the past years.

In order to clarify some of the remaining taxonomic problems, various types and additional material were examined, resulting in several new synonyms, new records, etc. and the discovery of the new species.

MATERIAL AND METHOD

Types and additional material deposited in the following public collections were examined: Hungarian Natural History Museum, Budapest, Hungary (HNHM; Gy. Szél), Muséum d'Histoire Naturelle, Genève, Switzerland (MHNG; G. Cuccodoro), Muséum National d'Histoire Naturelle, Paris, France (MNHN; A. Taghavian), Naturhistorisches Museum, Wien, Austria (NHMW; H. Schilhammer).

Illustrations of the genitalia and terminalia were made on the basis of permanent preparations in Euparal mounting medium on plastic cards pinned with the specimens. For the line drawings, a Jenalab compound microscope (Carl Zeiss, Jena) with a drawing tube was used. The SEM images were taken of uncoated specimens with a Hitachi S-2600N scanning electron microscope.

RESULTS

*Synonymies and revised key**for the Central European species of the Aloconota sulcifrons group**Aloconota mihoki* (Bernhauer, 1913)

Atheta (Aloconota) mihoki Bernhauer, 1913: 133 (as "Mihoki")

Atheta (Aloconota) mediterranea G. Benick, 1941: 184, **syn. n.**

Aloconota carpathica Jeannel et Jarrige, 1949: 283, **syn. n.**

Atheta (incertae sedis) carpatensis Tichomirova, 1973: 164 (a new name for *Aloconota carpathica*), **syn. n.**

The description of *Atheta mihoki* (Bernhauer, 1913) was based on one specimen collected in "Biharer Komitat (Vallis Misid)". The type locality is located in the Bihar Mountains (Romania). Benick (1941) described *Atheta mediterranea* on the basis of several specimens from "Ragusa Dalmatien, Omblaquelle" and "Griechenland, Veluchi-Gebirge", mentioning specimens also from various localities in Europe and Asia Minor: "Dalmatien, Mazedonien, Thessalien, Bulgarien, Goek-Dagh (Klein-Asien), Jaila-Gebirge (Krim)". Jeannel & Jarrige (1949) based their description of *Aloconota carpathica* on one female specimen from "Roumanie. Carpathes méridionales. – Peșterea dela Gârla vacii, à Runcu, jud. Gorj" (Romania. Southern Carpathians. – Gârla Vacii Cave, near Runcu village, Gorj county). This species was subsequently transferred to the genus *Atheta* by Tichomirova (1973) who proposed a new name, *Atheta carpatensis*, to replace *Aloconota carpathica*, which in her interpretation was a junior secondary homonym of *Atheta carpathica* (Miller, 1868), originally described as *Homalota*.

The types, except for the holotype of *Aloconota carpathica* (MNHNP), were not examined but I saw specimens of *Aloconota mihoki* and *A. mediterranea* from their type localities, from the Bihor Mountains and Dalmatia, respectively. My examination revealed some differences among the specimens in the external characters. It seems that these depend upon the geographical situation of the locality, a common phenomenon also in *Aloconota sulcifrons* (Stephens, 1832). The hind wings are ordinarily well developed and the body is often darkly coloured in case of the specimens from Asia Minor and Southern Europe (the Dinaric Mountains and the Southern Carpathians, etc.). *Aloconota mediterranea* and *A. carpathica* represent this form. (When describing the latter species, Jeannel & Jarrige compared it with *Aloconota currax* (Kraatz, 1856), and failed to realise that *A. carpathica*, in fact, belonged to the *sulcifrons* species group.) The specimens from the Eastern Carpathians, Central Europe, etc. are more or less short-winged and light-coloured, having most often smaller eyes. This form is known as *Aloconota mihoki*. Since convincing differences were found neither in the external characters nor in the shape of the genitalia, the above-mentioned dissimilarity is attributed to intraspecific variation. There is little doubt that *Atheta mihoki*, *A. mediterranea* and *Aloconota carpathica* are conspecific, so until further evidences become available and the group is studied on a wider scope all these names are considered synonyms.

While revising the material from Hungary and surrounding areas, attempts at identifying the species of the *A. sulcifrons* species group using the key by Benick (1954) and Benick & Lohse (1974) presented considerable difficulties. The species very closely resemble each other and require careful comparison for their determination. The morphology of the genitalia in this case is quite uniform, and at the same time subject to some variation, so that it must be regarded of secondary significance for the identification of the species in question. Unfortunately, due to the limited diagnostic value of external characters, such as size, puncturation, microreticulation, etc., as well as the considerable intraspecific variation and interspecific overlap, a reliable identification based on external characters alone is also difficult in most cases. Therefore, presenting an alternative key to further facilitate the recognition of these species was found desirable.

Key for the Aloconota sulcifrons species group

- 1 (6) Pronotal microsetae constitute a characteristic pattern in a narrow stripe in posterolateral portion on disc. Males: microsetae directed anteromedially and anterolaterally, respectively, approximately in two thirds of the total length of pronotum (Fig. 1 A) (see also in Hansen, 1954, fig. 138; Bruge 1999, fig. 8). Females: microsetae directed anterolaterally, approximately in one third of the total length of pronotum (Fig. 1 B). Males: posterior margin of abdominal tergite VIII with outer pair of denticles often a little more protruding than inner one, or outer pair on a level with inner one (see Hansen, 1954, fig. 134; Last, 1979, fig. 2).
- 2 (3) Puncturation and pubescence of abdominal tergites III–VI not particularly dense; pubescence mostly inconspicuous. Tergites III–VI, as a rule, with very weak silky shine; microreticulation very fine and dense. (Median lobe of aedeagus, though a little narrower in lateral view, like that of the following species. Spermathecal duct obviously longer than that of related

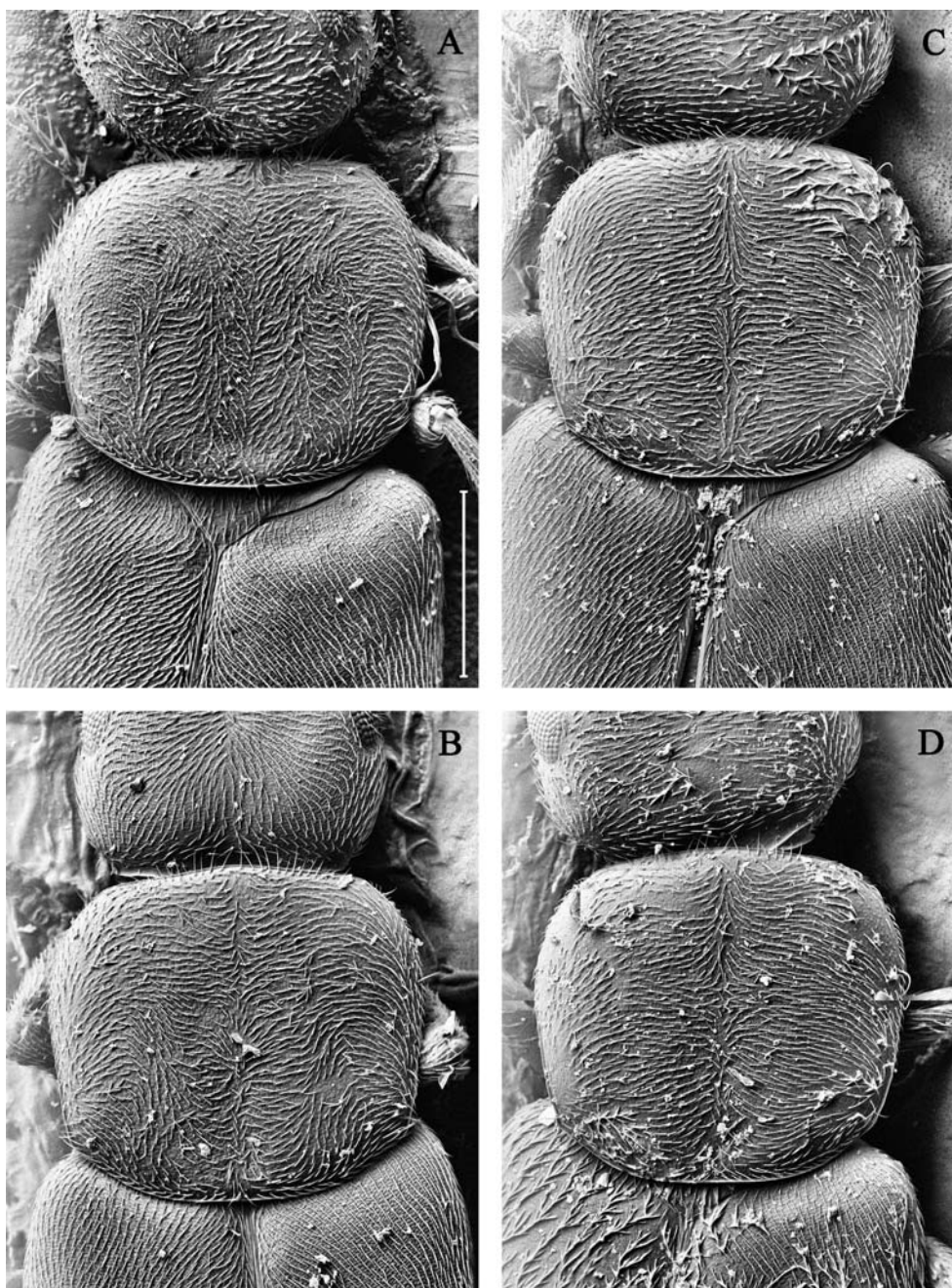


Fig. 1 - *Aloconota sulcifrons* (Stephens): A, forebody of male; B, forebody of female; *Aloconota mihoki* (Bernhauer): C, forebody of male; D, forebody of female (scanning electron micrographs, vacuum 25 Pa, voltage 25 kV, uncoated). Scale (in mm): A–D, 0.3.

species). For the illustrations of the genitalia, see Strand & Vik (1964). – Head and abdomen blackish brown or dark brown. Pronotum dark brown or dark reddish brown. Elytra lighter brown or reddish brown. Antennae dark brown or dark reddish brown. Legs brownish or yellowish red. Postocular region 1.3–1.5 times longer than eye. Antennomere X 1.4–1.6 times wider than long. Pronotum 1.06–1.12 times wider than long. Elytral suture (measured from apex of scutellum to inner apical angles) 0.90–0.98 times shorter than pronotum. Body length: 3.5–4.0 mm. – Distribution: North Europe (Scandinavia), West, Central and Southeast Europe, Asia Minor. In the study area (Hungary, the Carpathians and the Western Balkan regions), it is known only from the Bükk Mountains, Hungary.

Aloconota subgrandis (Brundin, 1954)

- 3 (2) Punctuation and pubescence of abdominal tergites III–VI fairly dense; pubescence fairly conspicuous in most cases. Tergites III–VI, as a rule, with weak silky shine; microreticulation extraordinarily fine and dense.
- 4 (5) Forebody more shining, with less pronounced microreticulation in most cases. Antennae and each antennomere, respectively, as well as legs, as a rule, a little longer. Beetles of larger size. Vertex and pronotum of males often with a weak impression along longitudinal medial line. Median lobe of aedeagus (in ventral view) seemingly widest in apical half. Spermatheca more markedly S-shaped, and duct longer. For the illustrations of the genitalia, see Strand & Vik (1964). – Head and abdomen brownish black or blackish brown. Pronotum blackish brown or dark brown. Elytra darker or lighter brown. Antennae blackish brown or dark brown. Legs light brownish red or brownish yellow. Postocular region 1.1–1.3 times longer than eye. Antennomere X 1.2–1.5 times wider than long. Pronotum 1.06–1.12 times wider than long. Elytral suture 0.91–1.00 times shorter than, or as long as pronotum. Body length: 3.8–4.5 mm. – Distribution: Europe and West Siberia. In the study area, it is a generally distributed and quite frequent species.

Aloconota insecta (Thomson, 1856)

- 5 (4) Forebody less shining, with more pronounced microreticulation in most cases. Antennae and each antennomere, respectively, as well as legs, as a rule, a little shorter. Beetles of smaller size. Vertex and pronotum of males often with a very weak impression along longitudinal medial line. Median lobe of aedeagus (in ventral view) seemingly widest about at the middle. Spermatheca less markedly S-shaped, and duct shorter. For the illustrations of the genitalia, see Strand & Vik (1964). – Head and abdomen blackish brown or dark brown. Pronotum dark brown or dark reddish brown. Elytra lighter brown or reddish brown. Antennae dark brown or dark reddish brown. Legs yellowish red or reddish yellow. Postocular region 1.0–1.6 times longer than, or as long as eye. Antennomere X 1.4–1.7 times wider than long. Pronotum 1.06–1.13 times wider than long. Elytral suture 0.81–0.93 times shorter than pronotum. Body length: 3.4–4.2 mm. – Distribution: Europe, Siberia, the Azores, the Canary Islands, the Madeira Archipelago, North Africa (Algeria, Morocco, Tunisia), the Near-East, Asia

Minor and Cyprus, East Asia (the Himalayas; China: Gansu; Korean peninsula), Central Asia (Kazakhstan); Southeast Asia, America, Africa, Australia and New Zealand. This is a cosmopolitan species, inhabiting the largest part of temperate zones, and occurring here and there also in the tropics. In the study area, it is a generally distributed and frequent species.

Aloconota sulcifrons (Stephens, 1832)

- 6 (1) Pronotal microsetae directed more or less laterally almost all over on the disc, and directed anterolaterally at posterior margin only (Fig. 1 C, D) (see also in Bruge, 1999, fig. 8). Males: posterior margin of abdominal tergite VIII with inner pair of denticles often a little more protruding than outer one (see Last, 1979, fig. 1). (Puncturation and pubescence of abdominal tergites III–VI not particularly dense; pubescence mostly inconspicuous. Tergites III–VI, as a rule, with very weak silky shine; microreticulation very fine and dense. Median lobe of aedeagus when viewed ventrally hardly broadened toward the middle. Spermatheca, though often more markedly S-shaped, and its umbilicus usually smaller, like that of the previous species.) For the illustrations of the genitalia, see Benick (1954). – Head and abdomen brownish black, blackish brown, dark brown or dark reddish brown. Pronotum blackish brown or dark brown, and darker or lighter reddish brown, respectively. Elytra blackish brown or brown, and lighter reddish brown or brownish red, respectively. Antennae blackish brown or dark brown, and reddish brown, respectively. Legs light brownish or yellowish red, and light brownish or reddish yellow, respectively. Postocular region 1.0–1.7 times longer than, or as long as eye. Antennomere X 1.3–1.7 times wider than long. Pronotum 1.04–1.13 times wider than long. Elytral suture 0.78–1.00 times shorter than, or as long as pronotum. Body length: 3.1–4.2 mm. – Distribution: West, Central and Southeast Europe, the Caucasus region (Crimean peninsula), Asia Minor. It is probably absent in Scandinavia. In the study area, it is known from Hungary (the Aggtelek, Börzsöny, Bükk and Kőszeg Mountains: Hung., Aggteleki N. P., Aggtelek, Ménes-völgy, Aegopodio-Alnetum subcarpaticum, parttaposás [treading of bank], 1988. IV. 26., leg. Ádám L.; Hung., Aggteleki N. P., Aggtelek, Vörös-tó, Juncetum effusi, Typha levélhüvelyéből [leaf-sheath], 1987. IX. 26., leg. Ádám L.; Hung., Aggteleki N. P., Szögliget, Ménes-völgy, Aegopodio-Alnetum subcarpaticum, egyelés [singling], 1987. VI. 15., leg. Merkl O.; Hung., Aggteleki N. P., Szögliget, Ménes-völgy, Aegopodio-Alnetum subcarpaticum, fűhálózás [sweep-netting], 1987. V. 11., leg. Merkl O.; Kemence, Királyháza, 1920. III. 25–29., leg. Dudich; Hung. Bükki N. P., Felsőtárkány, Hárs-kút, 500 m, Aegopodio-Alnetum, parttaposás, 1981. V. 8., leg. Ádám & Migály; Lillafüred [= Miskolc], tógazdaság [= Pisztrángkeltető Állomás], 1958. VIII. 26., Vásárhelyi I.; Bükk-hegys., Nagyvisnyó, Elzalak [= Nagy-völgy], 1956. VI. 5–12., ripicol [treading of bank], Exc. Kaszab & Székessy; Bükk-hegys., Nagyvisnyó, Elzalak [= Nagy-völgy], 1956. VI. 5–12., rostálva [sifted], Exc. Kaszab & Székessy; Hung. Bükki N. P., Parasznya, Soros-teber, 400 m, Anthyllido-Festucetum rubrae, fűhálózás, 1981. VI. 27., leg. Ádám & Hámori E.; Hu. Vas m., Velem: Borha-forrás, fűhálózás, 1979. VI. 2., leg. Ádám L.), Austria (Burgenland), Slovakia, Transylvania (Romania) and Croatia. *It is here recorded from Hungary for the first time.*

Aloconota mihoki (Bernhauer, 1913)

*Synonymies and revised key for the Amischa species of the Carpathians**Amischa analis* (Gravenhorst, 1802)*Aleochara analis* Gravenhorst, 1802: 76.*Amischa (Amischa) jugorum* Scheerpeltz, 1956: 528, **syn. n.**

Since its original description, which is based on a single female specimen from “Massives du Pelvoux in den Alpen der Dauphiné”, “Glacier de la Pilatte”, France, *Amischa jugorum* has not been recorded again. According to Scheerpeltz (1956), this species is characterised by the strongly transverse pronotum, short elytra and first of all by the indistinct puncturation of the forebody. In the description, however, there is no comparison with other species of the genus *Amischa* Thomson, 1858. Based on a study of the holotype (NHMW), there is no doubt that *Amischa jugorum* is conspecific with *Amischa analis*; external characters and the shape of the spermathecae are identical. Consequently, *Amischa jugorum* is here placed in the synonymy of the senior name *Aleochara analis*.

Amischa bifoveolata (Mannerheim, 1830)*Bolitochara bifoveolata* Mannerheim, 1830: 79.*Amischa strupii* Scheerpeltz, 1967: 13, **syn. n.**

The original description of *Amischa strupii* (Scheerpeltz, 1967) is based on an unspecified number of specimens (syntypes) collected in several localities in the Alps: “Col Lautaret in der Dauphiné”, “Oberstes Macugnagna-Tal des Monte-Rosa-Massives”, “oberstes Morteratsch-Tal des Bernina-Massives”, “Stilfser-Joch, Franzenshöhe, des Ortler-Massives” and “oberstes Feuchlbach-Tal der Kreuzeck-Gruppe in Osttirol”. A comparison of the types, all the specimens of *Amischa strupii* (NHMW) with specimens of *A. bifoveolata* did not produce any evidence that the former should represent a distinct species. The male and female sexual characters of *Amischa strupii* are in good agreement with those of *Amischa bifoveolata*. Therefore, I consider *Amischa strupii* to be a synonym of *Bolitochara bifoveolata*.

According to Muona (1990), the males of *Amischa analis* and *A. bifoveolata* can be separated by the breadth of abdominal sternite VIII. On the analogy of this, the largeness of the aedeagus seems to be an additional distinctive feature (for the illustrations of the genitalia, see Muona, 1990). The males of *Amischa bifoveolata* frequently have a larger aedeagus. The named characters, however, vary, especially in respect to proportions of the body. Consequently, the most reliable identification of *Amischa analis* and *A. bifoveolata* is possible only based on the female sexual characters.

The identity of the males of *Amischa bifoveolata* and *A. analis* is often debated. The males of *Amischa bifoveolata* with very short elytra and hind wings reduced in length – considering that there are no such specimens in case of *A. analis* – can be associated undoubtedly. As for the males of the latter species, I have studied large samples from the most arid parts of Hungary (e.g. from the Great Hungarian Plain) where no *Amischa bifoveolata* were found at all. Every female in these samples belongs to *Amischa analis*, consequently, it appears reasonable to regard the males as conspecific.

The following key is provided to the determination of the species occurring in Hungary and its surroundings. Due to the great external similarity, a reliable identification of *Amischa* species is possible only based on the primary and secondary sexual characters (for the illustrations, see Lohse, 1989 and Muona, 1990). These features are usually quite distinctive but subject to some variation at the same time, so that they are of little use for the identification in some cases. There are specimens, either males or females, which can not be identified safely. The sexes can be easily distinguished one another externally: vertex of males has microsetae directed anteriorly or anterolaterally at both sides, while microsetae are directed anteromedially in females.

1 (12) Males.

- 2 (7) Vertex slightly flattened in general, usually with a superficial foveola in the middle. Pronotal pubescence pattern most often of type IV: in anterior part of longitudinal medial line, microsetae directed posteriorly about in half of the full length (or in a little longer section occasionally), and directed anteriorly elsewhere. In some specimens (e.g. *Amischa decipiens*), pronotal pubescence pattern of type II, as in males of species enumerated below Lead 7. Posterior margin of abdominal sternite VIII ordinarily with 8–14, not quite evenly spaced macrosetae. Median lobe of aedeagus (in ventral view) with a fairly deep furrow in medial longitudinal line.

- 3 (4) Body darkly coloured in general: palpi, antennae and legs a little darker; abdomen almost uniformly dark-coloured, posterior margin of tergites and abdominal apex, respectively, hardly lighter. Microreticulation of abdominal tergites more strong, more dense, more discernible. Posterior margin of abdominal tergite VIII largely, deeply incised in the middle: deepness of median indentation substantially greater than length of antennomere III. Posterior margin of abdominal sternite VIII ordinarily with 12–14, not quite evenly spaced macrosetae; posterior margin nearly straight in the middle. Anterior crista of median lobe of aedeagus strongly developed. (Median lobe of aedeagus, in ventral view, about wedge-shaped; apex shortly tapered, terminate in a less sharp point.) – Head and abdomen black. Pronotum black or brownish black. Elytra black, brownish black, occasionally blackish brown. Antennae brown. Legs brownish yellow. Postocular region 1.2–1.4 times longer than eye. Antennomere X 1.4–1.8 times wider than long. Pronotum 1.19–1.26 times wider than long. Elytral suture 0.76–0.92 times shorter than pronotum. Body length: 1.9–2.3 mm. – Distribution: Southwest, West, Central and Southeast Europe, Asia Minor, North Africa (Tunisia). It is rare or absent in the northern parts of Central Europe. In the study area, it is known from Hungary, Transylvania (Romania) and Croatia (Ludbreg, leg. Apfelbeck). *It is here recorded from Croatia for the first time.*

Amischa forcipata Mulsant et Rey, 1873

- 4 (3) Body lightly coloured in general: palpi, antennae and legs a little lighter; abdomen not uniformly dark-coloured, posterior margin of tergites and abdominal apex, respectively, at least a little lighter. Microreticulation of

abdominal tergites less fine, less dense, less discernible. Posterior margin of abdominal tergite VIII largely, very weakly or weakly emarginate in the middle: deepness of median indentation at most as large as length of antennomere III. Posterior margin of abdominal sternite VIII ordinarily with 8–10, not quite evenly spaced macrosetae; posterior margin weakly rounded or very weakly emarginate in the middle. Anterior crista of median lobe of aedeagus weakly developed.

- 5 (6) Posterior margin of abdominal tergite VIII largely, very weakly or weakly emarginate in the middle: deepness of median indentation a little smaller than length of antennomere III. Posterior margin of abdominal sternite VIII weakly rounded. Median lobe of aedeagus (in ventral view) about wedge-shaped, with a pair of teeth at base; apex shortly tapered, terminate in a less sharp point. – Head and abdomen black or brownish black. Pronotum brownish black or blackish brown. Elytra blackish brown. Antennae yellowish brown. Legs brownish yellow. Postocular region 1.2–1.4 times longer than eye. Antennomere X 1.5–1.9 times wider than long. Pronotum 1.16–1.24 times wider than long. Elytral suture 0.83–0.96 times shorter than pronotum. Body length: 1.8–2.5 mm. – Distribution: West, Central and Southeast Europe, Asia Minor, the Canary Islands and the Madeira Archipelago, North Africa (Tunisia). In the study area, it is a generally distributed and frequent species.

Amischa decipiens (Sharp, 1869)

- 6 (5) Posterior margin of abdominal tergite VIII largely, weakly emarginate in the middle: deepness of median indentation about as large as length of antennomere III. Posterior margin of abdominal sternite VIII largely, very weakly emarginate in the middle (about half as deep as that of tergite VIII). Median lobe of aedeagus (in ventral view) spindle-shaped, without teeth at base; apex mutilated, and the anterior margin weakly emarginate in the middle. – Head and abdomen brownish black. Pronotum blackish brown or brown. Elytra brown. Antennae yellowish brown. Legs brownish yellow. Postocular region 1.2–1.4 times longer than eye. Antennomere X 1.6–2.0 times wider than long. Pronotum 1.15–1.20 times wider than long. Elytral suture 0.87–0.94 times shorter than pronotum. Body length: 1.8–2.3 mm. – Distribution: Central and Southeast Europe, Asia Minor. It is rare or absent in the northern parts of Central Europe. In the study area, it is known from Hungary, Burgenland, Slovakia and Croatia (the Velebit Mountains, Visočica, leg. Padewieth). *It is here recorded from Croatia for the first time*

Amischa filum (Mulsant et Rey, 1870)

- 7 (2) Vertex very weakly impressed in general. Pronotal pubescence pattern of type II: microsetae directed posteriorly along longitudinal medial line. Posterior margin of abdominal sternite VIII ordinarily either with a median group of 4–5 or with 8–13, unevenly spaced macrosetae. Median lobe of aedeagus (in ventral view) without a furrow.
- 8 (9) Posterior margin of abdominal tergite VIII ordinarily with a little wider emargination in the middle. Posterior margin of abdominal sternite VIII very

weakly emarginate in the middle (margin somewhat undulate there: a little produced in the middle), and ordinarily with a median group of 4–5 macrosetae. Median lobe of aedeagus (in ventral view) about wedge-shaped; apex less longer tapered, terminate in a sharp point, its sides without a cell-like area. – Head and abdomen black or brownish black. Pronotum black, brownish black or blackish brown. Elytra blackish brown or darker brown. Antennae yellowish brown. Legs brownish yellow. Postocular region 1.2–1.6 times longer than eye. Antennomere X 1.4–1.8 times wider than long. Pronotum 1.19–1.28 times wider than long. Elytral suture 0.84–0.96 times shorter than pronotum. Body length: 2.0–2.5 mm. – Distribution: North, West, Central and Southeast Europe, Asia Minor, the Madeira Archipelago, North Africa (Algeria, Tunisia). In the study area, it is a generally distributed and frequent species

Amischa nigrofusca (Stephens, 1832)

- 9 (8) Posterior margin of abdominal tergite VIII ordinarily with a little narrower emargination in the middle. Posterior margin of abdominal sternite VIII nearly straight or extraordinarily weakly emarginate in the middle (margin not at all undulate there), and ordinarily with 8–13, unevenly spaced macrosetae. Median lobe of aedeagus (in ventral view) about wedge-shaped; apex more longer tapered, terminate in a sharp point, its sides with a narrow, cell-like area.

- 10 (11) Abdominal sternite VIII and aedeagus, respectively, frequently a little larger and wider. – Head and abdomen black or brownish black. Pronotum black, brownish black or blackish brown. Elytra blackish brown or brown. Antennae brown or yellowish brown. Legs brownish yellow. Postocular region 1.3–2.0 times longer than eye. Antennomere X 1.6–2.0 times wider than long. Pronotum 1.18–1.28 times wider than long. Elytral suture 0.69–0.94 times shorter than pronotum. Body length: 1.7–2.2 mm. – Distribution: North, Southwest, West, Central, East and Southeast Europe, Asia Minor, Siberia, East Asia (Korean peninsula, the Far East). In the study area, it is probably a generally distributed but rare species (the short-winged form seems to be extremely rare)

Amischa bifoveolata (Mannerheim, 1830)

- 11 (10) Abdominal sternite VIII and aedeagus, respectively, frequently a little smaller and narrower. – Head and abdomen black or brownish black. Pronotum brownish black or blackish brown. Elytra blackish brown. Antennae yellowish brown. Legs brownish yellow. Postocular region 1.3–1.8 times longer than eye. Antennomere X 1.6–2.0 times wider than long. Pronotum 1.16–1.27 times wider than long. Elytral suture 0.81–0.92 times shorter than pronotum. Body length: 1.9–2.3 mm. – Distribution: Europe, Asia Minor, Iran, Siberia, the Azores and the Madeira Archipelago, North Africa (Algeria, Tunisia), Cyprus, East Asia (the Far East), Central Asia (Kazakhstan, Uzbekistan), North America. In the study area, it is a generally distributed and common species

Amischa analis (Gravenhorst, 1802)

- 12 (1) Females.

- 13 (18) Posterior margin of abdominal tergite VIII very weakly rounded or nearly straight, mostly with an extraordinarily weak emargination in the middle: width of median indentation smaller than length of antennomere III in this case. In other case, posterior margin with large, mostly very weak, occasionally weak emargination in the middle: median indentation wider in proportion to width of posterior margin. Spermatheca and spermathecal duct, respectively, a little shorter in most cases: anterior section of duct usually about as long as or a little longer than spermathecal head, diameter of coiled distal part a little greater than length of anterior section.
- 14 (15) Body darkly coloured in general: palpi, antennae and legs a little darker; abdomen almost uniformly dark-coloured, posterior margin of tergites and abdominal apex, respectively, hardly lighter. Microreticulation of abdominal tergites more strong, more dense, more discernible. Posterior margin of abdominal tergite VIII very weakly rounded or nearly straight, mostly with an extraordinarily weak emargination in the middle: width of median indentation (often substantially, occasionally a little) smaller than length of antennomere III. (Posterior margin of abdominal sternite VIII ordinarily rounded, however, in a short section, nearly straight in the middle.) Spermathecal head a little larger, wider, roundish, very weakly transverse, more distinctly separated from duct in most cases; embouchement of umbilicus ordinarily directed about straight ahead (toward to head of beetle) or a little obliquely toward to the left
Amischa forcipata Mulsant et Rey, 1873.
- 15 (14) Body lightly coloured in general: palpi, antennae and legs a little lighter; abdomen not uniformly dark-coloured, posterior margin of tergites and abdominal apex, respectively, at least a little lighter. Microreticulation of abdominal tergites less fine, less dense, less discernible. Either abdominal tergite VIII different or spermathecal characteristic distinct (see at Leads 16 and 17). (Posterior margin of abdominal sternite VIII ordinarily rounded.)
- 16 (17) Spermathecal head a little smaller, narrower, rounded rectangular, about quadrate, less distinctly separated from duct in most cases; embouchement of umbilicus ordinarily directed about straight ahead (toward to head of beetle), occasionally a little obliquely toward to the right. (Posterior margin of abdominal tergite VIII nearly straight, mostly with extraordinarily weak emargination in the middle: width of median indentation a little smaller than length of antennomere III in this case. In other case, posterior margin with large, mostly very weak, occasionally weak emargination in the middle: median indentation wider in proportion to width of posterior margin.)
Amischa decipiens (Sharp, 1869)
- 17 (16) Spermathecal head a little larger, wider, roundish, very weakly transverse, more distinctly separated from duct in most cases; embouchement of umbilicus ordinarily directed obliquely toward to the left. (Posterior margin

of abdominal tergite VIII with large, mostly very weak, occasionally weak emargination in the middle.)

Amischa filum Mulsant et Rey, 1870

18 (13) Posterior margin of abdominal tergite VIII with a large, weak emargination in the middle: median indentation narrower in proportion to width of posterior margin. Spermatheca and spermathecal duct, respectively, a little longer in most cases: anterior section of duct usually substantially longer than spermathecal head, diameter of coiled distal part a little smaller than length of anterior section.

19 (20) Posterior margin of abdominal tergite VIII ordinarily with a little wider emargination in the middle. Spermathecal head a little larger, wider, roundish, very weakly transverse, more distinctly separated from duct in most cases; embouchement of umbilicus ordinarily directed about straight ahead (toward to head of beetle) or obliquely toward to the right

Amischa nigrofusca (Stephens, 1832)

20 (19) Posterior margin of abdominal tergite VIII ordinarily with a little narrower emargination in the middle. Spermathecal head a little smaller, narrower, rounded rectangular, about quadrate, less distinctly separated from duct in most cases.

21 (22) Posterior margin of abdominal tergite VIII ordinarily with a little deeper emargination in the middle; median indentation delimited with more sharp angles at both sides. Embouchement of spermathecal umbilicus ordinarily directed obliquely toward to the left or about straight ahead (toward to head of beetle)

Amischa bifoveolata (Mannerheim, 1830)

22 (21) Posterior margin of abdominal tergite VIII ordinarily with a little shallower emargination in the middle; median indentation delimited with less sharp angles at both sides. Embouchement of spermathecal umbilicus ordinarily directed obliquely toward to the right

Amischa analis (Gravenhorst, 1802)

Notes on the genus Enalodroma

The genus *Enalodroma* was described by Thomson (1859, 1861) to include the new species *Enalodroma fucicola* Thomson, 1859 (= *Homalota hepatica* Erichson, 1839). Since its original description, *Enalodroma* has usually been regarded as a distinct taxonomic unit, either as a subgenus of the genus *Atheta* Thomson, 1858 (e.g. Benick & Lohse, 1974) or as a separate genus within the tribe Athetini (e.g. Smetana, 2004). Based on a study of the mouthparts and other morphological characters, Sawada (1984) synonymised it with *Aloconota* Thomson, 1858, however, his action did not obtain general acceptance. The genus *Aloconota* has certain specialised diagnostic features missing in *Enalodroma*, namely the slightly unequal claws, the long empodial seta, the narrowly elongate, often filiform copulatory piece, etc., and most likely this is why the subsequent authors maintained

the separate status of both taxa. Nevertheless, with regard to the similarities, *Enalodroma* and *Aloconota* would have to be considered as related groups. In addition, *Enalodroma* shares various characters with the species of *Alevonota* Thomson, 1858, *Callicerus* Gravenhorst, 1802, *Chinecallicerus* Assing, 2004, *Earota* Mulsant et Rey, 1874, *Geostiba* Thomson, 1858, *Homoiocalea* Bernhauer, 1943, *Pseudosemiris* Machulka, 1935, *Pseudothinoecia* Bernhauer, 1899, *Saphocallus* Sharp, 1888 and *Tropimenelytron* Pace, 1983. The hypothesis that these taxa are closely affiliated is supported by many similarities in the mouthparts, external characters and genital morphology.

Based on an examination of the type species of *Enalodroma* and several species of *Alevonota* – *A. egregia* (Rye, 1876), *A. elegantula* (Brisout de Barneville, 1863), *A. gracilentia* (Erichson, 1839), *A. kiesenwetteri* (Kraatz, 1856), *A. laeviceps* (Brisout de Barneville, 1863), *A. libanotica* (Fagel, 1965), *A. ocaloides* (Brisout de Barneville, 1863), *A. rufotestacea* (Kraatz, 1856) – no evidence was found suggesting that they should represent distinct genera. The following basic similarities were found in case of the named taxa: posteriorly more or less constricted head with weakly delimited neck; more or less reduced occipital carinae; moderately transverse antennomeres V–X, in general; labral characters of the same type; short and slender, apically bifid ligula; weakly transverse pronotum; pronotal pubescence pattern of the same type; male secondary sexual characters of the same type (e.g. elytra on either side of suture occasionally with longitudinal carina and with irregular puncturation, etc., as well as tergite VII with a pair of oblong tubercles near posterior margin, often rudimentary or completely reduced); aedeagus and spermatheca of the same type. Neither the external characters nor the general morphology of the genitalia seem to differ significantly enough, therefore, the question arises whether the rank of *Enalodroma* should be reduced to a subgenus or a group of species of *Alevonota*.

Assing & Wunderle (2008) divided *Alevonota* into two subgenera. These have essentially been distinguished by the length of occipital carinae and the structure of the genitalia, respectively. The representatives of the nominotypical subgenus have quite short occipital carinae, copulatory piece without long, filiform apical process and spermathecal duct not twisted. The subgenus *Liota* Mulsant et Rey, 1874 has been defined by the relatively long occipital carinae, the copulatory piece with long, filiform apical process and the twisted spermathecal duct, respectively. *Homalota hepatica* constitutes a third group, having fairly short occipital carinae, copulatory piece without long, filiform apical process and spermathecal duct twisted. Although a part of the known *Alevonota* species can be classified into one of these groups, species of ambiguous status can also be found. For example, most of the Canarian representatives of the genus is excluded from the grouping of species (see Assing & Wunderle, 2008). Evidently, the system of all the species within this phylogenetic neighbourhood is insufficiently known at the present time. The status of *Enalodroma* can be decided only based on a thorough revision and will have to be considered in future studies.

It should be noted that the genus *Geostiba* also very closely resembles *Alevonota*. The species of both genera share the following characteristics: posteriorly more or less constricted head with weakly delimited neck; moderately large to small, often reduced eyes; more or less reduced occipital carinae; moderately transverse antennomeres V–X, in general; short and slender, apically bifid ligula; weakly transverse pronotum, in most cases; pronotal pubescence pattern

of similar type (microsetae directed posteriorly in pronotal midline, rarely except for a short section at anterior margin); metatarsomeres I and II of subequal length, in most cases; aedeagus and spermatheca of similar type. It seems that the only reliable character distinguishing them is the pattern of the elytral pubescence. In case of *Alevonota* species, the microsetae directed more or less posterolaterally on the elytral disc, while in case of *Geostiba* species those directed posteriorly or (in males of certain species) slightly toward the suture. The classification of the genera *Alevonota* and *Geostiba* is difficult due to the great similarity of species and the paucity of distinctive features. Although, it is almost certain that both groups are phylogenetically separated, a complete review of the species is desired to find additional characters, which should provide an easy means of separation.

Discussion of the status of Oxypodera and Mycetota

Recently, Pace (2004) placed *Atheta kilimandjarensis* Bernhauer, 1915 and *Homalota fimorum* Brisout de Barneville, 1860 together in the subgenus *Oxypodera* Bernhauer, 1915, which he referred to the genus *Atheta*. The only common character indicated by Pace is the morphology of the spermatheca. *Atheta kilimandjarensis* is the type species of the subgenus *Oxypodera* Bernhauer, 1915, while *Homalota fimorum* belongs to the subgenus *Mycetota* Ádám, 1987. The systematic position and taxonomic status of *Oxypodera* and *Mycetota* are not clear at present. Both belong to the genus *Atheta*, both have a separate status, and share various characters with the species of *Acrotona* Thomson, 1859 and *Mocyta* Mulsant et Rey, 1874. The position and status of *Acrotona* and *Mocyta* are also not entirely clear. Both are treated as distinct genera by some authors or as subgenera of *Atheta* and *Acrotona*, respectively, by others.

From many genera of the tribe Athetini, *Oxypodera* and *Mycetota* are distinguished especially by the deflected pronotal hypomera (which are not visible in lateral aspect) and the characteristic shape of the spermatheca. A closer relationship to *Acrotona* and *Mocyta*, as presumed by some authors because of the similar diagnostic features, seems more or less likely. In addition, *Coprothassa* Thomson, 1859, *Hemitropia* Mulsant et Rey, 1874 and *Lypoglossa* Fenyés, 1918 are also similar to these groups, even share the morphology of pronotum, etc.

After a thorough examination of the type species and some other representatives of both taxa, there is at least some doubt that *Oxypodera* and *Mycetota* together should form a monophyletic group. Nevertheless, the hypothesis that they are phylogenetically closely affiliated is supported by numerous characters, for example, the pronotal pubescence pattern of the same type, the similar male secondary sexual characters on the abdominal tergite VIII (it may be subject to reduction) and the similar morphology of the genitalia. However, there are some significant characters distinguishing *Oxypodera* from *Mycetota*, especially the conspicuous medial macroseta on mesotibia, the short metatarsal segment I and the remarkably formed spermatheca. (In *Oxypodera*, the medial macroseta of mesotibia is 1.6–1.8 times longer than the tibial width and the metatarsal segment I is a little shorter than segment II. In *Mycetota*, the medial macroseta of mesotibia is about as long as the tibial width and the metatarsal segment I is about as long as segment II.) Consequently, it appears to be best to regard *Oxypodera* and *Mycetota* as closely allied but separate groups for the present.

The current knowledge of the diversity and distribution of *Oxypodera* and *Mycetota* is far from complete. The number of species known from various zoogeographic regions is difficult to assess. Not only a recent synopsis is absent but, due to the morphological similarity of many athetine groups, the subgeneric affiliations of the species currently attributed to *Oxypodera*, etc. require confirmation. This applies even more to the species described from the Afrotropical and the Oriental region and currently attributed to the subgenus *Xenota* Mulsant et Rey, 1874 (see, for example, Pace, 1995).

Today, *Oxypodera* includes approximately 20 valid species occurring primarily in East Africa. They have, as a rule, relatively small eyes, short elytra and hind wings more or less reduced in length. Most of them can be assumed to be endemic to individual mountain ranges or mountain peaks but many of them have been recorded only once or very rarely, so that their areas of distribution are poorly known. It can be inferred from the descriptions that *Oxypodera* is likely to represent a polyphyletic taxon. In view of the fact that most of the species have not been thoroughly examined, a change in the subgeneric assignments of the species currently attributed to *Oxypodera* seems too precocious at present.

Mycetota has a worldwide distribution, with species occurring in the Palaearctic, Nearctic, Oriental, Afrotropical and Neotropical regions (e.g. Feldmann, 2007; Pace, 2006; Smetana, 2004). Currently, a few species have been placed in this group, two of them, namely *Atheta laticollis* (Stephens, 1832) and *A. fimorum* (Brisout de Barneville, 1860) confined to the Western Palaearctic and one (*Atheta grata* Cameron, 1933) to the Eastern Palaearctic subregion. Two species, *Atheta mucronata* (Kraatz, 1859) and *A. immucronata* Pace, 1999 have a cosmopolitan distribution, inhabiting predominantly the tropical and subtropical zones of the Old and New World, respectively (e.g. Feldmann, 2007; Pace, 2006). They are present jointly, the latter probably as an introduced species, in some Atlantic islands and in the coastal region of Europe with Atlantic-Mediterranean climate. *Atheta immucronata* even occurs in the Tristan da Cunha Archipelago (Klimaszewski et al., 2002; Pace, 2006). Several species currently attributed to other athetine subgenera, especially *Xenota*, probably also belong to *Mycetota*.

On the distinguishing of Pella laticollis and P. hampei

Pella laticollis (Märkel, 1845) and *P. hampei* (Kraatz, 1862) have usually been considered as very similar but distinct species (see, for example, Maruyama, 2006). However, my studies of a large material (more than 120 specimens) collected from various localities revealed that the names in question referred probably to the same species. I have seen a few of the paralectotypes of *Myrmedonia hampei* (HNHM), however, the type material of *M. laticollis* was not examined. The distinctive characters of the species in question (e.g. body colour, pronotal microreticulation) are very variable. It seems that they depend upon the geographical situation of the locality. Amongst the relative few North and Central European specimens, which I have seen, the body colour is normally dark, and the pronotum is more or less dull. However, in case of specimens from Hungary, Romania and especially from the Balkans, the colour is very variable, dark in some and light in others. The light coloured specimens are rare in the northern areas, while they are prevalent in the southern territories (e.g. South Hungary, the Southern Carpathians in Romania, as well as Serbia and Croatia). The pronotal

microreticulation is also variable, nevertheless, the darkly coloured specimens have most often dull pronotum with more pronounced microreticulation. It seems that the body colour, the pronotal microreticulation, as well as other characters like the antennal width, the number of macrosetae on the abdominal sternite VIII, the genitalia, as well as the symbiotic hosts (see Maruyama, 2006) are insufficient to separate the two species. I have seen plenty of specimens, both darkly and lightly coloured ones, collected from the nests of *Lasius fuliginosus* and *Liometopum microcephalum*, respectively, and I found no convincing differences between them. Examination of the aedeagi did also not reveal any differences. In conclusion, there is little doubt that the named taxa are conspecific.

Notes on various athetine species

***Atheta boehmei* Linke, 1934**

Atheta (Atheta) böhmei Linke, 1934: 54.

Atheta (Anopleta) tricholomatobia V. B. Semenov, 2002: 273, **syn. n.**

Linke (1934) described *Atheta böhmei* on the basis of six specimens from “Leipziger Umgebung”, Germany. *Atheta tricholomatobia* was described from three species from “Moskauer Gebiet, die Rayon Taldom, Mel’dino”, Russia (Semenov, 2002). The types were not examined, however, the descriptions were in good agreement with one another, especially regarding the conspicuous antennal characters. Since there is little doubt that *Atheta böhmei* and *A. tricholomatobia* are conspecific, so these names are considered synonyms.

Atheta boehmei is an extremely rare species occurring sporadically in Central, East and Southeast Europe: Austria (Lower Austria), Germany (Hessen, Sachsen) and Russia. I have seen a specimen from Brassó (= Braşov, Transylvania, Romania) (leg. Fodor) (HNHM), and *recorded here from Romania for the first time*.

***Atheta dilaticornis* (Kraatz, 1856)**

Homalota dilaticornis Kraatz, 1856: 293.

Atheta (Ceritaxa) palatina G. Benick in Benick & Lohse, 1974: 171, **syn. n.**

Atheta (Ceritaxa) palatina G. Benick, 1975: 15, nec G. Benick, 1974, **syn. n.**

The original description of *Atheta palatina* is based on two female specimens (syntypes) collected at “Pfalz (Appenhofen)”, Germany (Benick in Benick & Lohse, 1974). In 1975, the type locality was specified equally as “Appenhofen, Pfalz” (Benick, 1975). One of the types was located in the MHNG collection, and I examined it. This is in agreement with the present interpretation of *Atheta dilaticornis* in every respect, therefore, I consider *Atheta palatina* to be a synonym of *Homalota dilaticornis*.

It should be noted that in 1974, the name *Atheta palatina* had unintentionally been published before the formal description was issued in 1975. On the first occasion, Benick made this name available in a diagnostic key that constitutes a description. Many other names were also published by the author in the same paper (Benick & Lohse, 1974), namely *Atheta degenerata*, *A. delecta*, *A. excisoides*, *A. exsecta*, *A. fagi*, *A. glabra*, *A. immixta*, *A. machulkai*, *A. minox*, *A. muelleri*, *A. nuda*,

A. pervagata, *A. similata*, *A. tuingensis*, *A. viennensis* and *A. wallisi*. According to the Code (ICZN 1999), all these names have been made available in 1974 (Benick & Lohse, 1974). The corresponding names published in 1975 are homonyms and also objective synonyms. All the later citations (e.g. Smetana, 2004) were made under the assumption that the names in question were first published in 1975. Their previous usage by Benick and Lohse (1974) was overlooked or ignored (probably the names were thought unavailable).

The publication date of *Atheta abruzziana*, *A. dubiosa* and *A. elegans* has usually been quoted as 1935 (e.g. Smetana, 2004). The names in question were validated in the second part of Benick's work in 1934, though the formal description followed in 1935 (see Benick, 1934, 1935). Although this was not intended to be the first publication of the names, they seem to have been made available the first time around.

Atheta testaceipes (Heer, 1839)

Homalota testaceipes Heer, 1839: 327.

Atheta (*Ceritaxa*) *degenerata* G. Benick in Benick & Lohse, 1974: 170, **syn. n.**

Atheta (*Ceritaxa*) *degenerata* G. Benick, 1975: 17, nec G. Benick, 1974, **syn. n.**

Benick (in Benick & Lohse, 1974) based the original description of *Atheta degenerata* on a male specimen (the holotype) from "Krain". One year later (Benick 1975), he specified the type locality as "Bled. Carn.", Slovenia. The main distinguishing characters indicated by Benick are the body size, the shape of the posterior margin of abdominal tergite VIII and the shape of the aedeagus. A comparison of all available males in HNHM revealed that the conditions in the type of *Atheta degenerata* (MHNG) and in the normally developed *A. testaceipes* are linked by some transitions, suggesting that the referred features are subject to variation in a degree. The degenerated form of the tergite VIII in the type is accounted for by the fact that it is a small male with very weakly pronounced secondary sexual character, an uncommon phenomenon in this species. No appreciable difference was found in the morphology of the aedeagus. Consequently, *Atheta degenerata* is here placed in the synonymy of the senior name *Homalota testaceipes*.

Atheta velebitica nom. nov.

Atheta (*Atheta*) *serotina* Ádám, 2008: 157, nec *Atheta serotina* Blackwelder, 1944: 161 (as "serotinus")

After the recent description of *Atheta serotina* from Croatia (Ádám, 2008), A. F. Newton (Chicago) kindly made me aware of the fact that the name was a junior primary homonym of *Atheta serotina* Blackwelder, 1944, currently attributed to the genus *Leptonia* Sharp, 1883. Therefore, I here propose the name *Atheta velebitica* nom. nov. for *Atheta serotina* Ádám, 2008, nec *Atheta serotina* Blackwelder, 1944. The name refers to the area (*Velebit Mountains*), where the known specimens were collected.

*Description of a new species****Rhopaletes slavoniae* sp. n.**
(Figs 2 A-G, 3 A-F)

Type material. *Holotype* (male): “Ludbreg, Apfelbeck”, Croatia. *Paratypes* (one male and one female): same data as the holotype. The types are deposited in the Hungarian Natural History Museum, Budapest.

Description.

Body length 1.8–2.1 mm. Length of forebody 0.90–0.91 mm. Pronotal width about 0.40, length 0.33 mm.

Body more or less unicoloured. Head, pronotum, elytra and abdomen reddish yellow. Antennae and legs light reddish yellow.

Body weakly fusiform. Surface with fairly superficial or obsolete microreticulation, and with more or less reclinate pubescence. Forebody finely coriaceous, with fine microreticulation of weakly transverse meshes, surface weakly shining. Abdomen a little more shining, with obsolete, almost indiscernible microreticulation of transverse meshes, and with characteristic imbricate sculpture. Vertex, pronotum and elytra with moderately dense and more or less asperate puncturation. Punctures on vertex indistinct, very fine, hardly asperate, obsolescent in the middle, difficult to see among microreticulation, and distinctly smaller than interstices. Puncturation of pronotum less fine, and more distinctly visible than that of head; punctures somewhat obsolete, faintly asperate, and smaller than interstices. Elytra with somewhat obsolete, and finely asperate puncturation, which a little stronger than that of pronotum; punctures on average smaller than interstices. Abdominal tergites III–V finely and less densely punctured; puncturation becoming finer and sparser toward abdominal apex; punctures, especially on last tergites smaller than interstices.

Head weakly transverse (Fig. 3 A), 1.10–1.20 times wider than long (length measured from anterior margin of clypeus), with rounded posterior angles. Frontoclypeal suture present as fine, transversal line. Vertex with pubescence directed anterolaterally. Surface slightly flattened, especially in males. Eyes absent. Temples fully margined; occipital carinae extend from occipital region to hypostoma. Neck broad, poorly delimited.

Antennae relatively short and stout (Fig. 3 E), distinctly incrassate apically. Antennomeres II and III elongate. Antennomere III much shorter than II. Antennomeres IV–X increasing in width apically. Antennomere IV weakly transverse, at most about 1.3 times wider than long, X strongly transverse, 2.3–2.5 times wider than long. Antennomere XI suboval and barely longer than combined length of antennomeres IX and X.

Pronotum weakly transverse (Fig. 3 B), about 1.22 times wider than long, and 1.16–1.22 times wider than head. Surface slightly convex, with vague transverse impression in the middle, near posterior margin. Posterior margin, though in small degree, obtusely angled in the middle. Posterior angles feebly marked, obtuse. Microsetae directed posteriorly along midline, and posterolaterally in lateral portion on disc (type V; see Höeg, 1945). Hypomera fully but narrowly visible in lateral view.

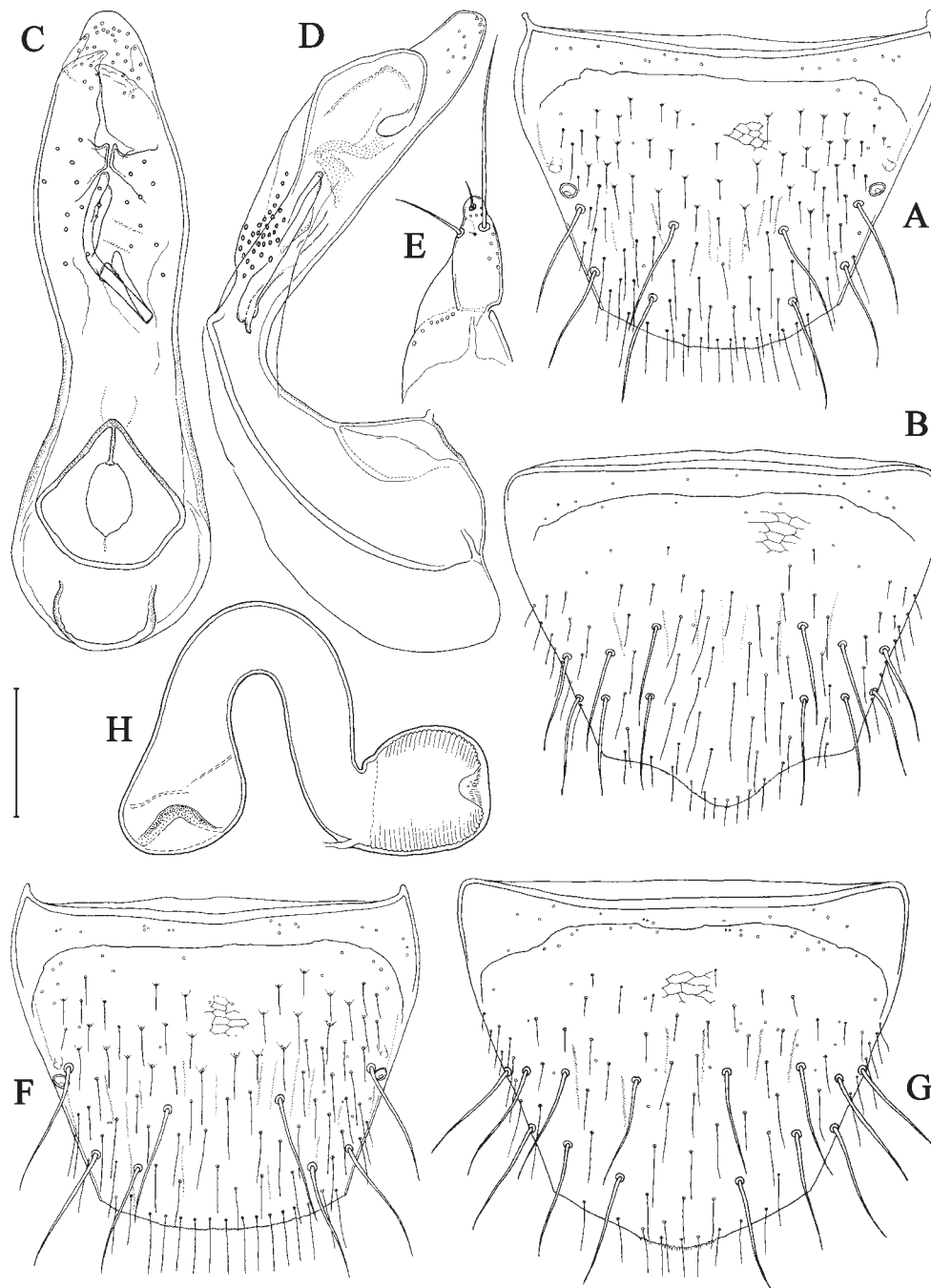


Fig. 2 - *Rhopaletes slavoniae* sp. n.: A, male tergite VIII; B, male sternite VIII; median lobe of aedeagus: C, ventral view; D, lateral view; E, apex of paramere; F, female tergite VIII; G, female sternite VIII; H, spermatheca. Scales (in mm): A, B, F, G, 0.1; C-E, H, 0.057.

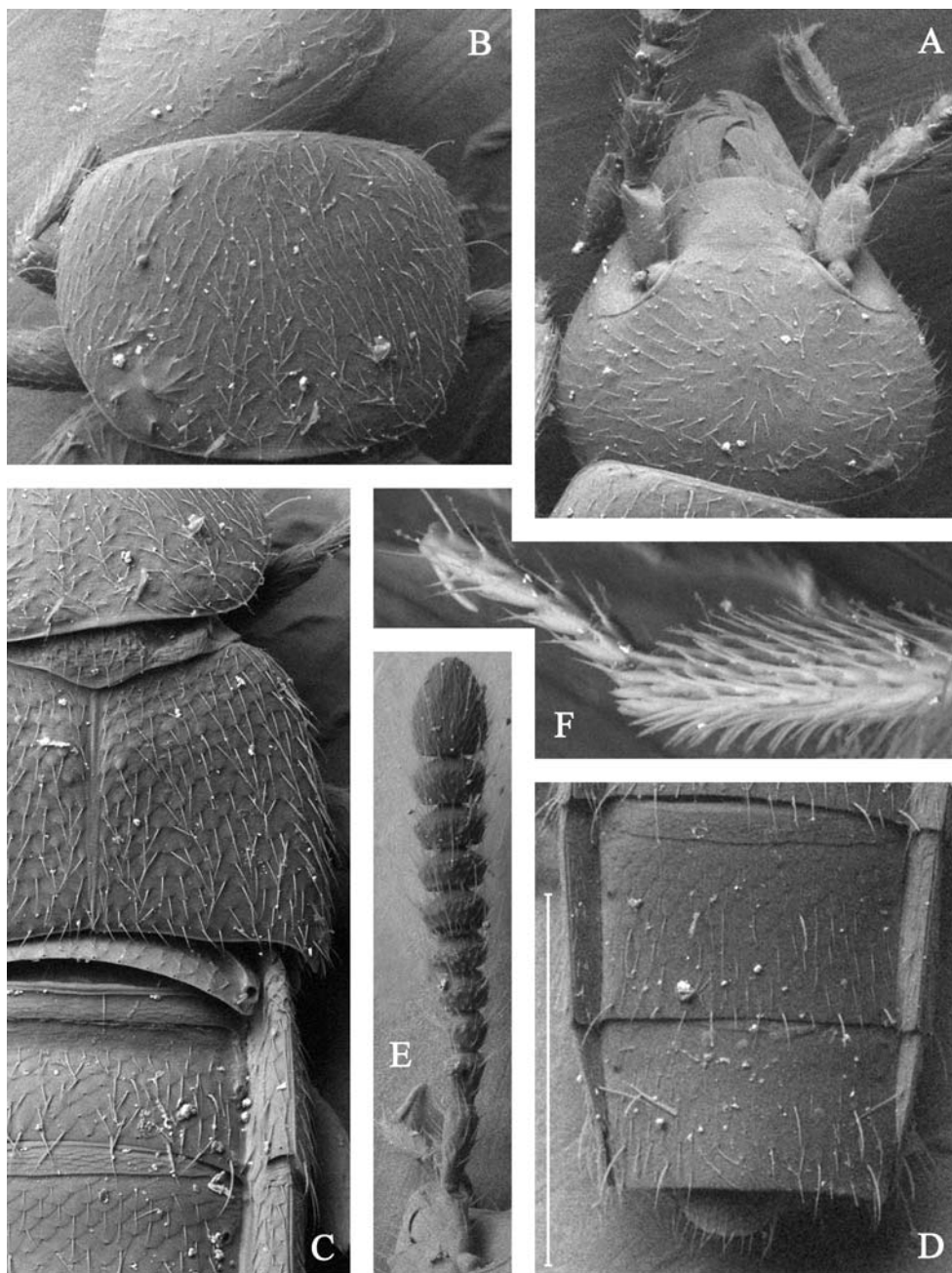


Fig. 3 - *Rhopaletes slavoniae* sp. n.: A, head; B, pronotum; C, elytron; D, abdominal tip; E, antenna; F, protarsus and protibia (scanning electron micrographs, vacuum 25 Pa, voltage 25 kV, uncoated). Scales (in mm): A, 0.31; B, C, E, 0.35; D, 0.50; F, 0.17.

Elytra wider (Fig. 3 C), and at suture (measured from apex of scutellum to inner apical angles) 0.69–0.74 times shorter than pronotum, either with a small, oblong, hardly elevated knob close to suture, nearer to sutural angle. Microsetae directed more or less posteriorly on disc. Posterior margin near posterolateral angle barely emarginate. Wings reduced.

Legs relatively short. Tarsal segmentation 4-5-5. Each tarsus with one empodial seta shorter than claws. Tarsal claws of similar length, external claw about as long as internal one. Protarsus and protibia: fig. 3 F. Medial macroseta of mesotibia hardly discernible among microsetae, about as long as tibial width. Metatarsus distinctly shorter than metatibia. First metatarsomere about as long as second, and much shorter than combined length of second and third metatarsomeres. Last metatarsomere much longer than first.

Abdomen more or less fusiform, widest at segment IV, slightly narrower than elytra. Abdominal tergite III with shallow transverse basal impression. Abdominal tip: fig. 3 D. Posterior margin of tergite VII with rudimentary white fringe.

Male: posterior margin of abdominal tergite VIII rounded (Fig. 2 A). Abdominal sternite VIII a little longer than tergite VIII. Posterior margin of sternite VIII obtusely pointed in the middle, with row of thin and short setae (Fig. 2 B). Median lobe of aedeagus is of similar morphology as other species of the genus (see, e.g. Pace, 1975), without dorsal bridge, and with unmodified ventral process (Fig. 2 C-E).

Female: posterior margin of abdominal tergite VIII rounded (Fig. 2 F). Abdominal sternite VIII barely longer than tergite VIII. Posterior margin of sternite VIII obtusely produced in the middle, with row of short setae, which stouter than in male (Fig. 2 G). Spermatheca of similar morphology as in other species of genus (see, Pace, 1975), with small umbilicus, and with relatively long duct (Fig. 2 H).

Comparative notes.

Rhopaletes slavoniae is closely related, and in all features very similar to the other Western Palaearctic representatives of the genus. Nevertheless, it can be readily distinguished from any known European species by the following combination of characters: eyes are completely absent; posterior margin of pronotum, though in a small degree, obtusely angled in the middle; either elytron with a small, oblong, hardly elevated knob close to the suture, nearer to the sutural angle; abdominal tergites with obsolete, almost indiscernible microreticulation, as well as with distinct imbricate sculpture and fairly well-visible puncturation; only tergite III has a shallow transverse basal impression; posterior margin of sternite VIII obtusely pointed (male) or produced in the middle (female). The spermatheca of *Rhopaletes slavoniae* is very similar in shape to that of *Rh. bericus* (Pace, 1975). The difference between the males of the named taxa in the shape of aedeagus is also insignificant. For an illustration of the genitalia of *Rhopaletes bericus*, see Pace (1975).

Comments.

The genus *Rhopaletes* Cameron, 1939 belonging to the subtribe Thamiaracina Fenyes, 1921 is currently represented by six species, four of them confined to the Western Palaearctic and two to the Eastern Palaearctic subregion (Smetana, 2004; the present paper). The species are micro- or anophthalmous, have reduced hind wings, and are locally endemic to the southern slopes of the Himalayas, the Alps and the Dinaric Mountains. All representatives of the genus seem to have a subterranean

habitat. The species are usually collected only by methods such as soil sifting and soil washing.

Owing to the highly derived morphology of *Rhopaletes* species, which can be explained as the result of an adaptation to subterranean habitats, their phylogenetic affiliations are difficult to assess based on morphological data alone. As can be concluded from the statements below, *Rhopaletes* is not very likely to be closely allied to *Thamiaraea* Thomson, 1858 (and *Thamiaraeina*, respectively), with which it shares a few characters. The hypothesis that the named genera are phylogenetically closely affiliated is virtually supported only by the fact that in case of their species, the labial palpomeres I and II are fused. *Rhopaletes* is characterised by numerous obvious features separating the genus from *Thamiaraea*, especially the differently shaped ligula and labial palpi, the presence of frontoclypeal suture, the different pubescence pattern of pronotum, the absence of an anterior transverse impression of abdominal tergites IV–V, the different genital morphology, etc.

Rhopaletes shares several characters with the genus *Geostiba* Thomson, 1858, especially the relatively short and stout antennae, the morphology of pronotum and elytra, the similar pubescence pattern of pronotum, etc. However, its other features such as the presence of frontoclypeal suture, the broad, poorly delimited neck, the fully margined temples, the absence of an anterior transverse impression of abdominal tergites IV–V, the different genital characters, etc. are distinctive. The genus *Platyola* Mulsant et Rey, 1875 has also similar morphology, sharing the subsequent features with *Rhopaletes*: the visible frontoclypeal suture, the relatively short and stout antennae, the pronotal pubescence pattern of the same type, the absence of an anterior transverse impression of abdominal tergites IV–V, the similar morphology of the genitalia, etc. (On the basis of near resemblance, Pace, in 2005, placed *Rhopaletes* in synonymy with *Platyola*.) However, the similarities are in conflict with other characters, for example, the pronotal hypomera of *Platyola* species are not visible in lateral view. *Platyola* and *Rhopaletes* are probably separate genera, all the same a closer relationship of them is quite obvious.

The systematic position of *Platyola* and *Rhopaletes* is not clear at present, although they have been classified into the tribe Athetini Casey, 1910. Based on the evidence currently available, it can not be decided with sufficient certainty whether they are more closely allied to the subtribe *Thamiaraeina* or to *Athetina*.

Etymology. The name refers to the historical territory (*Slavonia*), where the known specimens were collected. (Slavonia, in geographical sense, is a much smaller region between the rivers Drave and Save, close to the Danube river.)

Distribution and bionomics. At the moment, *Rhopaletes slavoniae* is known only from Ludbreg, the type locality, from surroundings of the Kalnik Mountains in Croatia. The distribution of this species is presumably restricted to the Western Balkan region. There is no information available about its ecology.

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OBSERVAȚII ASUPRA UNOR ALEOCHARINAE EUROPENE, CU DESCRIEREA UNEI NOI SPECII DE *RHOPALETES* DIN CROAȚIA (COLEOPTERA: STAPHYLINIDAE)

REZUMAT

Pornind de la studierea materialului tip și a altor materiale, au fost sinonimizate denumirile a zece specii: *Atheta mediterranea* G. Benick, 1941, *Aloconota carpathica* Jeannel et Jarrige, 1949 și *Atheta carpatensis* Tichomirova, 1973 cu *Aloconota mihoki* (Bernhauer, 1913); *Amischa jugorum* Scheerpeltz, 1956 cu *Amischa analis* (Gravenhorst, 1802); *Amischa strupii* Scheerpeltz, 1967 cu *Amischa bifoveolata* (Mannerheim, 1830); *Atheta tricholomatobia* V. B. Semenov, 2002 cu *Atheta boehmei* Linke, 1934; *Atheta palatina* G. Benick, 1974 și *Atheta palatina* G. Benick, 1975 cu *Atheta dilaticornis* (Kraatz, 1856); *Atheta degenerata* G. Benick, 1974 și *Atheta degenerata* G. Benick, 1975 cu *Atheta testaceipes* (Heer, 1839). Un nou nume, *Atheta velebitica* nom. nov., este propus pentru *Atheta serotina* Ádám, 2008, un omonim primar junior al *Atheta serotina* Blackwelder, 1944. Este prezentată și o cheie de determinare revizuită a speciilor central-europene ale grupului *Aloconota sulcifrons*. De asemenea, sunt făcute comentarii asupra separării masculilor de *Amischa bifoveolata* și *A. analis*. Este prezentată și o cheie de determinare a speciilor de *Amischa* colectate din Ungaria și din împrejurimi. Sunt făcute observații asupra relațiilor genurilor *Alevonota* Thomson, 1858 și *Enalodroma* Thomson, 1859. Statutul taxonomic al genurilor *Oxypodera* Bernhauer, 1915 și *Mycetota* Ádám, 1987 este pus în discuție. De asemenea, este dezbătut și statutul specific al speciei *Pella hampei* (Kraatz, 1862). Sunt prezentate observații asupra relațiilor lui *Alevonota* Thomson, 1858, precum și cele ale lui *Mycetota* Ádám, 1987, *Oxypodera* Bernhauer, 1915 și *Rhopaletes* Cameron, 1939. Sunt discutate datele publicate ale mai multor specii de *Atheta*, descrise de G. Benick. *Aloconota mihoki*, *Amischa forcipata*, *A. filum* și *Atheta boehmei* sunt menționate pentru prima oară din Ungaria, Croația și România. Este descrisă o nouă specie, *Rhopaletes slavoniae* sp. n., din Croația.

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CONTRIBUTIONS TO THE KNOWLEDGE OF ROVE BEETLES (COLEOPTERA: STAPHYLINIDAE) FROM “PLAIUL FAGULUI” STATE NATURE RESERVE, REPUBLIC OF MOLDOVA

SVETLANA BACAL, ALEXANDER DERUNKOV

Abstract. The paper represents the first contribution to the knowledge of the rove beetle fauna from the “Plaiul Fagului” State Nature Reserve. The identified specimens belong to 5 subfamilies and 12 genera. From the 14 identified species within the area, 8 species are recorded from the Republic of Moldova for the first time: *Atheta marcida* (Erichson, 1837), *Dinaraea aequata* (Erichson, 1837), *Geostiba circellaris* (Gravenhorst, 1806), *Lordithon trinotatus* (Erichson, 1839), *Tachinus rufipes* (Linnaeus, 1758), *Tachyporus transversalis* Gravenhorst, 1806, *Anthobium atrocephalum* (Gyllenhal, 1827) and *Lathrobium longulum* Gravenhorst, 1800. The genera *Geostiba* and *Anthobium* were recorded for the first time in the Republic of Moldova.

Résumé. Le travail présente la première contribution à la connaissance de la faune de Staphylinides de la Réserve Naturelle d'État „Plaiul Fagului”. Les espèces identifiées appartiennent à 5 sous-familles et 12 genres. Parmi les 14 espèces identifiées dans la zone, 8 sont enregistrées dans la République de Moldova pour la première fois: *Atheta marcida* (Erichson, 1837), *Dinaraea aequata* (Erichson, 1837), *Geostiba circellaris* (Gravenhorst, 1806), *Lordithon trinotatus* (Erichson, 1839), *Tachinus rufipes* (Linnaeus, 1758), *Tachyporus transversalis* Gravenhorst, 1806, *Anthobium atrocephalum* (Gyllenhal, 1827) et *Lathrobium longulum* Gravenhorst, 1800. Les genres *Geostiba* et *Anthobium* sont enregistrés pour la première fois dans la République de Moldova.

Key words: Coleoptera, Staphylinidae, “Plaiul Fagului” State Nature Reserve, Republic of Moldova.

INTRODUCTION

The information on the species of the family Staphylinidae is rare in the Republic of Moldova. Some data are included in the papers of Adashkevich (1972), Neculiseanu (1984) and Stan & Bacal (2006).

The study was carried out in the “Plaiul Fagului” State Nature Reserve, located in North-West of the Central Moldavian Plateau, 70 km from Chişinău. The Reserve covers an area of 5642 ha and has a rugged landscape with an altitude range between 150 – 410 m. The steep slopes deformed by sliding, with a 30° inclination, are prevalent here. The vegetation is formed of typical forest plants of Central Europe. The brown soils are predominant under the oak and beech forests, on the top of the hills of the altitude range of 280 – 410 m. The podzol soils formed under the oaks, on the slopes in the altitude range of 140 – 300 m (Ursu, 2005). The material identification is based on the feature of the external morphology. For the identification and geographical distribution of the species we used the following studies: Lohse (1964, 1974), and Löbl & Smetana (2004).

MATERIAL AND METHOD

The material was extracted from decomposed wood, in February and May 2009, in the “Plaiul Fagului” State Nature Reserve (47°18'N, 28°04'E). The specimens were collected by hand, on spot, or using flotation method, in laboratory.

The insects are preserved in the Entomology Museum of ASM, Chişinău, Republic of Moldova.

RESULTS AND DISCUSSIONS

The extracted rove beetles belong to 14 species. The identified species are cited according to the subfamilies and genera they belong to, with indication of the distribution data and some ecological characteristics (the new recorded species for the Republic of Moldova are marked by one asterisk, new recorded genera – by two asterisks):

Family Staphylinidae Latreille, 1802
Subfamily Aleocharinae Fleming, 1821
****Atheta marcida*** (Erichson, 1837)

Material: 1 spec., 16.02.2009.

Ecology: eurytopic mycetophylous forest species, frequently in the floodplain forests, in the decayed autumn mushrooms.

Distribution: Europa, North Africa and India.

Aleochara bipustulata (Linnaeus, 1760)

Material: 1 ♀, 29.05.2009.

Ecology: ubiquitous, mostly coprophilous species, in animal dung, in the decaying plant remnants, in decaying fungi, common.

Distribution: Transpalaeartic.

****Dinaraea aequata*** (Erichson, 1837)

Material: 1 spec., 16.02.2009.

Ecology: eurytopic xylobiontic species, under bark of dead broad-leaf wood, in bracket fungi (*Fomes*, *Polyporus*, *Trametes*, *Ganoderma* etc.).

Distribution: Europa and Siberia.

*****Geostiba circellaris*** (Gravenhorst, 1806)

Material: 4 specs, 16.02.2009.

Ecology: eurytopic species with the wide ecological amplitude, very common in moss and grass litter of both woodland and pastureland, myrmecophilous as a rule.

Distribution: Transpalaeartic, Nearctic (introduced).

Oxypoda abdominalis (Mannerheim, 1830)

Material: 1 spec., 16.02.2009.

Ecology: the eurytopic xerophilous species, very common in the forest and meadow litter on the sandy soils, frequently myrmecophilous.

Distribution: Transpalaeartic.

Subfamily Tachyporinae MacLeay, 1825
****Lordithon trinotatus*** (Erichson, 1839)

Material: 1 spec., 16.02.2009.

Ecology: eurytopic mycetophylous forest species, in a variety of woodland fungi in autumn.

Distribution: Transpalaeartic.

Mycetoporus eppelsheimianus Fagel, 1968

Material: 1 spec., 16.02.2009.

Ecology: stenoecic forest species, inhabits mostly deciduous, but also the mixed forests, in the forest litter, in moss.

Distribution: Europa (mostly the Central and South).

****Tachinus rufipes*** (Linnaeus, 1758)

Material: 1 spec., 16.02.2009.

Ecology: ubiquitous saprophilous species, widespread and very common in moss and grass litter and in cow and horse dung.

Distribution: Transpalaeartic, Nearctic (introduced).

Tachyporus hypnorum (Fabricius, 1775)

Material: 2 specs, 16.02.2009.

Ecology: ubiquitous, humicolous, muscicolous, phytodetriticolous.

Distribution: Transpalaeartic.

Tachyporus solutus Erichson, 1839

Material: 3 specs, 16.02.2009.

Ecology: eurytopic, mostly xerophilous, humicolous, phytodetriticolous, in different open biotopes.

Distribution: Transpalaeartic.

****Tachyporus transversalis*** Gravenhorst, 1806

Material: 1 spec., 16.02.2009.

Ecology: stenoecic sphagnum bog species.

Distribution: Europe, Russia, Afghanistan and Nearctic.

Subfamily Omaliinae MacLeay, 1825

*****Anthobium atrocephalum*** (Gyllenhal, 1827)

Material: 1 spec., 16.02.2009.

Ecology: hygrophilous, humicolous, phytodetriticolous, a forest species, prefer the wet forests, frequently floodplain alder forests, locally distributed in durable leaf litter mostly in birch woods.

Distribution: Transholartic.

Subfamily Paederinae Fleming, 1821

****Lathrobium longulum*** Gravenhorst, 1800

Material: 2 specs, 16.02.2009.

Ecology: eurytopic hygrophilous species, in bogs of different types, on the riverbanks and lakeshores, very common.

Distribution: Transpalaeartic.

Subfamily Staphylininae Latreille, 1802
Philonthus decorus (Gravenhorst, 1802)

Material: 1 spec., 16.02.2009.

Ecology: eurytopic hygrophilous species, one of the dominant ones in moss in woods and wetlands.

Distribution: Transpalaeartic.

The identified specimens belong to 5 subfamilies and 12 genera. Most species belong to the subfamily Tachyporinae – 6 species of 4 genera. From the subfamily Aleocharinae, 5 species were recorded which belong to 5 genera. The subfamilies Omaliinae, Paederinae and Staphylininae are represented by a genus with a single species each. For the first time, in the “Plaiul Fagului” State Nature Reserve 14 rove beetle species were found in decomposing wood. Two genera, *Geostiba* and *Anthobium*, and 8 species are recorded for the first time in the Republic of Moldova.

The species extracted from the decomposed wood, from the “Plaiul Fagului” State Nature Reserve are, in fact, species with a large area of distribution in the Palaearctic region mostly, also they are characterized by a high ecological plasticity including fungicolous, phytodetriticolous, muscicolous, silvicolous species.

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CONTRIBUȚII LA CUNOAȘTEREA STAFILINIDELOR (COLEOPTERA: STAPHYLINIDAE) DIN REZERVAȚIA NATURALĂ DE STAT “PLAIUL FAGULUI”, DIN REPUBLICA MOLDOVA

REZUMAT

Lucrarea prezintă prima contribuție la cunoașterea coleopterelor stafilinide din Rezervația Naturală de Stat “Plaiul Fagului”. Speciile identificate fac parte din 5 subfamilii și 12 genuri. Din cele 14 specii identificate din această rezervație 8 sunt citate pentru prima dată în fauna Republicii Moldova: *Atheta marcida* (Erichson, 1837), *Dinaraea aequata* (Erichson, 1837), *Geostiba circellaris* (Gravenhorst, 1806), *Lordithon trinotatus* (Erichson, 1839), *Tachyporus transversalis* Gravenhorst, 1806, *Tachinus rufipes* (Linnaeus, 1758), *Anthobium atrocephalum* (Gyllenhal, 1827) și *Lathrobium longulum* Gravenhorst, 1800. Genurile *Geostiba* și *Anthobium* sunt la prima semnalare în Republica Moldova.

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**PALAEARCTIC LONGHORN BEETLES (COLEOPTERA:
CERAMBYCIDAE) FROM “DR. KARL PETRI” COLLECTION
OF THE NATURAL HISTORY MUSEUM OF SIBIU (ROMANIA).
PART I: LEPTURINAE SUBFAMILY**

IOAN TĂUȘAN, CORNELIU BUCȘA

Abstract. The paper consists of data on 69 Palaearctic Cerambycidae species of the Lepturinae subfamily from the “Dr. Karl Petri” collection of the Natural History Museum from Sibiu. Dr. Karl Petri collected an important part of the material. Most of the specimens were collected from Romania, mainly from Transylvania.

Résumé. Le document comprend des données sur les 69 espèces de Cerambycidae paléarctiques de la sous-famille Lepturinae de la collection “Dr. Karl Petri” du Musée d’histoire naturelle de Sibiu. Dr. K. Petri a recueilli une partie importante du matériel. La plupart des exemplaires sont originaires de Roumanie, principalement de Transylvanie.

Key words: longhorn beetles, systematical inventory, natural heritage, Transylvania.

INTRODUCTION

Longhorn beetles have been studied in Romania and particularly in Transylvania since early 1890’s, when Seidlitz published in 1891, „Fauna Transsylvanica”. Comprehensive catalogues on Coleopterans were undertaken by Petri (1912, 1925-1926), studies which were an important database for the knowledge of the Romanian beetles fauna.

More recent, museum catalogues on longhorn beetles were undertaken by Chimișliu (1990-1993), Serafim (2005, 2006, 2007, 2009) and Tăușan & Bucșa (2010).

Karl Robert Petri (1852–1932), born in Sighișoara, was a naturalist by formation, specialized in important European universities. He had important professors like, E. Haeckel, E. Strassburger and R. Leuckart. Karl Petri was correspondent member of the Entomological Society of Budapest (Entomologischen Gessellschaft in Budapest) and member of the Transylvanian Society for Nature Science of Sibiu (Siebenbürgischen Vereins für Naturwissenschaften zu Hermannstadt) (Vlad-Antonie, 2004).

The “Dr. Karl Petri” collection consists of more than 46,300 insects. The material, a lifetime work, was collected mainly from Transylvania. Karl Petri exchanges with foreign specialists are to be found in his collections. He donated the collection in 1930, to the Natural History Museum from Sibiu, part of Brukenthal National Museum (Pascu & Schneider, 1998).

MATERIAL

The preserved material is only a small part of Dr. Karl Petri beetles collection from the Natural History Museum from Sibiu, Romania. Nomenclature and systematical order are according to those used by Sama (2009) in “Fauna

Europaea”, Danilevsky (2007) in the systematic list of European Cerambycidae and also Zicha (2009) in “BioLib”.

The following abbreviations will be used in this paper:

AUS - Austria; CEH - Czech Republic; CRO - Croatia; HUN - Hungary; ITA - Italy; FRA - France; GER - Germany; GRE - Greece; ROM - Romania; RUS - Russia; SVK - Slovakia; SPA - Spain; TUR - Turkey; Mts - Mountains; spec./specs - specimen/specimens; bor. - borealis (the northern part).

RESULTS

Family Cerambycidae Latreille, 1802

Subfamily Lepturinae Latreille, 1802

Acmaeops Le Conte, 1850

Acmaeops pratensis (Laicharting, 1784)

2 specs, Fogarasch Gebirge Serbota (Făgăraș Mts., ROM) leg. Petri, 1892; 1 spec., Kärnten (AUS).

Acmaeops smaragdulus (Fabricius, 1792)

1 spec., (HUN), without other data.

Akimerus Serville, 1836

Akimerus schaefferi (Laicharting, 1784)

syn. *Acimerus schaefferi* (Laicharting, 1784)

2 specs, Wörlitz (GER), 1.07.1906; 2 specs, Oszlány (SVK), leg. Kelecsenyi.

Alosterna Mulsant, 1863

Alosterna tabacicolor (De Geer, 1775)

1 spec., Malomviz (Râu de Mori, Hunedoara County, ROM), leg. Petri, 1904; 1 spec., Hammersdorf (Gusterița, Sibiu County, ROM), leg. Petri, 1904; 2 specs, Mühlbach Bistra (Sebeș, Alba County, ROM), leg. Petri; 1 spec., Bistra (Bistra, Alba County, ROM), leg. Petri, 1907; 3 specs, Fogarasch Gebirge (Făgăraș Mts., ROM), leg. Petri; 2 specs, Borszék (Borsec, Harghita County, ROM), leg. Petri.

Anastrangalia Casey, 1924

Anastrangalia dubia (Scopoli, 1763)

syn. *Leptura dubia* Scopoli, 1763

2 specs, Balănbánya (Bălan, Harghita County, ROM), leg. Petri, 1902; 1 spec., Borszék (Borsec, Harghita County, ROM), leg. Petri; 1 spec., Rodna Gebirge (Rodna Mountains, ROM), leg. Petri, 1892; 3 specs, Mühlbach Bistra (Sebeș, Alba County, ROM).

Anastangalia sanguinolenta (Linnaeus, 1761)

syn. *Leptura sanguinolenta* Linnaeus, 1761

1 spec., Baassen (Bazna, Sibiu County, ROM), leg. Petri 1885; 3 specs, Borszék (Borsec, Harghita County, ROM), leg. Petri; 1 spec., Rodna Gebirge (Rodna Mts., ROM), leg. Petri, 1892; 3 specs, Balănbánya (Bălan, Harghita County, ROM), leg. Petri, 1902.

Anoplodera Mulsant, 1839*Anoplodera rufipes* (Schaller, 1783)syn. *Leptura rufipes* Schaller, 1783

2 specs, Hermannstadt (Sibiu, Sibiu County, ROM), leg. Petri, 1894 and 1904; 1 spec., Schässburg (Sighișoara, Mureș County, ROM), leg. Petri, 1891; 1 spec., without other data; 1 spec., Skalitzk (CEH), leg. Brandeis, 1879.

Anoplodera sexguttata (Fabricius, 1775)syn. *Leptura sexguttata* Fabricius, 1775

1 spec., Schässburg (Sighișoara, Mureș County, ROM), leg. Petri, 18.06.1903.

Brachyta Fairmaire, 1864*Brachyta interrogationis* (Linnaeus, 1758)syn. *Evodinus interrogationis* (Linnaeus, 1758)

1 spec., (HUN) without other data.

Cortodera Mulsant, 1863*Cortodera flavimana* (Waltl, 1838)

2 specs, Pecs (HUN), 1904 and 1905.

Cortodera humeralis (Schaller, 1783)

1 spec., Hátsezeg (Hațeg, Hunedoara County, ROM), leg. Petri; 1 spec., Schässburg (Sighișoara, Mureș County, ROM), leg. Petri, 1898.

Cortodera kiesenwetteri Pic, 1898

2 specs, Caucasus bor., Teberda (RUS).

Cartodera villosa Heyden, 1876

3 specs, Budapest (HUN), 1893; 2 specs, Zobor (SVK), leg. Kelecsenyi.

Cortodera villosa circassica Reitter, 1890syn. *Cartodera circassica* Reitter, 1890

2 specs, Caucasus bor., Teberda (RUS).

Dinoptera Mulsant, 1863*Dinoptera collaris* (Linnaeus, 1758)syn. *Acmaeops collaris* Linnaeus, 1758

1 spec., Hermannstadt (Sibiu, Sibiu County, ROM), leg. Petri, 1904; 1 spec., Klausenburg (Cluj-Napoca, Cluj County, ROM), leg. Petri, 1891; 3 specs, Schässburg (Sighișoara, Mureș County, ROM), leg. Petri, 1919.

Evodinus Le Conte, 1850*Evodinus clathratus* (Fabricius, 1792)

5 specs, Fogarascher Gebirge (Făgăraș Mts., ROM), leg. Petri; 1 spec., Malomviz (Râu de Mori, Hunedoara County, ROM); 2 specs, Schuler Gebirge (Postăvaru Mts.,

Brașov, ROM), leg. Petri, 1902; 1 spec., Schuler Gebirge (Postăvaru Mts., Brașov, ROM), leg. Deubel, 1892; 1 spec., Ritivoi (RUS), leg. Deubel, 1892.

Gaurotes Leconte, 1850

Gaurotes (Carilia) virginea (Linnaeus, 1758)

1 spec., Borszék (Borsec, Harghita County, ROM), leg. Petri; 2 specs, Balănbănya (Bălan, Harghita County, ROM), leg. Petri, 1902; 1 spec., Bistra (Bistra, Alba County, ROM), leg. Petri, 1907; 1 spec., Malomviz (Râu de Mori, Hunedoara County, ROM); 1 spec., Rodna Gebirge (Rodna Mts., ROM), leg. Petri; 1 spec., Kärnten (AUS); 3 specs, Schuler Gebirge (Postăvaru Mts., Brașov, ROM), leg. Deubel, 1892; 3 specs, Schuler Gebirge (Postăvaru Mts., Brașov, ROM), leg. Petri, 1902.

Grammoptera Serville, 1835

Grammoptera abdominalis (Stephens, 1831)

syn. *Grammoptera variegata* (Germar, 1824)

4 specs, (HUN), without other data.

Grammoptera ruficornis (Fabricius, 1781)

2 specs, Schässburg (Sighișoara, Mureș County, ROM), leg. Petri, 1923; 1 spec., Szurduk-Pass (Pasul Surduc, ROM), leg. Petri, 1910; 2 specs, Deva (Deva, Hunedoara County, ROM), leg. Petri; 1 spec., without other data.

Grammoptera ustulata (Schaller, 1783)

1 spec., Schässburg (Sighișoara, Mureș County, ROM), leg. Petri.

Judolia Mulsant, 1863

Judolia cerambyciformis (Schränk, 1781)

syn. *Leptura cerambyciformis* Schrank, 1781

1 spec., Borszék (Borsec, Harghita County, ROM), leg. Petri; 1 spec., Rodna Gebirge (Rodna Mts., ROM), leg. Petri; 1 spec., Schässburg (Sighișoara, Mureș County, ROM) leg. Petri; 1 spec., Előpatak (Vâlcele, Covasna County, ROM), leg. Petri, 1892.

Judolia erratica (Dalman, 1817)

syn. *Leptura erratica* Dalman, 1817

1 spec., Szasz Regen (Reghin, Mureș County, ROM), leg. Petri, 1902; 1 spec., Schässburg (Sighișoara, Mureș County, ROM), leg. Petri, 1923; 1 spec., Klausenburg (Cluj-Napoca, Cluj County, ROM), leg. Petri, 1891; 1 spec., Toroczkó (Rimetea, Alba County, ROM), leg. Petri, 1903; 1 spec., without other data; 1 spec., Transilvania (ROM), leg. Fuss.

Judolia sexmaculata (Linnaeus, 1758)

syn. *Leptura sexmaculata* Linnaeus, 1758

4 specs, Mühlbach Bistra (Sebeș, Alba County, ROM), leg. Petri, 1907; 1 spec., Borszék (Borsec, Harghita County, ROM), leg. Petri.

Leptura Linnaeus, 1758*Leptura aethiops* Poda, 1761

2 specs, Schässburg (Sighișoara, Mureș County, ROM), leg. Petri, 1892; 1 spec., Unt. Elsass (Alsacia, North of Strasbourg, FRA), leg. Giebeler.

Leptura annularis Fabricius, 1801

syn. *Leptura arcuata* Panzer, 1793 nec. Linnaeus, 1758

1 spec., Rodna Gebirge (Rodna Mts., ROM), leg. Petri, 1892; 1 spec., without other data.

Leptura aurulenta, Fabricius, 1792

1 spec., Bükszád (Bixad, Covasna County, ROM), 1886; 2 specs, Schässburg (Sighișoara, Mureș County, ROM), leg. Petri.

Leptura quadrifasciata Linnaeus, 1758

1 spec., Rotenturm (Turnu Roșu, Sibiu County, ROM), leg. Petri; 1 spec., Fogarasch Gebirge (Făgăraș Mts., ROM), leg. Petri; 1 spec., Retyezát (Retezat Mts., ROM), leg. Petri, 1894; 1 spec., Petrozsény (Petroșani, Hunedoara County, ROM), leg. Petri, 1888.

Leptura russica Herbst, 1784

3 specs, Uralok (RUS).

Rutpela Nakane & Ohbayashi, 1957*Rutpela maculata* (Poda, 1761)

syn. *Leptura maculata* (Poda, 1761)

1 spec., Retjezat (Retezat Mts., ROM), leg. Petri, 1904; 2 specs, Rodna Gebirge (Rodna Mts., ROM), leg. Petri, 1892; 1 spec., Rotenturm (Turnu Roșu, Sibiu County, ROM), leg. Petri; 1 spec., Malomviz (Râu de Mori, Hunedoara County, ROM), leg. Petri, 1904.

Lepturobosca Reitter, 1913*Lepturobosca virens* (Linnaeus, 1758)

syn. *Leptura virens* Linnaeus, 1758

2 specs, Balănbănya (Bălan, Harghita County, ROM), leg. Petri, 1892; 2 specs, Rodna Gebirge (Rodna Mts., ROM), leg. Petri, 1892; 1 spec., Borszék (Borsec, Harghita County, ROM), leg. Petri; 1 spec., Malomviz (Râu de Mori, Hunedoara County, ROM), leg. Petri; 3 specs, Mühlbach Bistra (Sebeș, Alba County, ROM).

Pachyta Dejean, 1821*Pachyta lamed* (Linnaeus, 1758)

2 specs, Mühlbach Bistra (Sebeș, Alba County, ROM), leg. Petri; 1 spec., Bistra (Bistra, Alba County, ROM), leg. Petri, 1907.

Pachyta quadrimaculata (Linnaeus, 1758)

3 specs, Mühlbach Bistra (Sebeș, Alba County, ROM), leg. Petri; 3 specs, Rodna Gebirge (Rodna Mts., ROM), leg. Petri; 4 specs, Balănbănyă (Bălan, Harghita County, ROM), leg. Petri; 1 spec., Retjezat (Retezat Mts., ROM), leg. Petri; 1 spec., Borszék (Borsec, Harghita County, ROM), leg. Petri.

Oxymirus Mulsant, 1869*Oxymirus cursor* (Linnaeus, 1758)

1 spec., Mühlbach Bistra (Sebeș, Alba County, ROM), leg. Petri; 1 spec., Schuler Gebirge (Postăvaru Mts., Brașov, ROM), leg. Petri; 3 specs, Negoii (Negoii Mts., ROM), 21.06.1896 and 1887; 1 spec., Fogarasch Gebirge Serbota (Făgăraș Mts., ROM), leg. Petri, 23.07.1905; 2 specs, Gallia bor. Langres (Langres, Haute Marne region, FRA); 1 spec., Kronstadt (Brașov County, ROM), 1896.

Paracorymbia Miroshnikov, 1998*Paracorymbia fulva* (De Geer, 1775)

syn. *Leptura fulva* De Geer, 1775

2 specs, without other data.

Paracorymbia hybrida (Rey, 1885)

syn. *Leptura hybrida* Rey, 1885

1 spec., Val. Somvix (ITA), leg. Daniel; 1 spec., 1895, leg. Daniel; 1 spec., V. Cesio, (Cesio Maggiore, Dolomites Mts., ITA), leg. Daniel, 28.07.1894.

Paracorymbia maculicornis (De Geer, 1775)

syn. *Leptura maculicornis* De Geer, 1775

1 spec., Munchen (GER); 1 spec., Retyezăt (Retezat Mts., ROM), leg. Petri; 1 spec., Kärnten (AUS); 2 specs, Balănbănyă (Bălan, Harghita County, ROM), leg. Petri, 1902.

Paracorymbia pallens (Brullé, 1832)

syn. *Leptura pallens* Brullé, 1832

2 specs, Kalavryta, Morea (GRE), Megaspilaeon, Morea (GRE), det. Holtz.

Paracorymbia simplonica (Fairmaire, 1885)

syn. *Leptura maculicornis* var. *simplonica* Fairmaire, 1885

1 spec., without data.

Paracorymbia stragulata (Germar, 1824)

syn. *Leptura stragulata* Germar, 1824

1 spec., without other data, det. Paulan Daniel.

Paracorymbia tesseraula (Charpentier, 1825)

syn. *Leptura tesseraula* Charpentier, 1825

2 specs, Caucasus bor., Teberda (RUS).

Pedostrangalia Sokolov, 1896*Pedostrangalia (Etorofus) pubescens* (Fabricius, 1787)syn. *Leptura pubescens* Fabricius, 1787

6 specs, Mehadia (Mehadia, Caraş - Severin County, ROM), leg. Petri, 1895.

Pedostrangalia (Pedostrangalia) revestita (Linnaeus, 1767)syn. *Leptura revestita* Linnaeus, 1767

1 spec., Hátszeg (Haţeg, Hunedoara County, ROM), leg. Petri.

Pedostrangalia (Sphenalia) verticalis (Germar, 1822)

1 spec., Klyssa Dalmatia (CRO).

Pidonia Mulsant, 1863*Pidonia lurida* (Fabricius, 1792)

1 spec., Schässburg (Sighişoara, Mureş County, ROM), leg. Petri, 1893; 2 specs, Schullergebirge (Postăvaru Mts., Braşov, ROM), leg. Petri, 1902; 1 spec., Rodna Gebirge (Rodna Mts., ROM), leg. Petri, 1892; 1 spec., Malomviz (Râu de Mori, Hunedoara County, ROM), leg. 1904; 1 spec., Rosenauer Gebirge (Râşnov, near Postăvarul Mts., Braşov County), leg. 1892; 1 spec., without other data; 1 spec., Szurduk-Pass (Pasul Surduc, ROM), leg. Petri, 1910; 1 spec., Bistra (Bistra, Alba County, ROM), leg. Petri, 1907; 1 spec., Borszék (Borsec, Harghita County, ROM), leg. Petri; 1 spec., Mühlbach Bistra (Sebeş, Alba County, ROM), leg. Petri; 1 spec., Retjezat (Retezat Mts., ROM), leg. Petri; 1 spec., Fogarasch Gebirge (Făgăraş Mts., ROM), leg. Petri.

Pidonia elegans An et Kwon, 1991

2 specs, Caucas bor. Teberda (RUS).

Pseudovadonia Lobanov, Danielsvsky & Murzin, 1981*Pseudovadonia livida* (Fabricius, 1776)syn. *Leptura livida* Fabricius, 1776

1 spec., Hátszeg (Haţeg, Hunedoara County, ROM), leg. Petri, 1894; 1 spec., Schässburg (Sighişoara, Mureş County, ROM), leg. Petri, 1891.

Rhagium Fabricius, 1775*Rhagium bifasciatum* Fabricius, 1775syn. *Rhagium mordax bifasciatum* Fabricius, 1775

1 spec., Kärnten (AUS).

Rhagium inquisitor Linnaeus, 1758

5 specs, Borszék (Borsec, Harghita County, ROM), leg. Petri; 1 spec., Kronstadt (Braşov County, ROM), leg. Deubel, 1890; 1 spec., Retjezat (Retezat Mts., ROM), leg. Petri; 5 specs, Fogarasch Gebirge (Făgăraş Mts., ROM), leg. Petri.

Rhagium mordax (DeGeer, 1775)

3 specs, Schässburg (Sighișoara, Mureș County, ROM), leg. Petri; 1 spec., Rotenturm (Turnu Roșu, Sibiu County, ROM), leg. Petri; 1 spec., Szováta (Sovata, Mureș County, ROM), leg. Petri, 06.06.1911; 1 spec., Rodna Gebirge (Rodna Mts., ROM), leg. Petri, 1892.

Rhagium sycophanta (Schrank, 1781)

2 specs, Kronstadt (Brașov County, ROM), leg. Deubel, 1891; 1 spec., Schässburg (Sighișoara, Mureș County, ROM), leg. Petri, 1890; 2 specs, without other data.

Rhamnusium Latreille, 1829*Rhamnusium bicolor* (Schrank, 1781)

1 spec., Kronstadt (Brașov County, ROM), leg. Deubel, 1892; 2 specs, Germania (GER), without other data.

Stenocorus Fabricius, 1775*Stenocorus insitivus* (Germar, 1824)

1 spec., 1892, Caucasus (RUS).

Stenocorus quercus (Götz, 1783)

1 spec., Schässburg (Sighișoara, Mureș County, ROM), leg. Petri, 1894.

Stenocorus meridianus (Linnaeus, 1758)

1 spec., Schässburg (Sighișoara, Mureș County, ROM), leg. Petri, 1897; 1 spec., Baassen (Bazna, Sibiu County, ROM), leg. Petri, 1905.

Stenurella Villier, 1974*Stenurella bifasciata* (Müller, 1776)

syn. *Leptura bifasciata* Müller, 1776

2 specs, Oláhfalú (Vlăhița, Harghita County, ROM), leg. Petri, 1887; 1 spec., without other data.

Stenurella melanura (Linnaeus, 1758)

syn. *Leptura melanura* Linnaeus, 1758

2 specs, Rodna Gebirge (Rodna Mts., ROM), 1890 and 1892, leg. Petri; 1 spec., Balănbănya (Bălan, Harghita County, ROM), leg. Petri, 1902.

Stenurella nigra (Linnaeus, 1758)

syn. *Leptura nigra* Linnaeus, 1758

4 specs, Schässburg (Sighișoara, Mureș County, ROM), leg. Petri, 1900; 1 spec., Hátszeg (Hațeg, Hunedoara County, ROM), leg. Petri, 1903; 1 spec., Oláhfalú (Vlăhița, Harghita County, ROM), leg. Petri, 1885.

Stenurella septempunctata (Fabricius, 1792)

syn. *Leptura septempunctata* Fabricius, 1792

4 specs, Rotenturm (Turnu Roșu, Sibiu County, ROM) leg. Petri, 1914, 1 spec., Schässburg (Sighișoara, Mureș County, ROM), leg. Petri; 1 spec., Mehădia (Mehădia, Caraș-Severin County, ROM), leg. Petri, 1895; 1 spec., without other data.

Stictoleptura Casey, 1924*Stictoleptura cordigera* (Fuessly 1775)syn. *Leptura cordigera* Füsslin, 1775

7 specs: 2 specs, Süd Tirol (AUS); 4 specs, Messina (ITA), det. Vitale, 1905; 1 spec., Syria, Akbes (now placed in, Hatay village, TUR), det. Ch. Delagrang, 1880.

Stictoleptura erythroptera (Hagenbach, 1822)syn. *Leptura erythroptera* Hagenbach, 1822

1 spec., Zood, Csiker Gebirge (Sadu, Chicera Hill, Sibiu County, ROM), Nussbach (Măieruş, Braşov County, ROM), leg. Petri, 1886.

Stictoleptura rubra (Linnaeus, 1758)syn. *Leptura rubra* Linnaeus, 1758

2 specs, Borszék (Borsec, Harghita County, ROM), leg. Petri; 1 spec., Balănbănya (Bălan, Harghita County, ROM), leg. Petri, 1902; 1 spec., Klausenburg (Cluj-Napoca, Cluj County, ROM), leg. Petri, 1907; 1 spec., Fogarasch Gebirge (Făgăraş Mts., ROM), leg. Petri; 1 spec., Rotenturm (Turnu Roşu, Sibiu County, ROM), leg. Petri; 1 spec., Uralok (RUS); 1 spec., Glashutte Kerz (Glajaria, Făgăraş Mts.), 1893; 1 spec., Boemia (CEH), without other data.

Stictoleptura scutellata (Fabricius, 1781)syn. *Leptura scutellata* Fabricius, 1781

3 specs, Schässburg (Sighişoara, Mureş County, ROM); 3 specs, Malomviz (Râu de Mori, Hunedoara County, ROM); 2 specs, Rotenturm (Turnu Roşu, Sibiu County, ROM), leg. Petri; 1 spec., Nussbach (Măieruş, Braşov County, ROM), leg. Petri, 1886; 1 spec., Rodna Gebirge (Rodna Mts., ROM), leg. Petri, 1892.

Stictoleptura trisignata (Fairmaire, 1859)syn. *Leptura trisignata* Fairmaire, 1859

1 spec., Pardo, (SPA), det. J. Lauffer.

Strangalia Serville, 1835*Strangalia attenuata* (Linnaeus, 1758)syn. *Leptura attenuata* Linnaeus, 1758

1 spec., Schässburg (Sighişoara, Mureş County, ROM), leg. Petri; 2 specs, Baassen (Bazna, Sibiu County, ROM), leg. Petri, 1905, 1909; 3 specs, Rotenturm (Turnu Roşu, Sibiu County, ROM), leg. Petri; 1 spec., Retezat (Retezat Mts., ROM), leg. Petri, 1914; 1 spec., Fogarascher Gebirge (Făgăraş Mts., ROM), leg. Petri; 1 spec., Schässburg (Sighişoara, Mureş County, ROM).

Vadonia Musant, 1863*Vadonia bipunctata* (Fabricius, 1781)syn. *Leptura bipunctata* Fabricius, 1781

1 spec., Astrakan (RUS), without other data.

Vadonia bisignata (Brullé, 1832)syn. *Leptura bisignata* Brullé, 1832

1 spec., Smyrna (TUR), leg. Kruper.

Vadonia imitatrix (K. Daniel et J. Daniel, 1891)syn. *Leptura imitatrix* Daniel, 1891

1 spec., Koniskos (GRE), leg. Daniel.

Vadonia steveni (Sperk, 1835)syn. *Leptura steveni* Sperk, 1835

7 specs, Budapest (HUN), 1893.

Vadonia unipunctata (Fabricius, 1787)syn. *Leptura unipunctata* Fabricius, 1787

1 spec., Uralok (RUS).

Xylosteus Frivaldsky, 1838*Xylosteus spinolae* Frivaldsky, 1838

2 specs, Kronstadt (Brașov County, ROM), 1909.

DISCUSSIONS

The preserved specimens from the collection have a great historical importance, being collected at the end of the 19th century and at the beginning of the 20th. The fauna of Lepturinae counts 72 species (Panin & Săvulescu, 1961). In “Dr. Karl Petri” 59 species are present.

Stictoleptura scutellata, *Gaurotes virginea* and *Alosterna tabacicolor* are well represented in the collections.

Interesting species are part of the collection, also: *Acmaeops smaragdulus* (North of Europe), *Paracorymbia stragulata* (endemic species for the Iberian Peninsula), *Paracorymbia pallens* (endemic species for the Balkans) and species from South-West of Europe: *Paracorymbia hybrida*, *P. simplonica*, *Stictoleptura trisignata*.

Rare species like *Pedostrangalia revestita* and *Pedostrangalia pubescens* are present. For the last species, a new record, from Mehadia, for its distribution is given.

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CERAMBYCIDE PALEARCTICE (COLEOPTERA: CERAMBYCIDAE) ÎN
COLECȚIA “DR. KARL PETRI” A MUZEULUI DE ISTORIE NATURALĂ DIN SIBIU
(ROMÂNIA). PARTEA I: SUBFAMILIA LEPTURINAE

REZUMAT

Lucrarea cuprinde date referitoare la 69 de specii palearctice de coleoptere cerambycide, aparținând la 29 de genuri din subfamilia Lepturinae, păstrate în colecțiile Muzeului de Istorie Naturală, Muzeul Național Brukenthal. Din cele 72 specii de Lepturinae citate în “Fauna României” în

colecția Karl Petri se regăsesc 59. Din colecție fac parte câteva specii foarte interesante precum *Acmaeops smaragdulus* (din nordul Europei și din regiunea estpaleartică), *Paracorymbia stragulata* (endemit iberic), *Paracorymbia pallens* (endemit balcanic), specii din sud-vestul Europei: *Paracorymbia hybrida*, *P. simplonica*, *Stictoleptura trisignata*.

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THE CATALOGUE OF THE PALAEARCTIC SPECIES OF LAMIINAE (COLEOPTERA: CERAMBYCIDAE) FROM THE PATRIMONY OF “GRIGORE ANTIPA” NATIONAL MUSEUM OF NATURAL HISTORY (BUCHAREST) **(Part V)**

To Dr. Nicolae Săvulescu's memory

RODICA SERAFIM

Abstract. The catalogue presents Palearctic Cerambycidae coleopteran species of the subfamily Lamiinae preserved in the collections of “Grigore Antipa” National Museum of Natural History of Bucharest.

Résumé. Le catalogue présente les espèces de coléoptères paléartiques de Cerambycidae, sousfamille Lamiinae, gardés dans les collections du Muséum National d'Histoire Naturelle “Grigore Antipa” de Bucarest.

Key words: Coleoptera, Cerambycidae, Lamiinae, catalogue, collections, “Grigore Antipa” National Museum of Natural History, București (Bucharest).

INTRODUCTION

The Cerambycidae collections preserved in “Grigore Antipa” National Museum of Natural History from București (Bucharest), consists of:

- material from the old coleopteran collection from the Palearctic area (which gather specimens from Richard Canisius, Deszö Kenderessy, Eduard Fleck, Fridrich Deubel, Arnold Lucien Montandon, Emil Varady collections, acquired between 1883 – 1923);
- lots of material from Dr. Nicolae Săvulescu's collection acquired between 1961 – 1982 and material from the same collection, which were included in the Museum patrimony in 1992, after Dr. Nicolae Săvulescu's death;
- specimens obtained by exchange with foreign specialists and collectors;
- donations: Daniel Kubisz, Mihai Șerban Procheș, Viorel Ungureanu, Petru Istrate;
- material collected in the field in Romania by the specialists of the “Grigore Antipa” Museum and by their collaborators, during 1946 – 2009.
- material collected from Morocco, Turkey, Bulgaria, Tunisia, Syria (Expeditions of „Grigore Antipa” Museum in the Mediterranean countries), during 2005 – 2008.

A large part of the information given by the specimens from the collections was revaluated in by scientific papers.

The first data on the material of the old collections, which now belong to the Museum patrimony, were published by Fleck (1905), Montandon (1906, 1908).

Panin and Săvulescu (1961) published the material, collected till 1960, in the fascicle of „Romanian fauna” („Fauna României”).

A part of the data were published by Negru & Roșca (1967), Serafim (1985, 1997 a, b, 1998, 2004), Serafim & Maican (2004, 2008), Ungureanu, Maican & Serafim (2008), Maican & Serafim (2009).

The collection catalogue was published in several steps:

In the first part of the catalogue of Cerambycidae species data concerning 25 species of the subfamilies Prioninae (tribes Prionini and Aegosomatini) and Lepturinae (tribes Oxymirini, Xylosteini, Rhamnusiini and Rhagiini) were published (Serafim, 2005).

In the second part, 53 Palaearctic species of the subfamily Lepturinae, tribe Lepturini, are presented (Serafim, 2006).

In the third part, ten Palaearctic species of the subfamily Spondylidinae (tribes Anisarthronini, Asemmini, Saphanini, Spondydini) are presented (Serafim, 2007).

In the fourth part of Palaearctic Cerambycidae catalogue, two species of the subfamily Necydalinae and 91 species of subfamily Cerambycinae are listed (Serafim, 2009).

In the fifth part of catalogue, 112 species and subspecies of subfamily Lamiinae are listed. Most part of the material (79 taxa) originates in Romania.

The species identification was made by Sergiu Panin¹, Nicolae Săvulescu², Ștefan Negru³, Atena Roșca⁴, Rodica Serafim.

Nomenclature and systematical order are according to those used by Sama (2005) in „Fauna Europaea”, Danilevsky (2007) in „A check-list of Longicorn Beetles (Coleoptera, Cerambycoidea) of Europe”, Hoskovec & Rejzek (2009) in „Longhorn beetles (Cerambycidae) of the West Palaearctic region” and Lobl & Smetana (2010) in „Catalogue of Palaearctic Coleoptera”.

Abbreviations

f.h. – forest house; Mt./Mts - Mountain/s; spec. (s) – specimen/s; coll. - collection

Collectors' name:

A.M. – Achim Mihaela; A.I. – Andreescu Ioana; A.A.M. – Andrei Ada Maria; A.G. – Andrei Gabriela; A.Mi. – Andrei Mircea; B.F. – Bajet F.; B.J. – Balazuc J.; B.C. – Ban Cristina; B.M. – Băcescu Mihai; B.A. – Bănărescu Anca; B.P. – Berger P.; B.G. – Blănar Gabriel; B.V. – Brădescu Vladimir; B.S. – Bruschi S.; C.R. – Canisius Richard; C.I. – Căpușe Iosif; C.G. – Chișamera Gabriel; D.Fr. – Deubel Fridrich; D.L. – Dioszeghy Laszlo; D.I. – Drăghia Ion; D.D. – Dumitrescu Dan; F.Ed. – Fleck Eduard; F.M. – Foaltin Mariana; G.L. – Ganglbauer Ludwig; G.P. – Garagnani P.; G.N. – Gâldean Nicolae; Gh.P. – Gherghel P.; G.V. – Gheorghiu Victor; G.C. – Gonzalez C.; H.C. – Hoinic Cristina; Ig. A. – Igna A.; I.Al. – Iftime Alexandru; I.A. – Ionescu Anneliese; I.I. – Iorgu Ionuț; I.P. – Istrate Petre; K.D. – Kenderessy Deszo; Ku.D. – Kubisz Daniel; L.I. – Lepși Iosif; L.D. – Lupu Dochița; M.S. – Maican Sanda; M.I. – Matache Ioana; M.B.P. – Matei Bogdan Petre; M.A.L. – Montandon Arnold Lucien; M.D. – Murariu Dumitru; N.M. – Năzareanu Marinela; N.St. – Negru Ștefan; N.I. – Nemeș Ioan; O.S. – Ogura S.; P.S.X. – Palade Scobiola Xenia; P.C. – Părvu Corneliu; P.K.A. – Penecke Karl Alfons; P.A. – Petrescu Angela; P.I. – Petrescu Iorgu; P.E. – Pisciă Elena; P.G.A. – Popescu-Gorj Aurelian; P.S.M. – Procheș Șerban Mihai; R.I.V. – Raica Iuga Victoria; R.P. – Rapuzzi Pierpaolo; R.N. – Rădulet Năstase; R.V. – Redondo V.; R.J. – Renault J.; R.A. – Roșca Atena; S.G. – Sama Gianfranco; S.N. – Săvulescu Nicolae; S.D. – Săunașu Dragoș; S.E. – Schneider Eckbert; S.R. – Serafim Rodica; S.A. – Sermet A.; S.Ig. – Sienkiewicz Igor; S.Al. – Sofronie Alexandra;

¹ Sergiu Panin, author of the volume of Cerambycidae fauna (1961).

² Nicolae Săvulescu, author of the volume of Cerambycidae fauna (1961). He worked at the museum a short period, but was most faithful and most important collaborator of this institution.

³ Ștefan Negru worked at the museum during 1963 to 1970.

⁴ Atena Roșca, worked at the museum during 1954 to 1976.

S.Me. – Stan Melania; S.Au. – Stănescu Aurora; S.M. – Stănescu Mihaela; S.Mi. – Stănescu Mihai; S.I. – Stănoiu Ion; S.L. – Szekely Levente; T.Ma. – Tâlpeanu Matei; T.E. – Teleki E.; U.V. – Ungureanu Viorel; V.E. – Váradi Emil; W.M. – Weinberg Medeea, W.E. – Worrel Eugen.

Abbreviations of the county names in Romania:

AB – Alba; AG – Argeş; AR – Arad; BC – Bacău; BH – Bihor; BN – Bistriţa Năsăud; BT – Botoşani; BR – Brăila; BV – Braşov; BZ – Buzău; CS – Caraş Severin; CL – Călăraşi; CJ – Cluj; CT – Constanţa; CV – Covasna; DB – Dâmboviţa; DJ – Dolj; GL – Galaţi; GJ – Gorj; GR – Giurgiu; HD – Hunedoara; HR – Harghita; IF – Ilfov; IL – Ialomiţa; IS – Iaşi; MH – Mehedinţi; MM – Maramureş; MS – Mureş; NT – Neamţ; OT – Olt; PH – Prahova; SB – Sibiu; SM – Satu Mare; SV – Suceava; TL – Tulcea; TM – Timiş; TR – Teleorman; VS – Vaslui; VL – Vâlcea; VN – Vrancea.

MATERIAL AND RESULTS

Family Cerambycidae Subfamily Lamiinae Tribe Acanthocinini

Acanthocinus Dejean, 1821

Acanthocinus aedilis (Linnaeus, 1758)

1 spec., Băile Felix, Oradea (BH), 1911, V.E.; 7 specs, Păltiniş, Cindrel (Cibin) Mts (SB), 21.05.1952, S.N.; 9 specs, Răşinari (SB), 20.05.1953, S.N.; 1 spec., Răstolniţa (MS), 16.06.1956, S.N.; 1 spec., Bârnova (IS), 19.05.1956, S.N.; 5 specs, Deseşti, 2 km upstream Mara (MM), 17.07.1998, P.S.M.; 1 spec., Pleşca chalet, Ocna Şugatag (MM), 20.07.1998, P.A.; 1 spec., 1 km South of Izvoare health resort, Deseşti (MM), 23.07.1998, P.S.M.

Acanthocinus griseus (Fabricius, 1792)

1 spec., Covasna (CV), without other data, D.Fr.; 1 spec., Păltiniş, Cindrel (Cibin) Mts (SB), 20.05.1953, S.N.; 1 spec., Daneţi (DJ), 14.06.1953, S.N.; 1 spec., Lacul Sărat (BR), 8.07.1957, S.N.; 2 specs, Timişoara (TM), 8.06.1965; 1 spec., Băile Herculane (CS), 2.07.1967, S.N.

Acanthocinus reticulatus (Razoumowsky, 1789)

1 spec., Azuga (PH), without other data, F.Ed.; 14 specs, Băile Herculane (CS), 29.05.1956, S.N.

Exocentrus Dejean, 1835

Exocentrus adpersus Mulsant, 1846

1 spec., Croatia, Dalmatia, without other data, K.D.; 2 specs, Băile Herculane (CS), 23.07.1956, S.N.; 2.07.1967, S.N.; 5 specs, Baia de Aramă (MH), 8.07.1961, S.N.; 1 spec., Greci (TL), 30.06.1964, S.Ig.; 1 spec., Babadag (TL), 20.07.1977, P.G.A.; 9 specs, Italy, Udine, Cialla di Prepotto, 22.06.-6.08.1983, R.P.

Exocentrus lusitanus (Linnaeus, 1767)

2 specs, without data, F.Ed.; 11 specs, Bucureşti, Băneasa Forest, 10.05.1951, 18.05.1957, S.N.; 16 specs, Băile Herculane (CS), 12-14.06.1952, 2.07.1967, S.N.; 10 specs, Brăneşti, Pasărea Forest (IF), 30.04.1953, 6.06.1959, 4.07.1962, S.N.; 1 spec., Retezat Mts, Gura Zlata, 9.08.1955, S.N.; 3 specs, Comana Forest (GR), 24.06.1954, S.N.; 4 specs, Nucet (DB), 12.07.1956, S.N.; 4 specs, Bârnova (IS), 14.06.1958, S.N.; 1 spec., Canaraua Fetii (CT), 27.05.1962, S.N.; 1 spec., Bucureşti, 5.08.1964, R.A.; 1 spec., Moldova Nouă (CS), 26.05.1973, S.N.

Exocentrus punctipennis Mulsant & Guillebeau, 1856

1 spec., Pitești (AG), 6.08.1955, S.N.; 9 specs, Periprava, Danube Delta (TL), 5.07.1956, S.N.; 1 spec., Brănești, Pasărea Forest (IF), 6.06.1959, S.N.; 5 specs, Canaraua Fetii (CT), 15.07.1961, 16.07.1965, 15.05.1967, S.N.; 1 spec., Snagov (IF), 25.08.1963, R.A.; 4 specs, București, 12-22.07.1964, R.A.; 1 spec., Drobeta-Turnu Severin (MH), 7.08.1970, S.N.; 20 specs, Letea Forest, Danube Delta (TL), 11.07.1971, S.N.; 1 spec., Băile Herculane (CS), 13.06.1976, P.G.A.; 1 spec., Babadag Forest (TL), 20.07.1977, P.G.A.

Leiopus Serville, 1835*Leiopus nebulosus* (Linnaeus, 1758)

1 spec., Azuga (PH), without other data, F.Ed.; 1 spec., France, Besançon, without other data, M.A.L.; 1 spec., Comana Forest, without other data, M.A.L.; 1 spec., Austria, Graz, without other data, S.N.; 15 specs, Bârnova (IS), 2.06.1953, S.N.; 2 specs, Marila (Oravița) (CS), 1.07.1953, S.N.; 1 spec., Sighetu Marmăției (MM), 23.07.1953; 1 spec., Brănești, Pasărea Forest, 12.05.1955, S.N.; 2 specs, Pojoga (HD), 7.06.1955, S.N.; 3 spec., Retezat Mts, Gura Zlata, 15.06.-9.08.1955, S.N.; 8 specs, Retezat Mts, 25.07.1956, S.N.; 2 specs, Căliman Mts, Răstolnița, 16.06.1956, S.N.; 1 spec., Făgăraș Mts, Capra Peak, 28.07.1957, S.N.; 4 specs, Băile Herculane (CS), 12.07.1953, 22.07.1956, 2.07.1967, 2-5.08.1971, S.N.; 1 spec., Baia de Aramă (MH), 8.07.1961, S.N.; 3 specs, București, 17.06.1964, P.G.A., 01.08.1965, R.A., 17.08.1995, M.I.; 1 spec., Sulina (TL), 8.07.1968, P.G.A.; 10 specs, Moldova Nouă (CS), 25.05.1972, 4.05.-1.06.1973, 25.05.1974, S.N.; 20 specs, Italy, Udine, Cialla di Prepotto, 20.05.1983, R.P.; 1 spec., Stoenesti (VL), 7.07.1999, P.S.M.; 1 spec., Sătic, Dragoslăveni Valley (AG), 8.07.2000, S.Au.; 1 spec., Căciulați Forest (IF), 14.07.2001, S.D.; 1 spec., Piatra Craiului Mts, Brusturet chalet, Valea Seacă (AG), 21.06.2005, M.I.

Oplosia Mulsant, 1862*Oplosia cinerea* (Mulsant, 1839)

1 spec., Sighișoara (MS), without other data, D.Fr.; 1 spec., Brașov (BV), without other data, D.Fr.; 3 specs, Marila (Oravița) (CS), 1.07.1953, S.N.; 7 specs, Băile Herculane (CS), 29.05.1956, S.N.; 6 specs, Retezat Mts, 25-26.07.1956, S.N.

Tribe Acanthoderini

Aegomorphus Haldeman, 1847= *Acanthoderes* auct (not Serville, 1835)*Aegomorphus clavipes* (Schränk, 1781)

1 spec., without data, F.Ed.; 1 spec., Retezat Mts, Gura Zlata, 07.1934, T.E.; 1 spec., Căprioara, Săvârșin (AR), 16.06.1938, T.E.; 21 specs, Băile Herculane (CS), 12.07.-12.08.1953, 23.08.1954, 19.07.1956, 4.08.1967, 5.08.1971, S.N.; 1 spec., Făgăraș Mts, Capra Peak, 28.07.1957, S.N.; 1 spec., C.A. Rosetti, Danube Delta (TL), 5.07.1963, P.S.X.; 3 specs, Canaraua Fetii (CT), 12.06.1964; 1 spec., Marila (Oravița) (CS), 4.08.1977, S.N.; 1 spec., Bistret (DJ), 8.07.1982, T.Ma.; 1 spec., Lepșa Valley (GJ), 18.06.1992, S.R.; 2 specs, Sfântu Gheorghe, Danube Delta (TL), 28.05.1994, H.C.; 5 specs, Desești, Valley of the Mara river (MM), 17.07.1998, P.S.M.; 1 spec., Pleșca chalet, Ocna Șugatag (MM), 20.07.1998, P.S.M.; 1 spec., 1 km South of health resort Izvoare, Desești (MM), 23.VII.1998, P.S.M.; 2 specs,

Brănești, Pasărea Forest (IF), 13.06.1999; 2 specs, Valley of the Rica river, 3 km upstream Poienile de sub Munte (MM), 14.VI.2003, S.R., S.Mi.; 4 specs, Țibleș Mts, Dragomirești, Baicu f.h. (MM), 21-23.VI.2003, S.R.; 1 spec., Țibleș Mts, Săliște, Idișor streamlet (MM), 23.VI.2003, S.R.; 2 specs, Tarnița (GJ), 9.07.2004, P.A.

Tribe Agapanthiini

Agapanthia Serville, 1835

Agapanthia annularis (Olivier, 1795)

2 specs, Morocco, Volubilis, 29-30.04.2007, C.P., C.S. („Atlas” Expedition); 1 spec., Morocco, Mouley Idriss, 1.05.2007, C.P. („Atlas” Expedition).

Agapanthia cardui (Linnaeus, 1767)

2 specs, Pojoga (HD), 12.06.1957, S.N.; 10 specs, Italy, Forli, Cesena, 30.05.1970, G.P.; 1 spec., France, Cipières, le Plan, 8.06.1974, B.P.; 4 specs, France, Aiguines, Forêt de Margés, 5.06.1974, B.P.; 1 spec., France, Le Muy, 12.06.1974, B.P.; 1 spec., France, Les Adrets de Frejus, Bord de l'Argentièr, 14.06.1974, B.P.; 1 spec., Lipova (AR), 5.06.1976; 2 specs, Spain, Zaragoza, 30.05.1977, G.C.; 1 spec., Florești (GR), 24.05.1997, P.C.

Agapanthia cynarae (Germar, 1817)

1 spec., Croatia, Krk island, 20.05.1973, R.P.; 6 specs, Clisura Dunării⁵, Oreva (CS), 15-27.05.1976, S.N.; 4 specs, Danube Clisura (Clisura Dunării), Slătinic (CS), 17-26.05.1976, S.N. (Fig. 1 A).

Agapanthia dahli (Richter, 1821)

1 spec., Mangalia (CT), 8.06.1903, F.Ed.; 1 spec., Azuga (PH), without other data, F.Ed.; 1 spec., Piatra Olt (OT), without other data, F.Ed.; 1 spec., Comana (GR), without other data, M.A.L.; 1 spec., Bulgaria, Veliko Târnovo, without other data; 1 spec., Dalmatia, without other data, K.D.; 8 specs, Brănești, Pasărea Forest (IF), 19.06.1950, 14.06.1959, S.N., 10.05.1977, S.R.; 12 specs, Valu lui Traian (CT), 4.06.1954, 17-22.06.1955, 19-20.06.1958, P.S.X.; 1 spec., Bârnova (IS), 2.06.1953; 1 spec., Cernica Forest (IF), 28.05.1955, R.A.; 4 specs, Babadag Forest (TL), 23.06.1955, S.N., 20.06.1963, P.S.X., 26.05.1970, S.N.; 15 specs, Comana Forest (GR), 12.06.1957, 14.06.1959, 06.1967, S.N., 14.05.1995, P.S.M., 7.06.2006, S.R., 19.05.2009, S.R., F.M., I.I.; 1 spec., Oltenița (CL), 8.05.1959, P.S.X.; 1 spec., Tismana, Cioclovina hermitage (GJ), 4.06.1959, P.S.X.; 37 specs, Canarua Fetii (CT), 29.06.1956, 19.06.1960, S.N., 11.06.-17.07.1964, N.St., 17.05.-9.07.1972, 25.04.1982, 18.06.1983, S.N., 19.05.-20.07.1993, A.G., 26.06.1995, P.C.; 1 spec., Ciovârșani (MH), 24.06.1961, S.N.; 1 spec., București, Andronache Forest, 24.05.1962, P.G.A.; 1 spec., Brănești, Pustnicu Forest (IF), 5.07.1962, R.A.; 3 specs, Mangalia, Comarova Forest, (CT), 2.06.1962, P.G.A., D.I., 18.06.1964, P.S.X.; 1 spec., Techirghiol (CT), 20.06.1962, P.S.X.; 1 spec., Tulnici (VN), 22.07.1962, R.A.; 20 specs, Hagieni Forest (CT), 4.06.1962, P.G.A., 29.06.1963, S.N., 4-6.06.1964, S.N., N.St., 9.07.1992, S.R., 18.07.1997, S.M.; 1 spec., Chilia Veche (TL), 28.06.1963, P.S.X.; 7 specs, Agiea (CT), 28.05.1963, P.G.A., 15-18.06.1964,

⁵ Clisura Dunării (Danube Clisura) is situated between Nera river in the West, and Gura Văii in the East.

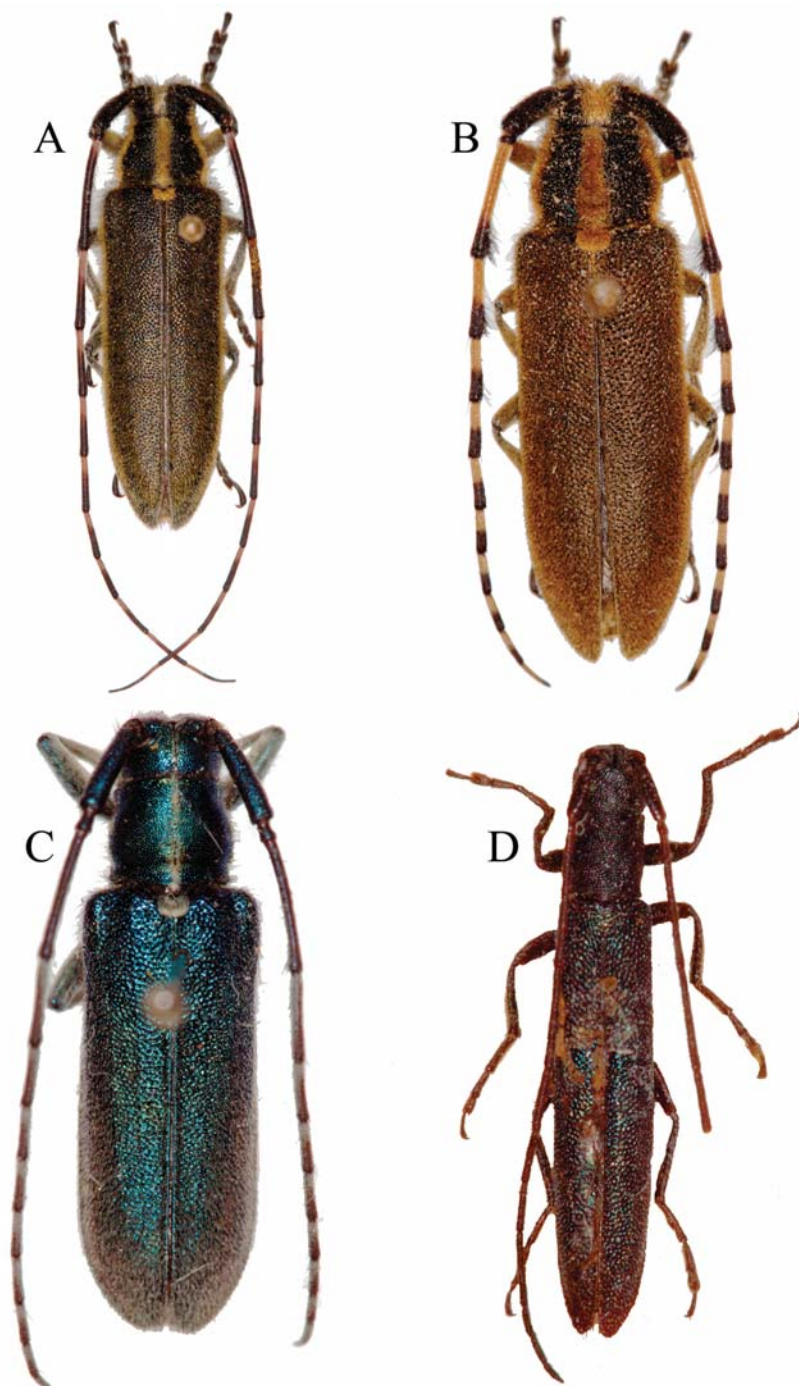


Fig. 1 - A, *Agapanthia cynarae*; B, *Agapanthia kirbyi*; C, *Agapanthia osmanlis*; D, *Theophilea subcylindricollis*. (Photos: I. Șt. Iorgu)

P.G.A., N.St.; 1 spec., Periprava, Danube Delta (TL), 13.05.1964, W.M.; 1 spec., Moldova Nouă (CS), 29.06.1964, S.N.; 1 spec., Băile Herculane (CS), 28.06.1965, P.G.A.; 3 specs, Dumbrăveni Forest (CT), 23.05.1965, S.N., 21.05.1994, 29.06.1995, A.G.; 2 specs, Sfântu Gheorghe, Danube Delta (TL), 19.08.1971, S.N., 28.05.1994, H.C.; 1 spec., Arad (AR), 5.07.1974, C.A.; 14 specs, Clisura Dunării, Orevă (CS), 19-28.05.1976, S.N.; 2 specs, Clisura Dunării, Slătinic (CS), 26-28.05.1976, S.N.; 5 specs, Gura Văii (MH), 19.05.1978; 1 spec., Ciucurova (TL), 19.06.1981, S.N.; 8 specs, Esecchio (CT), 19.04.1982, 12.06.1983, 11.05.1991, S.N.; 1 spec., Bistreț (DJ), 31.05.1982, W.M.; 4 specs, Albești (CT), 19.05.1983, S.N.; 1 spec., Turnu Roșu (SB), 13.05.1986, D.I.; 2 specs, Cheia (CT), 23.06.1993, M.I.; 3 specs, Popina Island, Razelm (Razim) Lake, 8.06.1994, H.C.; 2 specs, Rotbav (BV), 20.05.1996, P.S.M.; 30 specs, Olimp resort, North Mangalia (CT), 19-20.07.2003, S.R., P.A., C.G., F.M., A.A.M.; 2 specs, Tuzla (CT), 21.07.2003, F.M.; 1 spec., Cheson, Slobozia (IL), 10.06.2004, P.C.; 1 spec., Brănești (IF), 27.06.2007, S.Me.

Agapanthia irrorata (Fabricius, 1787)

1 spec., Algeria, without other data, M.A.L.; 1 spec., Morocco, without data; 1 spec., Italy, Sicily, Bosco della Ficuzza, 3.06.1975, S.G.; 1 spec., Italy, Sicily, Nebrodi Mts, Randazzo, 04.1976, S.G.; 2 specs, Italy, Sicily, Madonie Mts, Isnella, 06.1977, S.G.; 23 specs, Morocco, Volubilis, 1-30.04.2007, C.P., R.Z., C.S., S.G. („Atlas” Expedition); 6 specs, Morocco, Mouley Idriss, 1.05.2007, C.P.

Agapanthia kirbyi (Gyllenhal, 1817)

36 specs, Canaraua Feti (CT), 14.05.1958, 17.05.1972, S.N.; 1 spec., Băile Herculane (CS), 3.07.1960, S.N.; 1 spec., Clisura Dunării, Orevă (CS), 17.05.1976, S.N. (Fig. 1 B).

Agapanthia osmanlis Riche & Saulcy, 1858

2 specs, Bulgaria, Veliko Târnovo, without other data; 205 specs, Comana Forest (GR), 30.05.1954, 24.05.1958, 21.05.1959, 9.06.1963, S.N., 27.05.1990, 17.05.1997, P.S.M., 19.05.2009, S.R., F.M.; 2 specs, Snagov Forest (IF), 24.07.1963, S.N. (Fig. 1 C).

Agapanthia sricula Ganglbauer, 1884

2 specs, Italy, Sicily, Capaci, 20.03.1975; 1 spec., Italy, Sicily, Nebrodi Mts, Randazzo, 1.06.1975, S.G.; 1 spec., Italy, Sicily, Enna, Cerami, 05.1977, S.G.

Agapanthia suturalis (Fabricius, 1787)

3 specs, Tunisia, Kerkennah Islands, Setnou Island, 20-21.03.2006, C.P. („Punia” Expedition); 2 specs, Morocco, Merja Zerga (lagoon), 13.04.2007, C.P. („Atlas” Expedition).

Agapanthia villosoviridescens (De Geer, 1775)

1 spec., Kapelenberg (Tâmpa, Brașov), without other data, D.Fr.; 1 spec., Burgberg (Vurpăr) (AB), without other data; 1 spec., Agârbiciu (CJ), without other data; 6 specs, Băile Herculane (CS), 9.06.1951, 15.06.1952, 14.07.1960, 12.05.1961, 4.07.1964, 15.05.1977, S.N.; 9 specs, Bârnova (IS), 4.06.1953, S.N.; 4 specs, Retezat Mts, Gura Zlata, 2.06.1954, S.N., 30.06.1985, P.C.; 2 specs, Căldărușani,

Brazi (IF), 31.05.1957, P.S.X.; 1 spec., Tismana, Cioclovina hermitage (GJ), 4.06.1959, P.S.X.; 53 specs, Canaraua Fetii (CT), 15.05.1958, 27-29.05.1962, 17.05.1972, S.N.; 18-20.05.1993, P.C., P.A., H.C.; 1 spec., Șelimbăr (SB), 27.06.1961, S.N.; 4 specs, Periprava, Danube Delta (TL), 23.06.1962, S.N., 24.06.1967; 1 spec., Bulgaria, Varna, 4.06.1967, S.N.; 6 specs, Esechioi (CT), 14.05.1963, 20.06.1968, S.N.; 2 specs, Agigea (CT), 28.05.1963, P.S.X., 18.06.1964, N.St.; 6 specs, Mangalia, Comarova Forest (CT), 30.05.1963, 5.06.1965, P.S.X.; 1 spec., Snagov Forest (IF), 24.07.1963, S.N.; 1 spec., Oltina (CT), 8.05.1965, S.N.; 4 specs, Dumbrăveni Forest (CT), 23.05.1965, S.N., 18.05.1994, H.C.; 1 spec., Hagieni Forest (CT), 6.06.1965, P.S.X.; 13 specs, Caraorman, Danube Delta (TL), 11.05.-18.06.1967, P.S.X., S.Al., 1.05.-2.06.1968, P.G.A., D.I., 12.06.-20.07.1969, N.St., P.S.X.; 1 spec., Valley of Ialomița river, Slobozia (IL), 23.05.1967, W.M.; 2 specs, Ploiești (PH), 29.06.1967, R.A.; 1 spec., Cheia (PH), 26.07.1967, P.S.X.; 3 specs, Domogled Mt., Cerna Mts, 3.07.1968, B.V.; 2 specs, southern Dobrogea (CT), 2.06.1969, S.N.; 8 specs, Sinaia, Izvorul Dorului (PH), 27-29.06.1971, S.N.; 1 spec., Neptun resort, North Mangalia (CT), 9.09.1973, P.G.A.; 6 specs, Babadag Forest (TL), 25.05.1975, S.N.; 1 spec., Făgăraș Mts, 8.07.1976, P.S.X.; 2 specs, Lipova (AR), 5.06.1976; 1 spec., Moara Vlășiei (IF), 10.06.1978, A.G.; 3 specs, Stăncești (PH), 18.05.1978, S.N.; 3 specs, Tușnad (HG), 10.06.1978, P.S.X.; 1 spec., Chitila, Râioasa Forest (IF), 6.05.1979, A.G.; 1 spec., Mangalia, Comarova Forest (CT), 2.06.1982, S.N.; 1 spec., Strehaia (MH), 24.06.1983, P.C.; 1 spec., Săcuieni, Lacul Vărgat swamp (BH), 24.06.1986, G.N.; 5 specs, Plaiul Foi, Piatra Craiului Mts (BV), 11-12.07.1990, S.R., 9.06.2000, M.S.; 1 spec., Lupșa Valley, Motru Sec (GJ), 18.06.1992, S.R.; 1 spec., Negureni Forest (CT), 16.05.1994, A.G.; 1 spec., Trăiseni, Doftana Valley (PH), 26.06.1994, P.C.; 9 specs, Dumbrăveni Forest, Furnica (CT), 14-15.05.1995, P.C., A.G., A.M.; 2 specs, Rotbav (BV), 20.05.1996, P.S.M.; 1 spec., Telița, Celic Dere (TL), 20.05.1997, P.C.; 1 spec., Valea Teilor (TL), 22.05.1997, P.C.; 2 specs, Tataru dam on the Mara River (MM), 16.07.1998, P.S.M., P.An.; 1 spec., border of Coșeu River, Cornești (MM), 19.07.1998, P.C.; 2 specs, Piatra Craiului Mts, Speranța Valley, 9.06.2000, P.C.; 1 spec., Bârsa Groșetului, Piatra Craiului National Park, 9.06.2000, P.C.; 1 spec., Poienile de sub Munte, Lutoasa Valley (MM), 14.06.2003, P.C.; 2 specs, Ostrov islet, upstream the confluence of the Danube with the Jiu River (GJ), 17.05.2004; 1 spec., Valley of Polatiștea rivulet, „Defileul Jiului” National Park (GJ), 7.07.2004, B.C.; 4 specs, Maramureș Mts, Valley of Vaser River, Făina (MM), 19-20.VI.2003, S.R., 22.07.2004, C.G.; 1 spec., Țibleș Mts, Dragomirești, Baicu f.h. (MM), 21.06.2003, P.C.; 5 specs, Piatra Craiului National Park, Sățic (AG), 22.06.2005, S.R., P.E.; 2 specs, Comana Forest (GR), 19.05.2009, S.R.

Agapanthia violacea (Fabricius, 1775)

5 specs, Comana Forest (GR), without other data, M.A.L., 8.06.1955, 26.05.1963, 24.07.1965, R.A., 27.05.1990, P.S.M.; 8 specs, București, Băneasa Forest, 29.05.1952, S.N.; 2 specs, Cernica Forest (IF), 29.05.1956, R.A.; 14 specs, Băile Herculane (CS), 29.05.1956, 12.05.1961, 9.05.1962, 19.-20.05.1963, 24.05.1965, 21.05.1967, 15.06.1968, S.N., 20.06.1970, P.S.X., 15.07.1979, S.N.; 1 spec., Căldărușani (IF), 31.05.1957, P.S.X.; 1 spec., Oltina (CT), 13.05.1958, P.S.X.; 1 spec., Tismana (GJ), 3.06.1959, P.S.X.; 2 specs, southern Dobrogea (CT), 29.05.1962, S.N.; 1 spec., Esechioi (CT), 25.05.1962, S.N.; 30 specs, Canaraua Fetii (CT), 16-27.05.1962, 15.05.1963, S.N., 30.05.1965, N.St., 17.05.1972, S.N., 18-

20.05.1993, P.C., P.A., H.C., A.M., 19.05.1994, P.C.; 8 specs, Mangalia, Comarova Forest (CT), 2.06.1962, S.N., 30.05.1963, 5.06.1965, P.S.X.; 2 specs, Hagieni (CT), 19.06.1964, P.S.X., P.G.A.; 3 specs, Dumbrăveni Forest (CT), 23.05.1965, S.N.; 1 spec., Letea Forest, Danube Delta (TL), 20.07.1966, S.N.; 2 specs, Țigănești, Ciolpani (IF), 26.04.1966, R.A., P.S.X.; 1 spec., Adamclisi (CT), 22.05.1967, R.I.V.; 1 spec., Brateș, 27.05.1968; 6 specs, Italy, Forli, Cesena, 30.05.1970, G.P.; 1 spec., Nucet (DB), 15.06.1970, A.I.; 11 specs, Iortmac Lake (CT), 17.05.1972, S.N.; 1 spec., Moldova Nouă (CS), 20.05.1973, S.N.; 2 specs, Cicoș monastery (TL), 10.06.1973, C.A., 7.07.1975, P.G.A.; 5 specs, Clisura Dunării, Orevă (CS), 25.05.1976, S.N.; 3 specs, Zăvestreni Forest (TR), 24.06.1977, P.G.A., 2.05.1979, 3.05.1980, S.R.; 2 specs, Budești (CL), 25.05.-5.06.1979, W.M., S.R.; 3 specs, Babadag Forest (TL), 12.05.1982; 1 spec., Bistret (DJ), 31.05.1982, W.M.; 10 specs, Gura Motrului (MH), 21.06.1983, S.R., P.C., M.I., D.I.; 5 specs, Strehaia (MH), 24.06.1983, S.R., M.I.; 1 spec., Dridu (IF), 11.06.1987, P.C.; 2 specs, București, 12.05.1994, 29.05.1995, P.S.M.; 2 specs, Negureni (CT), 16.05.1994, A.G., 25.06.1995, P.C.; 1 spec., Călugăreni (GR), 11.05.1996, P.C.; 1 spec., Ciucurova (TL), 22.05.1997, H.C.; 1 spec., Valea Teilor (TL), 22.05.1997, S.R.; 2 specs, Telița (TL), 20.05.1997, P.C.; 2 specs, Revărsarea (TL), 23.05.1997, S.R.; 1 spec., Greaca (CL), 8.06.1997, P.S.M.; 1 spec., Repedea f.h. (MM), 17.06.2003, S.Me.; 1 spec., Coșnea f.h., Poienile de sub Munte (MM), 15.06.2003, S.Me.

Agapanthiola Ganglbauer, 1900

Agapanthiola leucaspis (Steven, 1817)

2 specs, Govora ? (VL), without other data, F.Ed.; 3 specs, Dobrogea, without other data, F.Ed.; 32 specs, Agigea (CT), 15-19.06.1953, 12.06.1961, S.N., 29.05.-18.06.1962, P.G.A., D.I., 27-31.05.1963, P.S.X., P.G.A., 15.06.-20.07.1964, W.M., P.S.X., P.G.A.; 1 spec., Murfatlar (CT), 12.07.1953, S.N.; 10 specs, Valu lui Traian (CT), 19-21.05.1955, 14.06.1956, 19.06.1958, P.S.X., 1.06.1961, W.M.; 1 spec., Săbăreni, Joița (IF), 17.05.1958, R.A.; 3 specs, Canaraua Feti (CT), 29.05.1962, S.N., 19.06.1964, N.St., 20.05.1993, H.C.; 10 specs, Mangalia, Comarova Forest (CT), 2.06.1962, P.G.A., 30.05.1963, P.S.X.; 14 specs, Esecchio (CT), 25.05.1962, 19.05.1967, 25.06.1984, 1.07.1987, S.N.; 22 specs, Hagieni Forest (CT), 19.06.1962, R.A., 6-8.06.1963, P.G.A., 4-20.06.1964, N.St., D.I., 21.06.1965, 30.05.1973, P.G.A.; 7 specs, C. A. Rosetti, Danube Delta (TL), 5.07.1963, 20.07.1964, 30.05.-7.06.1981, P.S.X.; 2 specs, Dumbrăveni Forest (CT), 23.05.1965, S.N.; 1 spec., Niculițel (CT), 28.06.1967, P.S.X.; 4 specs, Periprava, Danube Delta (TL), 24.06.1966, N.St., 30.05.1974, B.V.; 1 spec., Caraorman, Danube Delta (TL), 12.06.1969, N.St.; 19 specs, Letea Forest, Danube Delta (TL), 5.06.1979, P.G.A., 26-30.05.1980, P.G.A., P.S.X.; 4 specs, Hagieni Forest (CT), 28-29.05.1984, P.G.A., D.I., 11.07.1992, S.R.; 2 specs, Greaca (CL), 8.06.1997, P.S.M.

Calamobius Guérin, 1846

Calamobius filum (Rossi, 1790)

178 specs, Agigea (CT), 30.05.1962, P.G.G., 3-31.05.1963, P.G.A., D.I., 12-17.06.1964, 5-12.06.1967, S.N.; 1 spec., France, Les Adrets de Frejus, Bord de l'Argentière, 14.06.1974, B.P.; 4 specs, Spain, Huesca, Riglos, 23.05.1976, G.C.; 1 spec., France, Pyrénées Orientales, Banyuls-sur-Mer, 5.05.1989; 1 spec., Turkey, Kahramanmaraş, Karatepe-Aslantaş, 5.05.1998, P.S.M.; 4 specs, Balauru hill,

Beceni (BZ), 15.06.2002, 20.04.2003, U.V.; 1 spec., Morocco, Volubilis, 30.04.2007, C.S. („Atlas” Expedition); Cherrat, oued Bouznika, 15.04.2007, C.G., G.S. („Atlas” Expedition); 17 specs, Turkey, Kahmaranmaraş, altitude: 570 m, 1.06.2008, P.C., B.G. („Euphrates” Expedition); 1 spec., Syria, Jobeth Birghal, at 4 km South of the Citadel Salah Ed-Din (Saladin), 22.05.2008, P.C. („Euphrates” Expedition).

Theophilea Pic, 1895

Theophilea subcylindricollis Hladil, 1988

3 specs, Republic of Moldova, Chişinău, 1937, W.E. (Fig. 1 D).

Tribe Apodasyni

Anaesthetis Dejean, 1835

Anaesthetis testacea (Fabricius, 1781)

2 specs, Laculez (in southern Bucharest), without other data, F.Ed.; 1 spec., Măcin (TL), without other data, M.A.L.; 1 spec., Haţeg (HD), without other data, K.D.; 1 spec., Transylvania, without other data, K.D.; 2 specs, Dalmatia, without other data, K.D.; 1 spec., Băile Felix, Oradea (BH), 1911, V.E.; 1 spec., Comana Forest (GR), 27.05.1935; 3 specs, Mireşu Mare (Nagynyires) (MM), 1942, V.E.; 5 specs, Pojoga (HD), 7.06.1955, 27.06.1957, S.N.; 1 spec., Hăşmacul Mare, C. A. Rosetti, Danube Delta (TL), 14.07.1964, N.St.; 1 spec., Bârlad (VS), 18.06.1973, R.A.; 1 spec., France, Aiguines, Forêt de Margés, 5.06.1974, B.P.; 3 specs, France, Les Adrets de Frejus, Bord de l'Argentièr, 14.06.1974, B.P.; 5 specs, Italy, Udine, Cialla di Prepotto, 5.08.1983, R.P.

Deroplia Dejean, 1835

Deroplia genei (Aragona, 1830)

2 specs, southern Dobrogea, Baş Punar, 15.06.1955, 15.05.1958, S.N. (Fig. 3 A).

Deroplia troberti troberti (Mulsant, 1843)

1 spec., France, Côte d'Azur, Saint-Raphaël, Estérel, 18.04.1969, B.P.

Tribe Dorcadiini

Carinatodorcadion Breuning, 1943

Carinatodorcadion aethiops (Scopoli, 1763)

2 specs, Băile Felix, Oradea (BH), 1911, V.E.; 1 spec., Cluj (CJ), 15.07.1949; 3 specs, Arad, Ceala Forest (AR), 05.1951, S.N.; 4 specs, Timişoara (TM), 19.06.1951, S.N.; 1 spec., Reşiţa (CS), 27.06.1953, S.N.; 13 specs, Esechioi (CT), 19.05.1958, 18.06.1960, 9.06.1961, 14.05.1963, 8.05.1966, 16.06.1980, 29.05.1982, 8.05.1986, S.N.; 2 specs, Esechioi, Bugeac (CT), 7.06.1960, P.G.A.; 49 specs, Moldova Nouă (CS), 27-29.06.1964, 5-25.05.1973, S.N.; 2 specs, Canaraua Feti (CT), 17-19.07.1964; 2 specs, Băile Herculane (CS), 25.04.1983, S.N.; 1 spec., Botiz (SM), 28.06.1985, A.G.; 1 spec., Hagieni Forest (CT), 1.06.1988, S.N.

Carinatodorcadion fulvum (Scopoli, 1763)

46 specs, Măţasaru (DB), 4.06.1960, S.N.; 1 spec., Daia (IF), 1.07.1948; 136 specs, Bucureşti, Băneasa Forest, 10.05.1952, 24.05.1954; 24.04.1971, 30.04.-12.05.1974,

19.05.1991, S.N.; 4 specs, Botoșani (BT), 17.05.1956, S.N.; 1 spec., Mogoșoaia Forest (IF), 4.06.1957, S.Ig.; 1 spec., Snagov Forest (IF), 25.06.1957, R.A.; 1 spec., Suceava, Scheia Forest (SV), 10.05.1959, P.G.A.; 31 specs, Drobeta-Turnu Severin (MH), 9.08.1961, 21.07.-2.08.1962, 2-19.07.1970, S.N.; 6 specs, Dobrosloveni (OT), 15.04.1962; 2 specs, Nucet (DB), 25.04.1962, S.N.; 1 spec., Canarua Fetii (CT), 27.04.1963, S.N.; 4 specs, Brănești, Pustnicu Forest (IF), 8.05.1963, P.S.X., R.A.; 3 specs, Brănești, Pasărea Forest (IF), 8.05.-6.06.1963, P.G.A., S.Ig., 19.06.1965, R.A.; 2 specs, Țigănești, Ciolpani (IF), 26.04.1966, R.A., P.S.X.; 11 specs, Sinaia (PH), 29.09.1966, N.St., 29.07.1979, S.N.; 1 spec., Săbăoani (NT), 24.05.1967; 1 spec., Stejaru, Valea Ursului (NT), 29.04.1970; 1 spec., Nicolae Titulescu (OT), 25.06.1980, P.C.; 1 spec., Băile Herculane (CS), 19.05.1985, S.N.; 8 specs, Spătaru Forest, Costești (BZ), 12.05.-24.06.1987, P.C., G.N.; 2 specs, Muddy Volcanoes (Vulcanii Noroioși), Small Mists (Păclele Mici) (BZ), 1.05.1989, M.I.; 1 spec., București, 19.04.1991, S.N.; 7 specs, Dumbrăveni Forest (CT), 21.05.1994, A.G.; 1 spec., Găiseni (GR), 20.05.1996, I.Al.; 1 spec., Tunele, Sasca Montană (CS), 9.08.2005, P.E.; 15 specs, Vizireanu hill, Berca, Beceni (BZ), 4.05.2003, U.V., 16.04.-4.05.2005, U.V.; 1 spec., Crâng Park, Buzău (BZ), 18.06.2003, U.V.; 1 spec., Balauru hill, Izvorul Dulce, Beceni (BZ), 12.05.2004, U.V.

Iberodorcadion Breuning, 1943

Iberodorcadion fuliginator fuliginator (Linnaeus, 1758)

1 spec., France, without other data; 1 spec., Germany, Stuttgart, without other data; 2 specs, France, Val-de-Marne, Rungis, 25.04.1956, B.P.

Iberodorcadion fuliginator meridionale (Mulsant, 1839)

1 spec., France, Pyrénées-Atlantiques, Urrugne, col d'Ibardin, 6.05.1966; 2 specs, France, Mt. Lure, Basses Alpes, 28.06.1967, B.J.; 3 specs, France, Pic'Orly, Basses Pyrénées, 25.06.1969, B.J.

Iberodorcadion navasi (Escalera, 1900)

6 specs, Spain, Alrededores de Zaragoza, 27.03.1970, R.V., 26.03.1975, R.V.; 4 specs, Spain, Zaragoza, 25.03.1975, G.C.

Iberodorcadion perezii hispanicum (Mulsant, 1851)

4 specs, Spain, without other data, M.A.L.

Iberodorcadion neilense (Escalera, 1902)

2 specs, Spain, Sierra de la Demanda, Logrono, 15.04.1981, B.F.

Iberodorcadion seoanei seoanei (Graells, 1858)

4 specs, Spain, Zamora, Serra Cabrera Boja, 1.07.1980, B.F.

Iberodorcadion spinolae caunense (Lauffer, 1817)

2 specs, Spain, Moncayo, Zaragoza, 1.07.1975, G.C.

Neodorcadion Ganglbauer, 1884*Neodorcadion bilineatum* (Germar, 1824)

1 spec., București, without other data, M.A.L.; 1 spec., Mangalia (CT), without other data, M.A.L.; 1 spec., Măcin (TL), without other data, M.A.L.; 1 spec., Romanați county, without other data, M.A.L.; 2 specs, Lacul Sărat, Brăila (BR), without other data, M.A.L.; 3 specs, Budești (CL), 20.06.1947, 16.05.1958, R.A.; 1 spec., Calafat (DJ), 04.1953, S.N.; 1 spec., Sibiu (SB), 18.05.1953; 1 spec., București, Andronache Forest, 21.09.1953; 2 specs, București, Băneasa Forest, 24.05.1954, 21.06.1965, N.St.; 1 spec., Valu lui Traian (CT), 21.05.1955; 30 specs, Esecchio (CT), 12.05.1961, S.N., 25.04.-17.05.1963, S.N., N.St., 30.05.1978, 19.04.1981, 12.06.1983, S.N.; 1 spec., Târgu Jiu (GJ), 20.06.1956, R.I.V.; 2 specs, Eforie (CT), 18.06.1958, P.S.X.; 1 spec., Mogoșoaia Forest (IF), 26.05.1959, R.A.; 1 spec., Perișor Forest (DJ), 7.06.1960; 1 spec., Prundu (IF), 15.05.1961, W.M.; 1 spec., Constanța (CT), 21.06.1962, R.A.; 4 specs, Hagieni Forest (CT), 5.06.1962, P.G.A., 6.06.1964, S.N., 7.06.1965, N.St.; 1 spec., Techirghiol (CT), 20.06.1962, R.A.; 3 specs, Agigea (CT), 27.05.1963, P.G.A., 27.04.1964, N.St., 5.06.1979, D.A.; 7 specs, Iortmac Lake (CT), 15.05.1963, S.N.; 19 specs, Canarua Fetii (CT), 18-26.05.1963, 17.07.1964, S.N., 30.06.1965, N.St., 18.05.1993, 19.05.1994, P.C.; 2 specs, Brănești, Pustnicu Forest (IF), 27.05.1963, R.A.; 2 specs, Babadag Forest (TL), 20.06.1963, P.S.X.; 3 specs, Comana Forest (GR), 12.07.1963, N.St.; 3 specs, Budești (IF), 3.06.1965, 6.06.1979, D.A.; 1 spec., Ieșelnița (MH), 14.06.1969, P.G.A.; 4 specs, București, 13.05.-56.06.1971, 17.05.1974, R.A., 15.07.1981, P.G.A.; 29 specs, Cocos monastery (TL), 8.06.1973, C.A., 9.05.-17.X.1975, D.I., C.A.; 3 specs, Bistret (DJ), 1-2.06.1982, W.M., P.C.; 1 spec., Saru Forest (OT), 20.06.1982, M.D.; 2 specs, Drobeta-Turnu Severin, Mușă Forest (MH), 5.06.1984, P.C., M.I.; 3 specs, Hinova (MH), 6-7.06.1984, P.C., S.R.; 1 spec., Târgu Cărbunești (GJ), 13.07.1984, M.I.; 1 spec., Spătaru Forest (BZ), 24.06.1987, P.C.; 2 specs, Stoenesti (VL), 7.07.1990, P.S.M.; 1 spec., Popina Island, Razelm (Razim) Lake, 17.06.1991, G.N.; 1 spec., Enisala, Danube Delta (TL), 27.06.1991, G.N.; 8 specs, Negureni Forest (CT), 24.04.-18.05.1994, H.C., 25.06.1995, P.C.; 10 specs, Dumbrăveni Forest (CT), 21.05.1994, G.A., 14.05.1995, P.C., 25-28.06.1995, A.G., 18.06.1996, S.M.; 6 specs, Dumbrăveni Forest, Furnica (CT), 21-22.05.1997, P.C.; 1 spec., Ciucurova (TL), 22.05.1997, P.C.; 31 specs, Celic Dere (TL), 20-24.05.1997, S.R., H.C.; 1 spec., Telița (TL), 24.05.1997, P.C.; 1 spec., Vizireanu hill, Berca, Beceni (BZ), 4.05.2003, U.V.; 1 spec., București, Herăstrău Park, 5.04.2004, U.V.; 1 spec., Pietroșani (GR), 28.04.2004, P.C.; 4 specs, Balauru hill, Beceni (BZ), 4.05.2005, U.V.; 1 spec., Belciugatele (CL), 13.07.2005, U.V.; 1 spec., Lacul Sărat (TL), 25.05.2005, S.R.; 1 spec., Valea Fagilor, Luncavița (TL), 24.05.2005, S.R.; 1 spec., Beciu, Scorțoasa (BZ), 30.05.2007, U.V.; 3 specs, Bulgaria, Scorpilovici, 1.08.1994, P.S.M.

Neodorcadion exornatum (Frivaldsky, 1835)

3 specs, Canarua Fetii (CT), 5-9.05.1958, 9.05.1967, S.N.; 15 specs, Esecchio (CT), 14.05.1958, 14.05.1967, S.N.; 7 specs, Iortmac Lake (CT), 11-14.05.1958, S.N.; 2 specs, Vârvoru de Jos (DJ), 16.08.1962; 2 specs, Hagieni (CT), 29.06.1963, S.N.; 1 spec., Babadag Forest (TL), 25.05.1975, S.N. (Fig. 2 A, B).

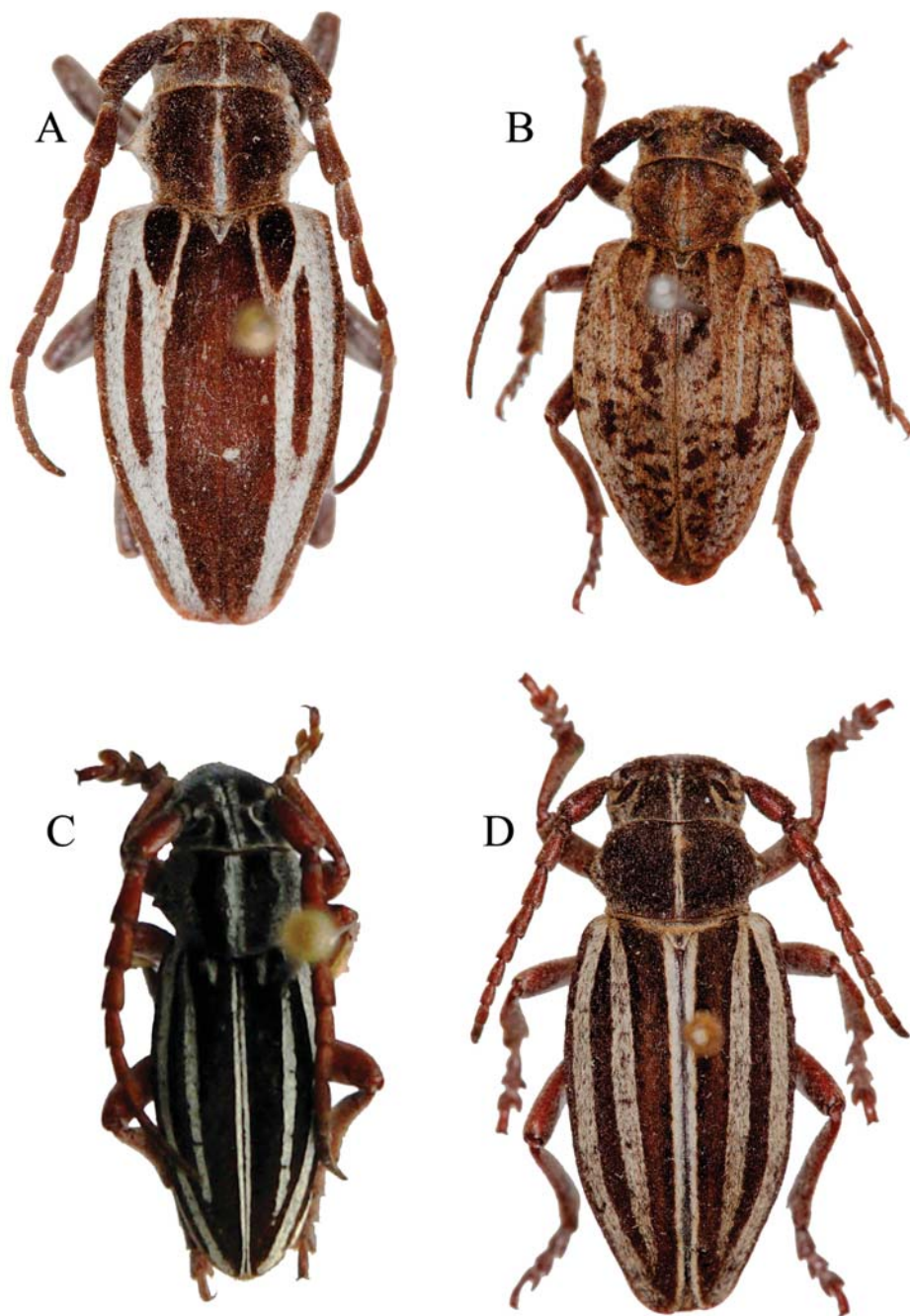


Fig. 2 - A, *Neodorcadion exornatum* male; B, *Neodorcadion exornatum* female; C, *Pedestredorcadion* sp.; D, *Pedestredorcadion scopoli*. (Photos: A, B, D - I. Șt. Iorgu; C - G. Chișamera)

Pedestredorcadion Breuning, 1943*Pedestredorcadion arenarium* (Scopoli, 1763)

4 specs, Italy, Ravenna, Bognacavallo, 15.05.1968, G.P.; 7 specs, Italy, Ravenna, Cotignola, 15.03.1967, 1-15.03.1971, G.P., 7.04.1972, S.A.

Pedestredorcadion decipiens (Germar, 1824)

1 spec., Bârlad Valley (VS), without other data, M.A.L.; 1 spec., Breazu (IS), 5.05.1961, P.G.A.; 97 specs, Esecchio (CT), 14.05.1962, 8.05.1966, 26-29.05.1982, S.N.; 1 spec., Șelimbăr (SB), 29.05.1963, S.N.; 1 spec., Babadag Forest (TL), 1.06.1963, S.N.; 2 specs, Hungary, Taksony, 19.04.1970, 10.04.1971.

Pedestredorcadion equestre (Laxmann, 1770)

2 specs, Republic of Moldova, Chișinău, 14.05.1936; 1 spec., Botoșani (BT), 17.05.1956; 2 specs, Oltina (CT), 23.04.1956, S.N.; 7 specs, Șelimbăr (SB), 29.05.1963, 20.05.1974, S.N.; 7 specs, Vizireanu hill, Berca, Beceni (BZ), 1.09.1999, 4.05.2003, U.V., 16.04.2005, U.V.; 1 spec., Muddy Volcanoes (Vulcanii Noroioși), Big Mists (Pâclele Mari) (BZ), 18.04.2002, U.V.; 3 specs, Balauru hill, Izvorul Dulce, Beceni (BZ), 20.04.2003, U.V.

Pedestredorcadion equestre transsilvanicum Ganglbauer, 1884

3 specs, București, without other data, M.A.L.; 90 specs, Pitești (AG), 22.04.1951, 20.04.1952, 20.04.1954, 9.05.1957, 2.05.1958, 2-4.06.1960, 9.05.1961, 20.04.1964, 24-29.04.1970, S.N.; 1 spec., Bârsani (GJ), 22.06.1954, R.I.V.; 4 specs, Dobrosloveni (OT), 15.04.1962; 1 spec., Găiseni (GR), 20.05.1996, I.A.I.

Pedestredorcadion holosericeum holosericeum Krynický, 1832

14 specs, Botoșani (BT), 17.05.1956, S.N.; 2 specs, Suceava (SV), 12.05.1960, P.G.A.; 1 spec., Dorohoi (BT), 10.05.1974.

Pedestredorcadion litigiosum litigiosum (Ganglbauer, 1884)

7 specs, Cernavodă (CT), without other data, M.A.L.; 4 specs, Măcin (TL), without other data, M.A.L.

Pedestredorcadion murrayi (Küster, 1847)

1 spec., Azuga (PH), without other data, F.Ed.; 1 spec., Bârlad Valley (VS), without other data, M.A.L.; 10 specs, Comana (GR), without other data, M.A.L., 1938, 30.05.1941, 5.04.1942; 1 spec., Băile Felix, Oradea (BH), 1911, V.E.; 1 spec., Dâmbovița county, 1950; 2 specs, Gemenea (DB), 3.06.1950; 4 specs, Râncă Novaci, Novaci Mts (GJ), 26.06.1951, L.I.; 66 specs, Pitești (AG), 20.04.1952, 20.04.1954, 3.05.1959, 4.06.1960, 29.04.1967, 19-28.04.1970, 21-25.04.1974, S.N.; 2 specs, Căldărușani (IF), 23.03.1957, R.A.; 5 specs, Brănești, Pasărea Forest (IF), 24.04.1960, W.M., 29.04.-2.05.1963, R.A., B.V., 2.05.1975, S.N.; 2 specs, Craiova (DJ), 19.03.1961; 5.06.1964, N.St.; 65 specs, București, 18.04.1958, 17.04.1961, S.N., 25.04.1962, 15.04.1963, R.A., 25.06.1966, B.V., 14.04.1972, R.A., 20.04.1974, N.M., 2.04.1975, R.A., 18.04.1976, S.R., 30.03.-4.04.1984, P.G.A., 21.04.-19.05.1987, S.N., N.M., 1.04.1989, N.M., 14.04.1991, S.N.; 10 specs, Dobrosloveni (OT), 15.04.1962; 17 specs, Nucet (DB), 25.04.1962, S.N.; 5 specs, Cernica Forest (IF), 17.04.1963, R.A.; 22 specs, București, Băneasa Forest, 24.04.1971, 4-7.05.1974, 29.04.1975, 16.06.1986, S.N.; 1 spec., Periprava, Danube

Delta (TL), 5.07.1974, P.G.A.; 2 specs, Aiud (AB), 7-9.04.1980, V.C.; 1 spec., Turda (CJ), 3.08.1982, S.N.; 1 spec., Strehaia (MH), 13.05.1982, D.D.; 6 specs, Bâltanele (Prunișor) (MH), 16.05.1982, D.D.; 2 specs, Călugăreni (GR), 1.05.1985, P.C.; 2 specs, Spătaru Forest, Costești (BZ), 12.05.1987, G.N.; 3 specs, Stoenesti (VL), 7.07.1990, P.S.M.; 1 spec., Găiseni (GR), 20.05.1996, I.A.I.; 1 spec., Izvoarele (TL), 21.05.1997, H.C.; 1 spec., Muddy Volcanoes (Vulcanii Noroioși) (BZ), 7.04.2001, U.V.; 30 specs, Balauru hill, Beceni (BZ), 23.04.-4.05.2003, 12.05.2004, 16.04.-4.05.2005, U.V.; 6 specs, Vizireanu hill, Berca, Beceni (BZ), 16.04.-4.05.2005, U.V.; 1 spec., Cetățuia (GR), 28.04.2004, S.Me.

Pedestredorcadion sp.⁶

1 spec., Babadag (CT), 2.06.1958; 154 specs, Hagieni (CT), 4.06.1962, 29.05.1963, 6.06.1964, 15.05.1968, 15.05.1978, S.N., 1.05.1980, P.C., 25.05.1982, S.N., 6.05.1984, P.C.; 5 specs, Babadag (CT), 25.05.1975, S.N., 15 specs, Albești (CT), S.N.; 4 specs, Esecchio (CT), 11.05.1991, S.N.; 1 spec., Popina Island, Razelm (Razim) Lake (CT), 9.05.1992, R.N. (Fig. 2 C).

Pedestredorcadion pedestre (Poda, 1761)

4 specs, București, without other data, F.Ed., C.R.; 3 specs, Pasărea Forest, without other data; 1 spec., Comana Forest (GR), without other data, M.A.L.; 2 specs, Dobrogea, Măcin, Greci, without other data, M.A.L.; 3 specs, Băile Felix, Oradea (BH), 1911, V.E.; 1 spec., Arad, Ceala Forest (AR), 07.1932; 1 spec., Mireșu Mare (Nagynyires) (MM), 1942, V.E.; 1 spec., Sibiu (SB), 17.05.1946; 29 specs, Băile Herculane (CS), 1950, V.E., 19.05.1963, W.M., 10-20.05.1964, S.N., N.St., 27.05.1971, S.N.; 8 specs, Botoșani (BT), 17.05.1956, S.N.; 24 specs, Babadag Forest (TL), 30.06.1956, P.S.X., L.I., 20.06.1963, 19.05.1968, P.S.X., 25.05.1975, S.N.; 3 specs, Scheia Forest, Suceava (SV), 10-12.05.1959; 1 spec., Săbăreni (GR), 12.05.1959, R.A.; 2 specs, Podari (DJ), 12.06.1960; 87 specs, Esecchio (CT), 12.05.1961, 25.04.-17.05.1963, 27.04.1976, 29.04.1978, 12.06.1983, S.N.; 9 specs, southern Dobrogea (CT), 25.04.1963, 25.04.1967, S.N.; 2 specs, Brănești, Pustnicu Forest (IF), 8-12.05.1963, R.A.; 6 specs, Ineu, Arad, 21.06.1963, S.N.; 1 spec., Greci (TL), 22.06.1963, S.Ig.; 2 specs, Calopăr, Panaghia Forest, (DJ), 25.05.1963; 18 specs, Sinaia (PH), 26.06.1963, R.A., 29.X.1964, N.St.; 22 specs, Hagieni Forest (CT), 29.06.1963, S.N., 1.05.1980, P.C., 6.05.1984, P.C.; 1 spec., Gârla Mare (MH), 24.04.1964; 2 specs, Reșca, Dobrosloveni (OT), 15.05.1964, N.St.; 1 spec., Caracal (OT), 15.05.1964, N.St.; 4 specs, Periprava, Danube Delta (TL), 8.05.1964, S.Ig.; 1 spec., Cloșani (GJ), 28.07.1964, C.I.; 4 specs, Bresnița, Drobeta-Turnu Severin (CS), 6.05.1965, S.N.; 4 specs, Canaraua Feti (CT), 30.06.1965, N.St., 18-20.05.1993, P.A., H.C.; 3 specs, Băile Herculane (CS), Domogled Mt., 26.05.1966, N.St., 29.05.1984, B.V., 19.05.1985, B.V.; 1 spec., Eșelnița Valley (MH), 22.04.1967, D.D.; 1 spec., Șvinița (MH), 29.03.1968, N.St.; 4 specs, Nucet (DB), 15.06.1970, M.D., A.I.; 24 specs, Cocoș monastery (TL), 10.06.1973, C.A., 10.05.-14.05.1975, C.A.; 1 spec., Lipova (BC), 5.06.1976; 1 spec., Trascău Mts, Buru (CJ), 30.04.1980, A.G.; 1 spec., Metalici Mts, Poiana (HD), 2.07.1980, A.G.; 4 specs, Saru Forest, Balș (OT), 22.06.1981, A.G., 20.06.1982, D.M.; 1 spec., Strehaia (MH), 15.05.1982, A.G.; 4 specs, Bâltanele (Prunișor) (MH), 16.05.1982, D.D.; 5 specs,

⁶ *Pedestredorcadion* sp. near *divisum* – these specimens represent an undescribed species currently under study by Sama, Dascălu and Pesarini.

Radovan, Panaghia Forest (DJ), 13-15.06.1984, A.G., A.Mi.; 1 spec., Sihlea (VN), 23.06.1987, P.C.; 1 spec., Costești, Spătaru Forest (BZ), 24.06.1987, M.I.; 1 spec., Enisala, Danube Delta (TL), 27.06.1991, G.N.; 2 specs, Popina Island, Razelm (Razim) Lake, 9.05.1992, S.Mi.; 1 spec., Jurilovca, 6 Martie Forest (TL), 10.05.1992, S.Mi.; 2 specs, Dumbrăveni Forest (CT), 21.05.1994, A.G.; 1 spec., Bulgaria, Skorpilovici, 1.08.1994, P.S.M.; 2 specs, Dumbrăveni Forest, Furnica (CT), 14.05.1995, P.C.; 10 specs, Telița, Celic Dere (TL), 20-24.05.1997, P.C., S.R., H.C.; 1 spec., Revărsarea (TL), 23.05.1997, S.R.; 2 specs, Valea Beiuului (CS), 16.05.2002, S.Me.; 9 specs, Vizireanu hill, Berca, Beceni (BZ), 4.05.2003, U.V.

Pedestredorcadion pusillum (Küster, 1847)

3 specs, Bârlad Valley (VS), without other data, M.A.L.; 1 spec., Mangalia (CT), without other data, M.A.L.; 19 specs, Lacul Sărat (BR), without other data, M.A.L., 22.05.1953, 28.05.1955, 8.06.1962, S.N.; 2 specs, Babadag Forest (TL), 1.06.1963, S.N.; 1 spec., Balta Albă (BZ), 21.05.1995, I.Al.

Pedestredorcadion scopoli (Herbst, 1784)

1 spec., without data, K.D.; 1 spec., Crăești (CJ), 04.1951; 1 spec., Timișoara (TM), 23.04.1954, C.I.; 1 spec., Tinca (BH), 24.05.1967, S.N.; 1 spec., Sibiu (SB), 14.04.1968, S.E.; 1 spec., București, Băneasa Forest, 3.05.1971, P.G.A.; 1 spec., Sfântu Gheorghe, Danube Delta (TL), 19.08.1971, S.N. (Fig. 2 D).

Pedestredorcadion septemlineatum (Waltl, 1838)

2 specs, Asia Minor, collecting data unknow, Ku.D.

Pedestredorcadion tauricum (Waltl, 1838)

4 specs, Mangalia (CT), without other data, M.A.L.; 1 spec., Lacul Sărat (BR), without other data, M.A.L.; 2 specs, București, without other data, M.A.L., 17.05.1991, P.S.M.; 1 spec., Vâlcea county, 1937; 3 specs, Bulgaria, Durostor county, 28.04.1938; 1 spec., Brânceni (TR), 1945; 4 specs, Comana Forest (GR), without other data, M.A.L., 17.05.1958, 24.06.1954, S.N.; 58 specs, Esecchio (CT), 17.05.1958, 12.05.-8.06.1961, 11-14.05.1963, 8.05.1966, 25.04.-14.05.1967, 11.05.1991, S.N.; 4 specs, southern Dobrogea (CT), 27.04.1963, S.N.; 12 specs, Brănești, Pasărea Forest (IF), 24.06.1952, P.S.X., 30.04.1953, S.N., 8.05.1963, P.G.A., P.S.X., 24.04.-7.05.1964, S.N., P.S.X.; 1 spec., Valu lui Traian (CT), 22.05.1955; 1 spec., București, Botanical Garden, 15.05.1963; 1 spec., Calopăr, Dâlga Forest (DJ), 5.06.1963, N.St.; 1 spec., Tecuci (GL), 5.06.1954, S.N.; 2 specs, Babadag Forest (TL), 23.06.1955, 25.05.1975, S.N.; 8 specs, Iortmac Lake (CT), 24.04.1963, S.N.; 4 specs, Băile Herculane (CS), 19.05.1963, W.M., 10-18.05.1964, S.N.; 11 specs, Hagieni Forest (CT), 28-29.06.1963, 6.06.1965, S.N., 1.05.1980, 6.05.1984, P.C., 22.05.1993, H.C.; 22 specs, Canarua Fetii (CT), 19.06.1960, 25.04.-25.05.1982, S.N., 18-20.05.1993, P.C., P.A., H.C., A.M., 20.05.1994, A.G.; 1 spec., Nanov Forest (TR), 14.05.1980, M.I.; 1 spec., Strehaia (MH), 14.05.1982, A.G.; 3 specs, Băltanele (MH), 16.05.1982, D.D.; 3 specs, Vasilați (CL), 18.05.1988, S.R.; 8 specs, Vidra (IF), 11.05.1989, P.G.A.; 5 specs, Dumbrăveni Forest (CT), 21.05.1994, A.G., P.A., 14.05.1995, P.C.; 5 specs, Negureni Forest (CT), 24.04.-15.05.1994, H.C., A.G.; 1 spec., Florești (GR), 12.06.1994, P.C.; 1 spec., Telița, Celic Dere (TL), 20.05.1997, P.C.; 1 spec., Valea Teilor (TL), 22.05.1997, P.C.

Tribe Lamiini

Herophila Mulsant, 1862*Herophila tristis* (Linnaeus, 1767)

1 spec., Italy, Trieste, without other data; 2 specs, Băile Herculane (CS), 06.1928, 19.05.1934, S.N. (Fig. 3 C).

Lamia Fabricius, 1775*Lamia textor* (Linnaeus, 1758)

1 spec., France, Besançon, without other data, M.A.L.; 1 spec., France, Mello (Oise), without other data, M.A.L.; 2 specs, Azuga (PH), without other data, F.Ed.; 2 specs, Hațeg (HD), without other data, K.D.; 1 spec., Agăș (BC), 8.06.1908; 1 spec., Băile Felix, Oradea (BH), 1911, V.E.; 5 specs, Băile Herculane (CS), 1950, V.E., 12.06.1953, 19.06.1956, 21.06.1959, 2.07.1960, S.N.; 1 spec., Pitești (AG), 06.1951, S.N.; 1 spec., Timișoara (TM), 20.06.1951, S.N.; 1 spec., București, Buda, 12.07.1957, R.A.; 1 spec., Sighetu Marmăției (MM), 27.06.1954, S.N.; 1 spec., Rucăr (AG), 06.1957, T.N.; 1 spec., Suceava (SV), 15.05.1959, S.N.; 2 specs, Ieșelnița Valley (MH), 3.06.1961, P.S.X.; 1 spec., Greșu, Focșani (VN), 21.07.1962, P.S.X.; 1 spec., Craiova (DJ), 5.06.1964, N.St.; 1 spec., Gândiți (?), 3.05.1966, S.N.; 1 spec., Spain, Zaragoza, La Alfranca Pastaiz, 7.05.1977, G.C.; 1 spec., Gura Văii (MH), 29.07.1979, S.N.; 1 spec., Strehaia (MH), 12.05.1982, S.R.; 1 spec., Târgu Cărbunești (GJ), 13.07.1984, S.R.; 1 spec., Galeș (AG), 25.05.1986, P.C.; 1 spec., Podu Dâmbovița (AG), 15.05.1990, A.Mi.; 3 specs, Muddy Volcanoes (Vulcanii Noroioși) (BZ), 1.05.2000, 15.06.2002, U.V.; 2 specs, ostrovul (island) Chichinete, Danube (MH), 12.05.2004, S.Mi.; 1 spec., Petroșani (GR), 28.06.2004, S.Me.; 1 spec., Arbănași, Beceni (BZ), 25.07.2005, U.V.; 1 spec., Cornetu (IF), 10.06.2006, C.G.

Morimus Brullé, 1832*Morimus asper asper* (Sulzer, 1776)

1 spec., France, Lyon, without other data, M.A.L.; 2 specs, Croatia, Istria, Pola, 1936; 1 spec., France, Provence Lucéram, Forêt de Turini, 5.08.1959, B.P.; 1 spec., France, Lanoux, Adrech, 21.07.1963, B.P.; 2 specs, France, Pyrénées Orientales, Forêt dela Massane, 07.1966, R.J.; 1 spec., France, Cipières, Bords du Loup, 14.06.1974, B.J.

Morimus asper funereus Mulsant, 1863

1 spec., Dolj county, 19.07.1937; 5 specs, Pitești (AG), 28.04.1950, 28.04.1951, S.N.; 1 spec., Periș (IF), 4.05.1950; 4 specs, Bârnova (IS), 21.05.1950, S.N.; 18 specs, Băile Herculane (CS), 1950, V.E., 1.06.1959, P.G.A., 1.07.-4.09.1960, S.N., 1.06.1962, P.G.A., 23.06.1963, 4.07.1964, 22.05.-12.07.1965, S.N., 26.05.-1.06.1966, P.G.A., 24.06.1970, R.A., 8.06.1977, S.N.; 3 specs, București, Băneasa Forest, 20.04.1951, P.G.A., 4.06.1959, S.N.; 13 specs, Comana Forest (GR), 25.05.1951, P.G.A., 12.06.1956, 30.05.1959, S.N., 9.06.-5.07.1963, R.A., S.N., 22.05.1971, S.N., 14.05.1995, P.S.M., 26.04.1998, P.S.M., 5.04.2005, C.G., 19.05.2009, P.A., P.I.; 41 specs, Moldova Nouă (CS), 23.05.1953, 10.05.1976, S.N.; 1 spec., southern Dobrogea (CT), 20.06.1956, S.N.; 5 specs, Brănești, Pasărea Forest (IF), 6.06.1959, 9.07.1970, S.N.; 1 spec., Craiova (DJ), 30.05.1960; 2 specs, Căldărușani, Brazi (IF), 21.06.1960, R.A.; 1 spec., Babadag Forest (TL),

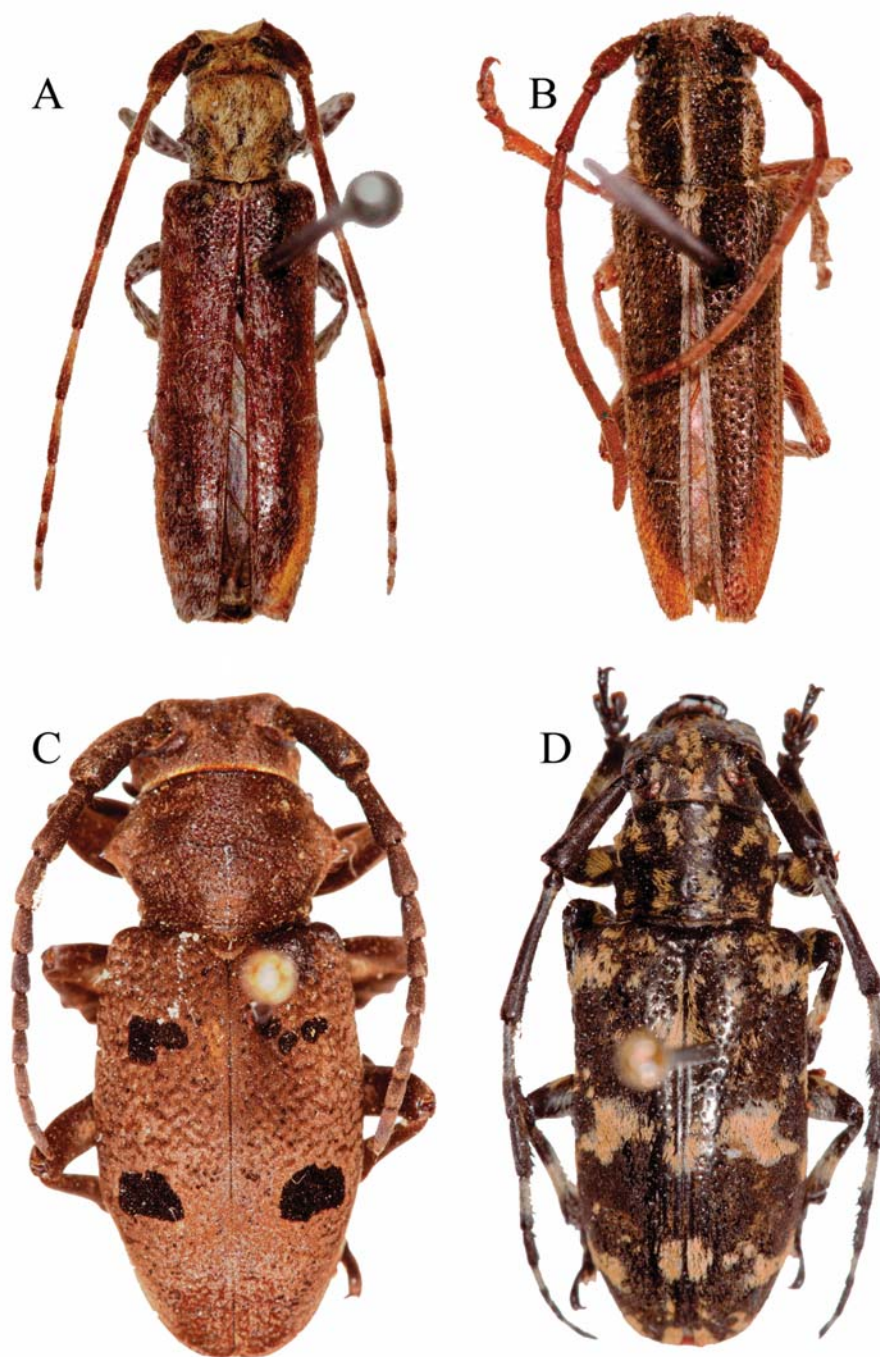


Fig. 3 - A, *Deroplia genei*; B, *Coptosia* sp.; C, *Herophila tristis*; D, *Mesosa longipennis*.
(Photos: I. Șt. Iorgu)

22.06.1962, P.G.A.; 1 spec., Bârlad (VS), 22.08.1963, R.A.; 1 spec., Caracal, Reșca-Romula (OT), 15.05.1964, N.St.; 4 specs, Canaraua Feti (CT), 16-19.07.1964, W.M., S.N., 30.05.1965, N.St., 14.07.1966, S.N.; 1 spec., Țigănești, Ciolpani (IF), 26.04.1966, R.A.; 1 spec., Danube Gorges (Cazanele Dunării) (MH), 20.05.1966, N.St.; 5 specs, Ieșelnița (MH), 3.06.1966, P.G.A., 7.06.1967, N.St., 14.05.1968; 1 spec., Orșova (MH), 2.04.1966, N.St.; 1 spec., Locva Mts, Lacul Dracului (CS), 26.07.1966, B.M.; 1 spec., Păltiniș, (Cibin) Mts (SB), 2.07.1966, S.N.; 2 specs, Baia Nouă, Danube Gorges (Cazanele Dunării) (MH), 4.08.1967, N.St.; 1 spec., Grațca, Orșova (MH), 27.04.1968, N.St.; 4 specs, Mraconia Valley, Dubova (MH), 24.05.1970, S.N.; 6 specs, Ghelmeșioaia (MH), 1.06.1971, 2.06.1972, S.N.; 51 specs, Moldova Nouă (CS), 26-28.05.1971, 24.05-4.06.1973, 27.05.1975, 06.1976, S.N.; 6 specs, Cocos monastery (TL), 13.05.-4.07.1975, C.A., 24.05.2005, S.R.; 1 spec., Cladova (AR), 10.06.1976; 1 spec., Gura Văii (MH), 4.07.1978, S.N.; 2 specs, Dealu, Căscioarele Forest (IF), 7-8.06.1979, S.R.; 1 spec., Corbii Mari, Pîntenoaia Forest (IF), 21.06.1979, L.D.; 2 specs, Ciucurova (TL), 19.06.1981, S.N., 22.05.1997, D.M.; 3 specs, Snagov Forest (IF), 12.07.1991, Ș.I.; 2 specs, București, 20.08.1991, P.S.M., 8.05.1995, P.S.M.; 4 specs, Jurilovca, 6 Martie Forest (TL), 10.05.1992, N.R.; 2 specs, Lupșa Valley, Motru Sec (GJ), 18.06.1992, S.R.; 1 spec., Cloșani (GJ), 18.06.1992, P.C.; 1 spec., Sohodol Gorges (Cheile Sohodolului) (GJ), 21.06.1992, P.C.; 1 spec., Slava Rusă (TL), 22.06.1993, S.Mi.; 2 specs, Cernica Forest (IF), 7-9.07.1995, P.S.M., I.A.I.; 3 specs, Telița, Celic Dere (TL), 20-24.05.1997, P.C.; 7 specs, Unguriu, Măgura (BZ), 11.05.-18.08.2003, 19.07.2004, 24.04.2006, 28.04.2007, U.V.; 1 spec., Arbănași, Beceni (BZ), 25.07.2005, U.V.; 1 spec., Valea Bratcului (GJ), 6.06.2004, R.N.; 1 spec., Schitu Locurele (GJ), 8.07.2004, B.C.; 1 spec., Tarnița (GJ), 9.07.2004, P.A.; 5 specs, Valea Fagilor, Luncavița (TL), 24.05.2005, S.R.; 1 spec., Sasca Montană, Valea Bei f.h. (CS), 10.08.2005, P.E.

Tribe Mesosini

Mesosa Latreille, 1829

Mesosa curculionoides (Linnaeus, 1761)

2 specs, France, Besançon, without other data, M.A.L.; 1 spec., Titu (DB), without other data; 1 spec., Băile Felix, Oradea (BH), 1911, V.E.; 34 specs, Comana Forest (GR), without other data, M.A.L., 25.06.1935, P.G.A., 14.05.-9.07.1955, 12.07.1956, 4-16.06.1959, 15.05.1973, S.N.; 14.07.1989, B.A., 3.05.1997, P.S.M.; 2 specs, București, Băneasa Forest, 05.1952, S.N.; 2 specs, Babadag Forest (TL), 23.06.1955, S.N.; 1 spec., Snagov (IF), 25.04.1957, R.A.; 1 spec., Mogoșoaia (IF), 4.06.1957, S.Ig.; 1 spec., Căldărușani (IF), 12.06.1958, R.A.; 1 spec., Pitești (AG), 2.06.1960, S.N.; 1 spec., Vidra (VN), 13.09.1960, R.A.; 2 specs, Letea Forest, Danube Delta (TL), 11.05.1964, P.S.X.; 2 specs, C. A. Rosetti, Danube Delta (TL), 11.06.1964, P.S.X.; 2 specs., Orșova (MH), 2.04.1966, N.St.; 2 specs, Băile Herculane (CS), 25.06.1963, 15.06.1968, S.N.; 4 specs, Moldova Nouă (CS), 24.05.-1.06.1973, S.N.; 1 spec., Sulina (TL), 14.06.1974, S.N.; 1 spec., Târnăveni (MS), 28.05.1998, I.P.; 1 spec., Unguriu, Măgura (BZ), 3.07.2003, U.V.; 1 spec., ostrovul Mocanu (island), Danube (GR), 21.06.2004, P.C.; 2 specs, Valea Fagilor, Luncavița (TL), 24.05.2005, S.R.

Mesosa longipennis Bates, 1873

1 spec., Japan, Okinawa, Omoto Mt., 20.06.1971, O.S.; 1 spec., Japan, Okinawa, Ganpira, 9.07.1971, O.S.; 1 spec., Japan, Okinawa, Banna Mt., 15.07.1971, O.S. (Fig. 3 D).

Mesosa nebulosa (Fabricius, 1781)

1 spec., Burgberg (Vurpăr) (AB), without other data; 2 specs, Azuga (PH), without other data, F.Ed.; 1 spec., Kronstädter Gebirge (Braşov Mts) (BV), without other data, D.Fr.; 1 spec., Kapelenberg (Tâmpa, Braşov), without other data, D.Fr.; 1 spec., Bârlad Valley (VS), without other data, M.A.L.; 1 spec., Predeal (BV), without other data, M.A.L.; 5 specs, Comana Forest (GR), without other data, M.A.L.; 4 specs, Bucureşti, Băneasa Forest, 19.04.1951, 10.05.1952, 4.05.1956, S.N.; 7 specs, Băile Herculane (CS), 12.07.1953, 29.05.-19.07.1956, 2.07.1967, 25.05.1971, S.N.; 2 specs, Comana Forest (GR), 24.06.1954, S.N.; 1 spec., Haţeg Mts, 23.07.1955, S.N.; 1 spec., southern Dobrogea (CT), 25.07.1955, S.N.; 1 spec., Vrata (MH), 06.1956, S.N.; 1 spec., Daneţi, Gura Jiului (DJ), 14.06.1956, R.I.V.; 1 spec., Babadag Forest (TL), 30.06.1956, P.S.X.; 1 spec., Rucăr (AG), 06.1957, N.T.; 3 specs, Craiova (DJ), 30.05.1960; 1 spec., Dumbrăveni Forest (CT), 23.05.1965, S.N.; 1 spec., Bucureşti, 25.07.1967, R.A.; 3 specs, Moldova Nouă (CS), 25.05.1971, S.N.; 1 spec., France, Aiguines, Forêt de Margès, 5.06.1974, B.P.; 1 spec., Luncaviţa (TL), 20.05.1996, P.S.M.; 1 spec., Muddy Volcanoes (Vulcanii Noroioşi) (BZ), 15.06.2002, U.V.; 1 spec., Unguriu, Măgura (BZ), 03.07.2003, U.V.

*Monochamus Dejean, 1821**Monochamus galloprovincialis galloprovincialis* (Olivier, 1795)

2 specs, France (Gallia, Landes), without other data, K.D.

Monochamus galloprovincialis pistor (Germar, 1818)

1 spec., Băile Herculane (CS), 30.07.1951, S.N.

Monochamus saltuarius (Gebler, 1830)

3 specs, Retezat Mts, Gura Apei, 28.07.1956, S.N.

Monochamus sartor (Fabricius, 1787)

1 spec., Broşteni, Carpathian Mts (SV), without other data, M.A.L.; 1 spec., Poiana Țapului (PH), without data; 1 spec., Schuler Gebirge (Postăvaru Mt.), Braşov, without other data, D.Fr.; 1 spec., Băile Tuşnad, Ciuc Depression (HR), without other data, D.Fr.; 1 spec., Frecker Gebirge (Făgăraş Mts), Bârcaciu, 06.1924; 1 spec., Hohe Rinne (Păltiniş), Cibin Mts (Zibin Gebirge) (SB), without other data, W.E.; 1 spec., Retezat Mts, 11.06.1946; 1 spec., Slănic Moldova, Nemira Mts (BC), 06.1949; 1 spec., Bucegi Mts, Padina, 12.07.1951, S.N.; 2 specs, Rodnei Mts, Pietrosu Peak (MM), 26.07.1953, S.N.; 2 specs, Rarău Mts, 28.07.1953, S.N.; 2 specs, Retezat Mts, Gura Zlata, 9.08.1955, S.N.; 1 spec., Vatra Dornei, Dorna Depression (SV), 09.1955; 2 specs, Retezat Mts, Gura Apei, 28.07.1956, S.N.; 1 spec., Căliman Mts, Răstolniţa, 28.08.1956, S.N.; 4 specs, Făgăraş Mts, Negoiu chalet, 28.07.1957, S.N.; 9 specs, Făgăraş Mts, Capra Peak, 28.07.-4.08.1957, 15.09.1959, S.N.; 6 specs, Făgăraş Mts, Suru chalet, 7.08.1957, S.N.; 1 spec., Comăneşti, Bacău, 1.09.1970; 4 specs, Lotariţa Mts, Voineasa, Lotru Valley

(VL), 1.08.1996, P.S.M.; 2 specs, Gurghiu Mts, Valea Sălardului (MS), 3.08.1999, I.P.; 1 spec., Apuseni Mts, Glăvoiu cave (BH), without other data; 1 spec., Predeal (BV), 6.07.2004, U.V.; 1 spec., Săpânța, Colibi f.h. (MM), 6.07.1996, H.C.; 1 spec., Lerești (AG), 19.07.2003, S.M.; 12 specs, Valley of the Rica River, 3 km upstream Poienile de sub Munte (MM), 14.VI.2003, S.R., P.C.; 19 specs, Valley of the Repedea River, 500 m upstream Repedea f.h. (MM), 18.06.2003, S.R., S.Mi., S.Me.; 2 specs, Țibleș Mts, Săliște, Valley of the Idișor streamlet (MM), 23.VI.2003, S.R.; 1 spec., Făgăraș Mts, Vidraru Lake, Cumpăna chalet (AG), 3.08.2004, S.R.; 2 specs, Făgăraș Mts, Vidraru Lake, 7.08.2004, M.D.; 92 specs, Maramureș Mts, Valley of the Vaser River, Făina, 21-22.07.2004, S.R., C.G., B.C.

Monochamus sutor (Linnaeus, 1758)

1 spec., Suisse, Travers, without other data, M.A.L.; 1 spec., Făgăraș Mts (Frecker Gebirge), Bârcaciu, 06.1924; 1 spec., Bucegi Mts, Tătaru, 4.08.1949; 21 specs, Făgăraș Mts, Capra Peak, 20.08.1950, 28.07.-4.08.1957, 17.08.1959, S.N.; 2 specs, Bucegi Mts, Bolboci chalet, 12.07.1953, S.N.; 1 spec., Rarău Mts, Izvorul Alb, 19.08.1955, S.N.; 4 specs, Retezat Mts, Gura Zlata, 9.08.1955, 25.07.1956, S.N.; 3 specs, Retezat Mts, Gura Apei, 28.07.-9.08.1956, S.N., 8.08.1976, P.C.; 9 specs, Făgăraș Mts, Otic Peak, 16.08.1959, S.N.; 1 spec., Parâng Mts, Rânca, 17.07.1964; 1 spec., Maramureș Mts, Valley of the Vaser River, 20.08.1982, Ig.A.; 1 spec., Sâmbăta de Sus (SB), 23.08.1980; 2 specs, Gurghiu Mts, 10.07.1994, M.B.P.; 2 specs, Lerești, Valea Ursului, 800 m (AG), 14.08.1997, 22.07.2003, S.M.; 1 spec., Cernica (IF), 9.07.1995, I.A.I.; 13 specs, the confluence of the Rica and the Budescu rivers, Poienile de sub Munte (MM), 14.06.2003, S.R., P.C.; 12 specs, Valley of the Rica River, Poienile de sub Munte (MM), 14.06.2003, S.R., S.Mi.; 5 specs, Valley of the Repedea River, 500 m upstream Repedea f.h. (MM), 18.06.2003, S.R.; 170 specs, Maramureș Mts, Valley of the Vaser River, Făina, 19.06.2006, S.R., 21-22.07.2004, S.R., C.G., B.C.

Tribe Obereini

Oberea Dejean, 1835

Oberea erythrocephala (Schrank, 1776)

3 specs, Transylvania, without other data, K.D.; 4 specs, Hațeg (HD), without other data, K.D.; 2 specs, without data, F.Ed.; 1 spec., Băile Govora (VL), without other data, F.Ed.; 2 specs, Austria, Umgebungen Graz, without other data, P.K.A.; 2 specs, Comana Forest (GR), without other data, M.A.L., F.Ed.; 1 spec., Valu lui Traian (CT), 05.1950; 14 specs, Brănești, Pasărea Forest (IF), 5.07.1952, 2-19.06.1959, S.N.; 2 specs, Budești (CL), 11.06.1956, 2.06.1964, S.N.; 4 specs, Canaraua Fetii (CT), 29.06.1956, 27.05.1962, S.N., 29.06.1964, N.St., 18.07.1967, S.N.; 10 specs, Sfântu Gheorghe, Delta Danube (TL), 17.06.1958, S.N.; 1 spec., Hărman (BV), 8.06.1963; 11 specs, Agigea (CT), 27-30.05.1963, P.S.X., P.G.A., S.N., 15-17.06.1964, P.S.X., P.G.A., 4.07.1965, N.St.; 1 spec., Hagieni Forest (CT), 28.05.1963, S.N.; 1 spec., C. A. Rosetti, Danube Delta (TL), 27.05.1981, P.S.X.; 1 spec., Sihlea (VN), 23.06.1987, M.I.; 3 specs, southern Dobrogea (CT), 28.06.1987,

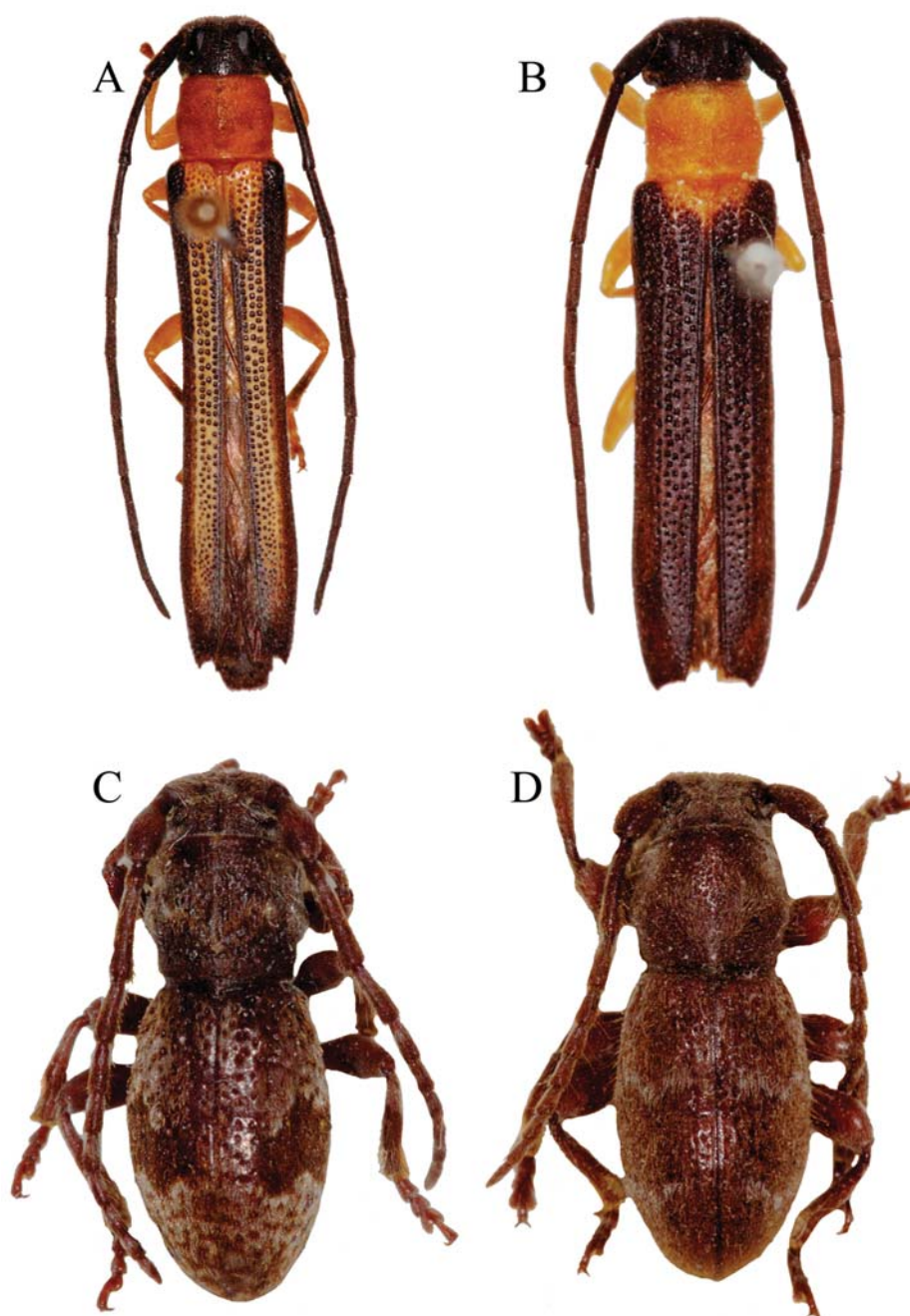


Fig. 4 - A, *Oberea mixta*; B, *Oberea pedemontana*; C, *Parmena balteus*; D, *Parmena bicincta*.
(Photos: I. Șt. Iorgu)

S.N.; 3 specs, Popina Island, Razelm (Razim) Lake, 8.06.1994, H.C.; 1 spec., Aleșd (BH), 27.06.1994, S.Au.

Oberea euphorbiae (Germar, 1813)

1 spec., Târgu Jiu (GJ), 18.06.1954; 11 specs, Buhaz sand level, Delta Danube (TL), 17.06.1958, S.N.; 29 specs, Periprava, Danube Delta (TL), 23.06.-11.07.1962, D.I., S.N., 29-30.06.1963, P.S.X., P.G.A., D.I., 2.07.1963, P.S.X., 13.05.1964, W.M., P.S.X., N.St.; 1 spec., Agigea (CT), 17.06.1964, P.G.A.; 23 specs, Caraorman, Danube Delta (TL), 7-12.05.1967, P.S.X., D.I., W.M., P.G.A., 11.05.1968, P.G.A., 13.06.1984, P.S.X., 24.06.1991, Gh.P., 15.05.1992, G.N.; 1 spec., Letea Forest, Danube Delta (TL), 15.06.1970, S.N.; 7 specs, Sfântu Gheorghe, Delta Danube (TL), 24.06.1982, 5.07.1983, S.N.; 2 specs, Băile Herculane (CS), 28.06.1986, S.N.; 1 spec., Maliuc, Mila 26 (TL), 18.05.1992, G.N.; 1 spec., Dunavăț, Danube Delta (TL), 9.06.1994, H.C.; 3 specs, Cetățuia (GR), 26.04.2004, S.Me.; 2 specs, Malu (GR), 27.04.2004, P.C.

Oberea linearis (Linnaeus, 1761)

1 spec., without data, F.Ed.; 1 spec., France, Besançon, without other data, M.A.L.; 1 spec., Republic of Moldova, Cernăuți (Czernowitz), without other data; 1 spec., București, Băneasa Forest, 15.07.1959, S.N.

Oberea mixta Bates, 1873

8 specs, Japan, Chichibu, Saitama, 14.06.1971, O.S. (Fig. 4 A).

Oberea oculata (Linnaeus, 1758)

1 spec., București, without other data, M.A.L.; 1 spec., France, Besançon, without other data, M.A.L.; 1 spec., Azuga (PH), without other data, F.Ed.; 5 specs, Bran (Torzburg) (BV), without other data, C.R.; 1 spec., Moinești (BC), without other data, C.R.; 1 spec., Băile Felix, Oradea (BH), 1911, V.E.; 1 spec., Retezat Mts, Gura Zlata, 2.08.1934; 1 spec., Dăărăști (IF), 06.1949; 1 spec., București, Roșu, 24.08.1953, P.G.A.; 1 spec., Roșu Lake (Lacul Roșu), Hășmașu Mare Mts (HG), 24.08.1953, P.G.A.; 3 specs, Mangalia, Comarova Forest (CT), 1.07.1955, S.N.; 2 specs, Băile Herculane (CS), 15.07.1955, 2.07.1957, S.N.; 1 spec., Retezat Mts, 19.08.1958, S.N.; 8 specs, Pitești (AG), 2.08.1957, 2.07.1959, 2.07.1962, S.N.; 12 specs, Ciovârșani (MH), 24-27.06.1961, S.N.; 1 spec., Periprava, Danube Delta (TL), 29.06.1962, S.N.; 1 spec., Eșelnița (MH), 30.05.1968, P.S.X.; 2 specs, Budești (CL), 25.05.-5.06.1979, W.M., D.I.; 1 spec., Nanov Forest (TR), 26.06.1980, D.I.; 1 spec., Sfântu Gheorghe, Delta Danube (TL), 5.07.1983, S.N.; 1 spec., Târgu Cărbunești (GJ), 12.07.1984, M.I.; 1 spec., Călinești Oaș (SM), 31.07.1985, G.V.; 1 spec., Cărligătura Valley, 17 km upstream Repedea (MM), 27.06.1998, P.C.; 1 spec., Tataru dam on the Mara River, Ocna Șugatag (MM), 16.07.1998, P.S.M.; 1 spec., Buzău Mts, Harțagu, Nechoiașu f.h., 16.08.2002, U.V.

Oberea pedemontana Chevrolat, 1856

2 specs, București, Băneasa Forest, 15.07.1959, 18.06.1960, S.N.; 8 specs, Șelimbăr (SB), 15.06.1961, 4.06.1962, S.N.; 3 specs, Murfatlar (CT), 12.06.1961, S.N.; 4 specs, Hagieni Forest (CT), 4-5.06.1962, S.N., 20.06.1964, D.I. (Fig. 4 B).

Oberea pupillata (Gyllenhal, 1817)

2 specs, without data, C.R.; 1 spec., Retezat Mts, 11.06.1946.

Tribe Parmenini

Parmena Dejean, 1821*Parmena balteus* (Linnaeus, 1767)

4 specs, France, without other data, M.A.L.; 2 specs, France, Saint Vallier, Pt. De Danadiou, 19.05.1973, B.P.; 2 specs, France, Alpes Maritimes, Cipières, Le Plan, 8.06.1974, B.P.; 1 spec., France, Var, Le Muy, 12.06.1974, B.P. (Fig. 4 C).

Parmena bicincta Küster, 1849

3 specs, Croatia, Dalmatia, Lesina, without other data (Fig. 4 D).

Parmena pubescens (Dalman, 1817)

1 spec., Italy, Sicily, without other data.

Parmena solieri Mulsant, 1839

1 spec., France (Gallia), without other data, K.D.; 2 specs, Italy, Sicily, la provincia di Palermo, Piana degli Albanesi, 6.XII.1975, B.S.

Parmena unifasciata (Rossi, 1790)

1 spec., Băile Herculane (CS), 13.05.1960, S.N.

Tribe Phytoeciini

Cardoria Mulsant, 1862*Cardoria scutellata* (Fabricius, 1792)

1 spec., Hagieni Forest (CT), 29.05.1963, S.N. (Fig. 5 A).

Coptosia Fairmaire, 1864*Coptosia* sp.

1 spec., Valu lui Traian (CT), 3.06.1957, S.N. (Fig. 3 B).

Opsilia Mulsant, 1862*Opsilia coerulescens* (Scopoli, 1763)

5 specs, Transylvania, without other data, K.D.; 1 spec., Lotru Valley (VL), without other data, D.Fr.; 2 specs, Comana Forest (GR), without other data, M.A.L.; 1 spec., Bârlad Valley (SV), without other data, M.A.L.; 2 specs, Ploiești (PH), 9-10.06.1953; 1 spec., Bârsești (GJ), 22.06.1954, R.I.V.; 1 spec., Mangalia, Comarova Forest (CT), 1 07.1955, S.N.; 5 specs, Canaraua Fetii (CT), 22.07.1955, 27.05.1962, 18.07.1967, S.N.; 1 spec., Greci (TL), 26.05.1956, P.S.X.; 1 spec., Ocolna (DJ), 12.06.1956, R.I.V.; 1 spec., Potelu (OT), 13.06.1956, R.I.V.; 2 specs, southern Dobrogea (CT), 5.06.1959, S.N.; 22 specs, Brănești, Pasărea Forest (IF), 2-22.06.1959, S.N., 8.06.1964, D.I.; 1 spec., Bozovici (CS), 6.06.1962, D.I.; 9 specs, Agigea (CT), 28-29.05.1962, P.G.A., 19-20.06.1962, R.A., 15-17.06.1964, P.S.X., P.G.A., 16.05.2006, P.E.; 4 specs, Hagieni Forest (CT), 7.06.1963, P.G.A., 5-7.06.1965, S.N.; 4 specs, Ieșelnița (MH), 14-17.05.1969, P.G.A., W.M., 3.06.1968, P.S.X., 20.06.1970, R.A.; 3 specs, Ghelmegioaia (MH), 2.06.1971, S.N.; 1 spec.,

France, Aiguines, Forêt de Margés, 5.06.1974, B.P.; 1 spec., Clisura Dunării, Oreva (CS), 23.05.1976, S.N.; 1 spec., Băile Herculane (CS), 10.07.1977, S.N.; 3 specs, Esechio (CT), 29.04.1978, S.N.; 3 specs, Greece, Athens, 16.04.1978, 19-24.04.1979, M.I.; 5 specs, Moara Vlăsiei (IF), 10.06.1978, S.R., A.G.; 1 spec., Budești (CL), 25.05.1979, W.M.; 1 spec., Padeș (GJ), 16.06.1992, S.R.; 1 spec., Slava Rusă, Babadag (TL), 22.06.1993, M.I.; 2 specs, Trăiseni, Valley of the Doftana River (PH), 26.06.1994, P.C.; 1 spec., Celic Dere monastery (TL), 20.05.1997, H.C.; 1 spec., Valley of the Bistra River (MM), 28.06.1997, M.I.; 1 spec., Tunisia, Bulla Regia, 28.03.2006, C.P. („Punia” Expedition); 1 spec., Morocco, Merja Zerga, 12.04.2007, C.P. („Atlas” Expedition); 4 specs, Morocco, Tioumliline, 28.04.2007, C.P. („Atlas” Expedition); 1 spec., Morocco, Volubilis, 29.04.2007, P.B.M. („Atlas” Expedition); 1 spec., Morocco, Mouley Idriss, 1.05.2007, C.P. („Atlas” Expedition).

Opsilia molybdaena (Dalman, 1817)

1 spec., Morocco, Cherrat, Oued Bouznika, 15.04.2007, C.S. („Atlas” Expedition); 2 specs, Morocco, Volubilis, 29.04.2007, C.P. („Atlas” Expedition); 1 spec., Morocco, Jmalha, 5.05.2007, C.P. („Atlas” Expedition).

Oxyilia Mulsant, 1862

Oxyilia duponchelii (Brullé, 1832)

1 spec., Greece, without other data (Fig. 5 B).

Phytoecia Dejean, 1835

Phytoecia (Helladia) adelpha (Ganglbauer, 1884)

2 specs, Turkey, Issos Erzin, Hatay, 8.05.1998, P.S.M., I.AI.

Phytoecia (Helladia) humeralis (Waltl, 1838)

1 spec., Greece, Crete, 1.05.2004, P.S.M.

Phytoecia (Helladia) praetextata (Steven, 1817)

14 specs, Esechio (CT), 9.05.1958, 9.06.1961, 9-14.05.1963, 25.04.1963, S.N. (Fig. 5 D).

Phytoecia (Musaria) affinis (Harrer, 1784)

(= *Phytoecia nigripes* Voet, 1778)

1 spec., Kronstädter Gebirge (Brașov Mts) (BV), without other data, D.Fr.; 2 specs, Almaș (AR), 1.07.1907; 1 spec., Căpâlnaș (AR), 8.05.1940, S.N.; 3 specs, Bârnova (IS), 13.06.1965, S.N.; 1 spec., Valea Beiului, Beușnița waterfall (CS), 14.05.2002, S.Me.

Phytoecia (Musaria) argus (Froelich, 1793)

1 spec., Kronstädter Gebirge (Brașov Mts) (BV), without other data, D.Fr.; 1 spec., Valea lui David (IS), 10.06.1984, P.G.A.

Phytoecia (Phytoecia) caerulea (Scopoli, 1772)

1 spec., without data, K.D.; 1 spec., București, Filaret, without other data, F.Ed.; 9 specs, Măcin (TL), without other data, M.A.L., F.Ed., 23.05.1961; 1 spec., Babadag Forest (TL), without other data, F.Ed.; 1 spec., Dobrogea, without other data, F.Ed.;

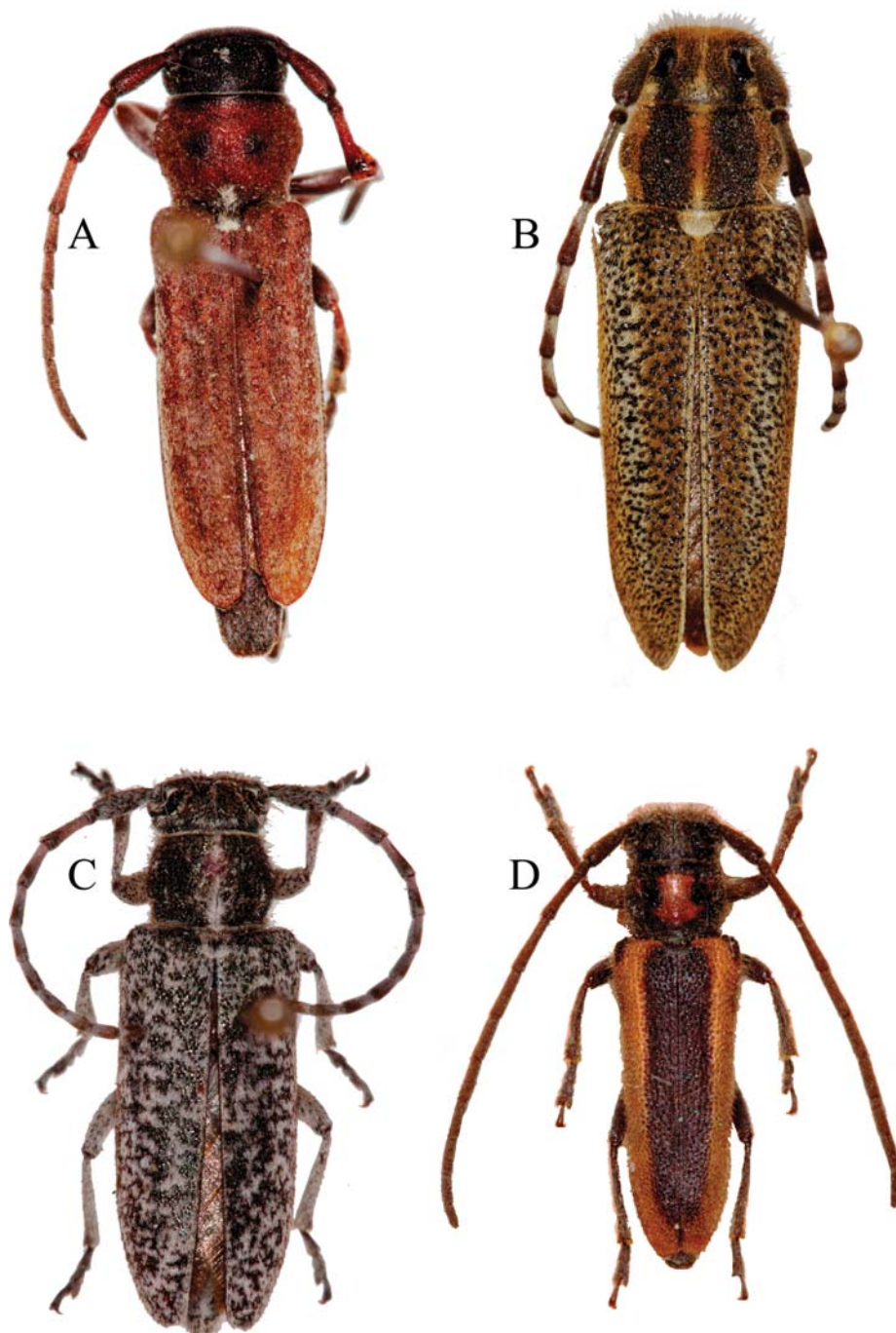


Fig. 5 - A, *Cardoria scutellata*; B, *Oxyilia duponchelii*; C, *Pilemia tigrina*; D, *Phytoecia praetextata*.
(Photos: I. Șt. Iorgu)

1 spec., Oltina (CT), 17.05.1955, P.G.A.; 11 specs, Valu lui Traian (CT), 18-21.06.1955, P.S.X., 21.06.1958, S.N., 28.06.1961, I.A.; 1 spec., Hanu Conachi (GL), 18.05.1956; 17 specs, Esecchio (CT), 19.05.1958, 14-25.05.1962, 9-14.05.1963, 1.07.1987, S.N.; 1 spec., Căldărușani (IF), 21.05.1960, R.A.; 1 spec., Măcin (TL), 23.05.1961; 18 specs, Canaraua Fetii (CT), 27.05.1962, 15.05.1963, S.N.; 5 specs, Comarova Forest, Mangalia (CT), 2-3.06.1962, S.N.; 3 specs, Agigea (CT), 30.05.1963, P.G.A., 20.06.1964, W.M.; 1 spec., Hagieni Forest (CT), 7.06.1963, P.G.A.; 1 spec., C. A. Rosetti, Delta Danube (TL), 12.05.1964, W.M.; 1 spec., Budești (CL), 3.06.1964, R.A.; 18 specs, Dumbrăveni Forest (CT), 23.05.1965, S.N., 14.05.1995, P.C., A.M.; 2 specs, Nucet (DB), 15.06.1970, M.D., A.I.; 1 spec., Iortmac Lake (CT), 17.05.1972, S.N.; 2 specs, Spain, Zaragoza, 5.04.1977, G.C.; 1 spec., Dumbrava de Jos (MH), 14.05.1982, S.R.; 1 spec., Strehaia (MH), 24.06.1983, P.C.; 1 spec., Sihlea (VN), 23.06.1987, P.C.; 8 specs, Nuci (CL), 05.1988, M.I.; 4 specs, Vasilați (IF), 18.05.1988, S.R.; 1 spec., Maliuc, Mila 26, Danube Delta (TL), 19.05.1992, M.I.; 1 spec., Cetatea Arganum, Capul Dolosman, Razelm Lake (TL), 11.05.1993; 1 spec., Teița, Celic Dere (TL), 20.05.1997, P.C.; 2 specs, Turkey, Göreme, Nevşehir, 9.05.1998, P.S.M., I.Al.; 2 specs, Turkey, Aksaraz, 9.05.1998, P.S.M., I.Al.; 1 spec., Unguriu, Măgura (BZ), 19.07.2004, U.V.

Phytoecia (Phytoecia) cylindrica (Linnaeus, 1758)

1 spec., without data, F.Ed.; 5 specs, Comana Forest (GR), without other data, M.A.L.; 4 specs, București, Băneasa Forest, 10.05.1952, 5.05.1982, 18.05.1991, S.N.; 1 spec., Brănești, Pasărea Forest (IF), 30.04.1953, S.N.; 1 spec., Oravița (CS), 1.07.1953, S.N.; 3 specs, Bârnova (IS), 4.06.1953, 4.06.1954, S.N.; 1 spec., Mediaș (SB), 5.06.1954, S.N.; 1 spec., Deva (HD), 6.06.1955, S.N.; 11 specs, Băile Herculane (CS), 15.07.1955, S.N., 20.05.1964, 30.05.1965, P.G.A., 20.07.1991, S.N.; 3 specs, Căldărușani (IF), 31.05.1957, P.S.X., 21.05.1960, R.A.; 3 specs, Chitila (IF), 10.05.1958, P.S.X.; 5 specs, Oltina (CT), 15.05.1958, S.N.; 4 specs, Săbăreni (GR), 17.05.1958, S.Ig., P.S.X.; R.A.; 8 specs, Canaraua Fetii (CT), 27.05.1962, S.N., 20.05.1994, A.G.; 2 specs, Mangalia, Comarova Forest (CT), 2.06.1962, P.G.A., 17.06.1963, S.N.; 1 spec., Agigea (CT), 15.06.1964, P.S.X.; 8 specs, Domogled Mt., Cerna Mts (CS), 2.06.1965, P.G.A., D.I.; 10 specs, Dumbrăveni Forest (CT), 23.05.1965, S.N., 14.05.1995, P.C.; 4 specs, Hagieni Forest (CT), 21.05.1965, S.N., 6.06.1965, P.S.X.; 1 spec., Valea Lungă (DB), 28.05.1967, R.A.; 1 spec., Ciolpani, Țigănești Forest (IF), 26.04.1966, R.A.; 1 spec., Strehaia (MH), 12.05.1982, S.R.; 11 specs, Negureni Forest (CT), 18.05.1993, P.C., 18-21.05.1994, H.C., 2 specs, Valea Fagilor, Luncavița (TL), 24.05.2005, S.R., A.G.

Phytoecia (Phytoecia) erythrocnema Lucas, 1846

1 spec., Morocco, Cascades d'Ouzoud, 27.04.2007, C.G. („Atlas” Expedition); 5 specs, Morocco, Volubilis, 30.04.2007, P.C. („Atlas” Expedition).

Phytoecia (Phytoecia) icterica (Schaller, 1783)

4 specs, Hațeg (HD), without other data, K.D.; 1 spec., Craiova (DJ), 07.1946; 8 specs, București, without other data, 6.X.1957, P.S.X.; 3 specs, Comana Forest (GR), without other data, M.A.L., 15.05.2005, U.V.; 1 spec., Ploiești (PH), 10.06.1953; 1 spec., București, Băneasa Forest, 24.05.1954; 1 spec., Budești (CL),

28.05.1954; 19 specs, Tecuci (GL), 5.06.1954. S.N.; 2 specs, Oltina (CT), 17.05.1955, S.N.; 36 specs, Canaraua Feti (CT), 15.05.1958, 27.05.1962, 15.05.1963, 11.06.1967, 15-16.06.1984, S.N., 19.05.1993, A.M.; 1 spec., Valea lui David (IS), 10.06.1958, S.N.; 1 spec., Mogoșoaia (IF), 26.05.1959, R.A.; 1 spec., Esecchio (CT), 9.06.1961, S.N.; 5 specs, Dumbrăveni Forest (CT), 23.05.1965, S.N., 17-21.05.1994, P.C., H.C.; 1 spec., Strehaia (MH), 24.06.1983, S.R.; 3 specs, southern Dobrogea (CT), 28.06.1987, S.N.; 2 specs, Negureni Forest (CT), 18.05.1993, P.C., P.A.; 1 spec., Negureni, Valea Cișmelelor (CT), 18.05.1994, H.C.; 1 spec., București, 30.01.2002, A.G.; 1 spec., Pietroșani (GR), 28.04.2004, P.C.; 2 specs, Coșnea f.h., Poienile de sub Munte (MM), 19.07.2004, P.C.

Phytoecia (Phytoecia) nigricornis (Fabricius, 1781)

9 specs, Comana Forest (GR), without other data, M.A.L., F.Ed., 5.07.1951, 14.05.-3.06.1955, 16.06.1959, 24.05.1962, S.N.; 1 spec., Călimănești, Cozia monastery (VL), 9.06.1953, S.N.; 1 spec., Oravița (CS), 1.07.1953, S.N.; 3 specs, Bârnova (IS), 4.06.1954, 20.06.1969, S.N.; 18 specs, Tecuci (GL), 5.06.1954. S.N.; 1 spec., Armășești (IF), 27.06.1954; 1 spec., Mangalia, Comarova Forest (CT), 1.07.1955, S.N.; 1 spec., Căldărușani (IF), 31.05.1957, P.S.X.; 4 specs, Brănești, Pasărea Forest (IF), 26.05.1958, 5-19.06.1959, S.N.; 3 specs, Canaraua Feti (CT), 19.06.1960, S.N., 20.05.1993, H.C.; 1 spec., Esecchio (CT), 25.05.1962, S.N.; 1 spec., Clisura Dunării, Slătinic (CS), 17.05.1976, S.N.; 1 spec., Sihlea (VN), 23.06.1987, M.I.; 1 spec., Sohodol Gorges (Cheile Sohodolului) (GJ), 21.06.1992, P.C.; 1 spec., Făgăraș Mts, Bâlea waterfall, 24.07.1994, P.C.; 3 specs, Celic Dere monastery, Telița (TL), 20.05.1997, S.R., H.C.; 1 spec., Valea Teilor (TL), 22.05.1997, S.R.; 2 specs, Ciucurova (TL), 22.05.1997, H.C.; 1 spec., Telița (TL), 24.05.1997, P.C.; 1 spec., Dumbrăveni Forest, Ceair Valley (CT), 17.07.1997, A.A.D.; 1 spec., Florești (GR), 24.07.1997, P.C.; 1 spec., Pietrele Albe, Valley of the Jiu River (GJ), 7.07.2004, B.C.; 1 spec., Locurele hermitage (GJ), 8.07.2004, B.C.

Phytoecia (Phytoecia) pustulata (Schränk, 1776)

3 specs, without data, K.D.; 1 spec., Slobozia (IL), without other data, F.Ed.; 1 spec., Bârlad Valley (SV), without other data, M.A.L.; 4 specs, Comana Forest (GR), without other data, M.A.L.; 1 spec., Comana, 1937; 2 specs, Austria, Umgebungen Graz, without other data; 2 specs, Făget (CJ), 19.05.1946; 1 spec., Voinești (DB), 24.05.1950; 1 spec., Gemenea (DB), 31.05.1950; 3 specs, București, Băneasa Forest, 29.03.1951, S.N., 24.05.1955; 1 spec., Mogoșoaia (IF), 23.05.1954; 1 spec., Valu lui Traian (CT), 21.05.1955; 7 specs, Săbăreni (GR), 12.05.1958, R.A.; 1 spec., Budești (CL), 16.05.1958, R.A.; 5 specs, Băile Herculane (CS), 4.07.1961, S.N., 19.05.1963, P.G.A., 18-27.05.1965, P.G.A., S.N.; 1 spec., Hagieni (CT), 7.06.1965, S.N.; 1 spec., Valea Lungă (DB), 28.05.1967, R.A.; 1 spec., Valea Rea, Sinaia (PH), 25.08.1967, N.St.; 9 specs, Ieșelnița (MH), 13-14.05.1969, W.M., P.G.A.; 1 spec., Doftana (BC), 11.06.1971, W.M.; 1 spec., Strehaia (MH), 12.05.1982, S.R.; 3 specs, Livada (SM), 12.06.1985, P.G.A.; 2 specs, Esecchio (CT), 1.07.1987, S.N.; 2 specs, Aușeu (BH), 24-27.06.1994, S.Au.; 1 spec., Turkey, Çukurova region, Osmaniye, 1.05.1998, P.S.M.; 1 spec., Balauru hill, Izvorul Dulce, Beceni (BZ), 6.05.2002, U.V.

Phytoecia (Phytoecia) virgula (Charpentier, 1825)

1 spec., Piatra Olt (OT), without other data, F.Ed.; 1 spec., Laculez (in southern Bucharest), without other data, F.Ed.; 1 spec., Dobrogea, without other data, F.Ed.; 2 specs, Măcin (TL), without other data, M.A.L.; 1 spec., București, without other data, M.A.L.; 3 specs, Comana Forest (GR), without other data, M.A.L.; 1 spec., Dobromir (CT), 22.06.1950, S.N.; 12 specs, Agigea (CT), 12.06.1951, S.N., 29.05.1962, P.G.A., 27.04.-30.05.1963, P.G.A., P.S.X., 15-17.06.1964, P.G.A.; 1 spec., Murfatlar (CT), 12.06.1953, S.N.; 2 specs, Tecuci (GL), 5.06.1954, S.N.; 1 spec., Bugeac Lake (CT), 29.08.1955, S.N.; 8 specs, Valu lui Traian (CT), 21-22.05.1955, P.S.X., 18.05.-19.06.1955, S.N.; 1 spec., Oltina (CT), 17.05.1955, S.N.; 2 specs, Săbăreni (GR), 12.05.1958, R.A.; 1 spec., Oltenița (CL), 8.05.1959, P.S.X.; 1 spec., Căldărușani (IF), 21.05.1960, R.A.; 4 specs, Hagieni Forest (CT), 15.06.1961, 11.05.-7.06.1965, S.N.; 4 specs, Canarua Fetii (CT), 27.05.1962, 11.06.1967, S.N., 19.05.1994, H.C.; 5 specs, Esecchio (CT), 9-12.05.1963, 1.07.1987, S.N.; 10 specs, Dumbrăveni Forest (CT), 23.05.1965, S.N., 18.05.1994, H.C.; 1 spec., Adamclisi (CT), 2.06.1965, P.S.X.; 1 spec., Cogeacu Bandiți (CT), 3.06.1965, P.S.X.; 1 spec., Bulgaria, Varna, 4.06.1967, S.N.; 1 spec., Cămărzana (SM), 19.05.1987, P.C.; 1 spec., Negureni Forest (CT), 16.05.1994, G.A.; 2 specs, Izvoarele (TL), 21.05.1997, S.R., P.C.; 1 spec., Ciucurova Forest (TL), 22.05.1997, P.C.; 1 spec., Valea Teilor (TL), 22.05.1997, P.C.; 3 specs, Luncavița, Valea Fagilor (TL), 23.05.1997, S.R., H.C., 25.05.2005, M.I.; 5 specs, Cerna, Măcin Mountains National Park (TL), 26.05.2005, S.R, M.I.; 2 specs, Suluc Valley, Măcin Mountains National Park (TL), 27.05.2005, M.I.

Pilemia Fairmaire, 1864*Pilemia hirsutula* (Frolich, 1793)

3 specs, Dobrogea, without other data, F.Ed.; 1 spec., Hârșova (CT), without other data, M.A.L.; 1 spec., the Caucasus, 1888, G.L.; 3 specs, Tecuci (GL), 5.06.1954, S.N.; 1 spec., Valu lui Traian (CT), 21.06.1955, P.S.X.; 1 spec., Mangalia, Comarova Forest (CT), 1.07.1955, S.N.; 24 specs, Hagieni Forest (CT); 29.05.-6.06.1963, S.N., P.G.A., 19.06.1964, D.I., P.G.A., 5-7.06.1965, S.N., 27.05.1984, P.G.A.; 5 specs, Dumbrăveni Forest (CT), 23.05.1965, S.N.; 7 specs, Ghidigeni (GL), 12.07.1981, S.N.

Pilemia tigrina Mulsant, 1851

1 spec., Borosjenő (Ineu), 4.07.1925, D.L.; 3 specs, Ineu (AR), 4.07.1954, 21.06.1963, S.N.; 2 specs, Dumbrăveni Forest (CT), 23.05.1965, S.N. (Fig. 5 C).

Tribe Pogonocherini

Pogonocherus Dejean, 1821*Pogonocherus eugeniae* Ganglbauer, 1891

1 spec., Italy, Romagna (FO), 700 m, 09.1977, S.G.

Pogonocherus fasciculatus (De Geer, 1775)

1 spec., Azuga (PH), without other data, F.Ed.; 2 specs, Kronstädter Gebirge (Brașov Mts) (BV), without other data, D.Fr.; 1 spec., Sinaia (PH), without other data; 2 specs, Germany, without other data, K.D.; 1 spec., Câmpulung Moldovenesc (SV), 23.03.1951; 1 spec., Retezat Mts, Gura Apei, 28.07.1956, S.N.; 1 spec., Tăul

lui Dumitru swamp (MM), 7.07.1996; 1 spec., Giumalău Mts (SV), 16.06.1998; 1 spec., Maramureş Mountains Natural Park, Poloninca Peak (MM), 12.06.2007, P.C.

Pogonocherus hispidulus (Piller & Mitterpacher, 1783)

1 spec., without data, K.D.; 4 specs, Retezat Mts, Gura Zlata, 9.08.1955, S.N.; 1 spec., Moldova Nouă (CS), 4.05.1973, S.N.; 1 spec., Măgura (BZ), 28.06.2006, U.V.

Pogonocherus hispidus (Linnaeus, 1758)

1 spec., Azuga (PH), without other data, F.Ed.; 1 spec., Croatia, Dalmatia, without other data, K.D.; 1 spec., Brăneşti, Pasărea Forest (IF), 6.06.1959, S.N.; 1 spec., Băile Herculane (CS), 13.05.1960, P.G.A.; 1 spec., Vişeu de Sus (MM), 11.06.1966, S.N.; 1 spec., Moldova Nouă (CS), 25.05.1974, S.N.; 1 spec., Zăvestreni (TR), 9.05.1980, S.R.; 1 spec., Fundata (IL), 14.X.1980, D.D.; 1 spec., Dumbrăveni Forest, Furnica (CT), 21.05.1994, P.C.

Pogonocherus neuhausi Müller, 1916

1 spec., Italy, Puglia, Gargano, San Menaio, 7.09.1977, S.G.; 4 specs, Italy, Romagna (FO), 700 m, 10.08.1977, S.G.

Pogonocherus ovatus (Goeze, 1777)

7 specs, Azuga (PH), without other data, F.Ed.

Pogonocherus perroudi Mulsant, 1839

1 spec., Italy, Puglia, Gargano, San Menaio, 7.08.1977, S.G.; 6 specs, Italy, Romagna (FO), 3.08.1977, S.G.

Tribe Pteropliini

Albana Mulsant, 1846

Albana m-griseum Mulsant, 1846

2 specs, France, Cipières, le Plan, 8.06.1974, B.P.; 1 spec., France, Cipières, Bords du Loup, 14.06.1974, B.P.; 1 spec., France, Pyrénées-Orientales, Amélie-les-Bains, 06.1982.

Niphona Mulsant, 1839

Niphona picticornis Mulsant, 1839

1 spec., France, Alpes Maritimes, Vallauris, 18.04.1974, B.P.; 2 specs, Lebanon, Beyrut, 06.1982.

Pterolophia Newman, 1842

Pterolophia caudata (Bates, 1873)

6 specs, Japan, Saitama, Mitsumine Mt., 10.08.1970, O.S.; 2 specs, Japan, Saitama, Chichibu, 27.06.1978, O.S.

Tribe Saperdini

Eutetrappa Bates, 1884

Eutetrappa chrysochloris (Bates, 1879)

2 specs, Japan, Fukushima, Aizu, 10.06.1971, O.S.

Menesia Mulsant, 1856*Menesia bipunctata* (Zoubkoff, 1829)

1 spec., without data, K.D.; 1 spec., Bicaz, Lapos Peak, 4.06.1971, S.N.

Saperda Fabricius, 1775*Saperda carcharias* (Linnaeus, 1758)

1 spec., without data, K.D.; 2 specs, Grăușor (MS perhaps), without other data; 1 spec., Buștenari (PH), without other data, C.R.; 1 spec., Măgura Odobești (VN), 14.08.1955, S.N.; 2 specs, București, Băneasa Forest, 14.04.1961, S.N.; 1 spec., Italy, Pavia, Ottobiano, 3.X.1965, G.F.; 55 specs, Răstoaca, Valley of the Putna River (VN), 29-30.08.1970, 30.08.-5.09.1971, 28.08.-1.09.1972, 27-29.08.1973, 2.09.1975, 1-28.08.1987, 2.07.1989, S.N.; 1 spec., Găiseni (GR), 20.05.1996, I.A.I.; 2 specs, Izvorul Dulce, Beceni (BZ), 1.08.2005, 12.08.2006, U.V.

Saperda octopunctata (Scopoli, 1772)

1 spec., France, Besançon, without other data, M.A.L.; 3 specs, Măcin ? (TL), without other data, F.Ed.; 1 spec., Bârlad Valley (SV), without other data, M.A.L.; 24 specs, Comana Forest (GR), without other data, M.A.L., 30.05.1954, 14.05.1955, 16.06.1959, 19.07.1966, S.N.; 4 specs, Brănești, Pasărea Forest (IF), 25-27.05.1951, 29.04.1959, S.N.; 1 spec., Lacul Sărat (BR), 6.07.1958, S.N.; 12 specs, Babadag Forest (TL), 06.1958, S.N., 20.06.1963, P.S.X., 20.07.1977, P.G.A.; 2 specs, Băile Herculane 19.07.1966, S.N.; 1 spec., France, Aiguines, 29.05.1969, B.P.; 2 specs, France, Var, Roquebrune-sur-Argens, La Bouverie, 30.05.1972, B.P.; 3 specs, Ciucurova Forest (TL), 22.05.1997, S.R., P.C.; Valea Bei f.h., Sasca Montană (CS), 10.08.2005, P.E.

Saperda perforata (Pallas, 1773)

1 spec., without data, K.D.; 1 spec., Schneckenberg (Dealul Melcilor), Brașov, without other data; 2 specs, București, without other data, M.A.L., 22.07.1955, P.G.A.; 1 spec., Căpâlnaș (AR), 19.04.1951, S.N.; 1 spec., Rășinari (SB), 1.06.1954, S.N.; 1 spec., Iași (IS), 6.06.1958, S.N.; 11 specs, Periprava, Danube Delta (TL), 4.06.-17.07.1959, 29.06.1963, S.N., 22.06.1966, P.G.A., 15-17.07.1971, 19.06.1990, S.N.; 8 specs, Letea Forest, Danube Delta (TL), 28-29.06.1963, P.G.A., D.I., 17.07.1964, 20.08.1981, P.G.A.; 1 spec., Babadag Forest (TL), 11.06.1972, S.N.; 10 specs, C. A. Rosetti, Danube Delta (TL), 24.06.1962, S.N., 10.06.1979, 12-15.07.1980, 21.08.1981, P.G.A., 20.07.1987, S.L.; 2 specs, Băile Herculane (CS), 15.06.1987, S.N.; 1 spec., Izvorul Dulce, Beceni (BZ), 06.1999, U.V.

Saperda populnea (Linnaeus, 1758)

1 spec., Târgu Jiu (Sisești) (GJ), without other data; 1 spec., Bârnova (IS), 2.06.1953, S.N.; 128 specs, Comana Forest (GR), 23.05.-24.06.1954, 14.05.-3.06.1955, 24.05.1958, 14.05.-14.06.1959, S.N.; 1 spec., Budești (CL), 16.05.1958, R.A.; 15 specs, Vlădila (OT), 20.03.1960; 1 spec., Olțișoru (OT), 15.04.1960, P.G.A.; 1 spec., Vrata Forest, Gârla Mare (MH), 25.05.1963; 1 spec., Moldova Nouă (CS), 26.05.1973, S.N.; 5 specs, Sfântu Gheorghe, Danube Delta (TL), 25.06.1982, S.N.; 1 spec., Turulung Vii (SM), 13.06.1985, M.I.; 1 spec., Dumbrăveni Forest, Furnica (CT), 14.05.1995, P.C.

Saperda punctata (Linnaeus, 1767)

1 spec., Craiova (DJ), without other data, S.I.; 1 spec., Pozsoga, Krasso-Szörény (Caraș Severin), 05.1934, T.E.; 1 spec., București, Băneasa Forest, 10.05.1952, S.N.; 9 specs, Comana Forest (GR), 30.05.1954, 16.06.1959, S.N.; 3 specs, Babadag Forest (TL), 23.06.1955, 11-14.06.1972, S.N.; 4 specs, Canaraua Fetii (CT), 29.06.1956, 27.05.1962, 17.07.1964, S.N.; 2 specs, Brănești, Pasărea Forest (IF), 11.06.1961, S.N.; 1 spec., Budești (CL), 3.06.1964, R.A.; 1 spec., Videle (TR), 18.06.1964, N.St.; 3 specs, Hagieni Forest (CT), 19.06.1964, P.G.A., 5.06.1965, S.N.

Saperda scalaris (Linnaeus, 1758)

3 specs, Azuga (PH), without other data, F.Ed.; 3 specs, Dobrogea, without other data, F.Ed.; 1 spec., Cruce, Broșteni, the Carpathian Mountains (SV), without other data, M.A.L.; 2 specs, Comana (GR), without other data, M.A.L., 12.06.1983, S.N.; 1 spec., București, 25.07.1953, S.N.; 3 specs, Rarău Mts, 26.07.1953, S.N.; 1 spec., Retezat Mts, Gura Apei, 28.07.1956, S.N.; 1 spec., Băile Herculane (CS), 4.07.1964, S.N.; 1 spec., Vișeu de Sus (MM), 10.06.1965, S.N.; 3 specs, Moldova Nouă (CS), 21.06.1971, 1.06.1973, S.N.; 2 specs, France, Aiguines, Forêt de Margés, 28.05.1974, 5.06.1974, B.P.; 9 specs, Valley of the Doftana River (PH), 24-26.06.1994, P.C.; 2 specs, Trăiseni (PH), 25.06.1994, P.A.; 2 specs, Gurghiu Mts (MS), 10-18.07.1994, M.P.B.; 1 spec., Cernica Forest (IF), 7.07.1995, P.S.M.; 1 spec., Valley of the Mara River, 2 km upstream Desești (MM), 17.07.1998, P.S.M.; 10 specs, Valley of the Rica River, Poienile de sub Munte, (MM), 14.06.2003, S.R., S.Me.; 1 spec., Valley of the Vaser River, Cozia (MM), 22.07.2004, B.C.; 1 spec., National Park Piatra Craiului Mts, Sătic (AG), 22.06.2005, S.R.

Saperda similis Laicharting, 1784

1 spec., France, Besançon, without other data, M.A.L.

Stenostola Dejean, 1835*Stenostola ferrea* (Schränk, 1776)

2 specs, Brănești, Pasărea Forest (IF), 22.05.1951, S.N., 30.04.1953; 1 spec., Carmen Sylva (Eforie Sud) (CT), 22.06.1952, S.N.; 18 specs, Băile Herculane (CS), 12.07.1953, 29.05.1956, S.N., 17.05.1964, P.G.A., 21.05.1967, 12.06.1978, 12.06.1982, 6.06.1985, 20.07.1991, S.N.; 2 specs, Bârnova (IS), 4.06.1954, 19.05.1956, S.N.; 1 spec., Canaraua Fetii (CT), 27.05.1962, S.N.; 1 spec., Râncă Novaci, Novaciu Mts (GJ), 24.06.1963; 1 spec., Ieșelnița (MH), 14.05.1969, P.G.A.; 1 spec., Moldova Nouă (CS), 25.05.1974, S.N.; 3 specs, France, Aiguines, le Château, 28.05.1974, B.P.; 12 specs, France, Aiguines, Forêt de Margés, 28.05.1974, 5.06.1974, B.P.; 14 specs, Italy, Udine, Cialla di Prepotto, 20.06.1983, R.P.

Tribe Tetropini

Tetrops Stephens, 1829*Tetrops praeustus* (Linnaeus, 1758)

5 specs, București, without other data, M.A.L., F.Ed.; 1 spec., Slobozia (IL), without other data, F.Ed.; 1 spec., Laculez, (in southern Bucharest), without other data, F.Ed.; 1 spec., Austria, Umgebungen Graz, without other data, P.K.A.; 3 specs,

Azuga (PH), 06.1933; 3 specs, Roman county, 1933; 1 spec., Ilfov county, 16.05.1935; 1 spec., Moara Domneasă (IF), 10.05.1938; 2 specs, Mireșu Mare (Nagynyires) (MM), 1942, V.E.; 2 specs, Horezu (VL), 29.05.1946; 1 spec., Lacul Sărat (BR), 28.05.1956, S.N.; 8 specs, Suceava (SV), 16.05.1957, 8.05.1959, N.I.; 3 specs, Canaraua Feti (CT), 14.05.1958, 27.05.1963, S.N.; 6 specs, Pitești (AG), 2-3.06.1960, 9.05.1961, 2 06.1963, S.N.; 2 specs, Gemenea (DB), 19.05.1961; 3 specs, Comana Forest (GR), 24.05.1962, S.N.; 2 specs, Constanța, Palas (CT), 21.05.1962, 8.05.1963, R.A.; 1 spec., Hagieni Forest (CT), 7.06.1963, P.G.A.; 1 spec., Brănești, Pasărea Forest (IF), 5.05.1966, R.A.; 2 specs, Ieșelnița (MH), 3.06.1968, P.S.X., 14.05.1969, P.G.A.; 2 specs, Ieșelnița (MH), 3.06.1968, 14.05.1969, P.G.A.; 2 specs, Hungary, Budapest, Széchenyi-hegy, 1.06.1969, P.S.X.; 4 specs, Italy, Ravena, Bridighella, 13.04.1970, G.P.; 5 specs, București, 21.05.1971, 8.05.1972, R.A., 20.05.1990, 12.05.1994, 16.05.1997, P.S.M.; 1 spec., Tulcea (TL), 24.05.1981, P.S.X.; 1 spec., Strehaia (MH), 10.05.1982, S.R.; 1 spec., Balauru hill, Izvorul Dulce, Beceni (BZ), 4.05.2005, U.V.; 1 spec. Schitu (GR), 15.07.2007, P.C.

Tetrops starkii Chevrolat, 1859

1 spec., Băile Herculane (CS), 18.05.1965, S.N.

DISCUSSIONS

The specimens of the acquired collections at the end of the 19th century and the beginning of the 20th are preserved for their historical value, although not all of them have collecting data. The specimens of Deszö Kenderessy collection, an amateur entomologist from Transylvania, were collected at the end of the 19th century from Hațeg Depression. The collection material of the amateur entomologist Eduard Fleck, acquired in 1914, was collected especially from the Bucegi Mountains, most of them from Azuga. A large number of the specimens of the Fridrich Deubel collection (amateur entomologist from Brașov), acquired in 1923, originates in the surroundings of Brașov. Arnold Lucien Montandon collection consists of coleopterans collected at the end of the 19th century and the beginning of the 20th one, from the royal estate of Broșteni, the Carpathian Mountains (Suceava county), Comana Forest (Giurgiu county) or Dobrogea.

The Lamiinae species of Romanian fauna represent 71 % of collections.

Oplosia cinerea, a rare species, is distributed in Europe and Near East. From Romania, it was reported from Băile Herculane, Sibiu, Brașov, Retezat Mountains – Gura Zlata (Panin & Săvulescu, 1961) and Pietrele Albe – Valley of the Jiu River (Serafim, Chimișliu & Lila, 2004).

Agapanthia kirbyi is distributed in Europe and Near East. From Romania, it was reported from Băile Herculane, Cocioc, Măcin, Canaraua Feti (Panin & Săvulescu, op.cit.), Cheile Țesnei, Mehedinți Mountains (Ruicănescu, 1997). In the collections of "Grigore Antipa" Museum there are specimens collected from Băile Herculane, Canaraua Feti and Oreva (Danube Clisura).

Agapanthia osmanlis is distributed in South-East Europe (Romania, Bulgaria, Hungary, European Turkey, Serbia, Kosovo, Voivodina, Montenegro) and Near East. In Romania the species was cited only in Comana Forest (Panin & Săvulescu, op.cit.). In the Museum's collections there are specimens collected from Comana Forest and Snagov Forest.

Agapanthia cynarae was cited by Csíki (1905) from Plavișevița, by Ruicănescu (1992) from Oglănic Valley, Iron Gate and by Botu (1998) from Gura Văii and Schela Cladovei. In collections there are specimens, collected from the Danube Clisura (Oreva and Slătinic), in May 1976 (unpublished data). The species occurs in South and South East Europe.

In 2005, the species *Theophilea subcylindricollis* was cited for the first time in Romania, from Moldova region (Botanical Garden of Iași, „Valea lui David” Nature Reserve, Mârzești Forest, Bîrnova Forest, Vlădeni wetland, Probota, Bălătau Nature Reserve (Dascălu, 2005). Also, the species was found in Cheveres Forest, Timiș county (Hoskovec & Rejzek, 2009). In the Museum’s collections there are specimens collected in 1937 from Chișinău, Republic of Moldova.

Deroplia genei, Southern and Central European species, is rare in Romania. It was reported from Greci (Montandon, 1908), Sibiu and Cîsnădioara (Petri, 1925-1926), Valea Iortmacului (Panin & Săvulescu, op.cit.). In collections there are specimens collected in South Dobrogea: Canarua Fetii, Baș Punar, Oltina.

Carinatodorcadion aethiops, *C. fulvum*, *Neodorcadion bilineatum*, *Pedestredorcadion murrayi*, *P. pedestre*, *P. tauricum* are common in Romania.

Carinatodorcadion aethiops and *C. fulvum* are European species. *Neodorcadion bilineatum* occur in South-East Europe, Near East, *Pedestredorcadion pedestre* in Central, East and South-East Europe, *P. tauricum* in South-East Europe, *P. murrayi* in Romania, Serbia, Kosovo, Voivodina and Montenegro.

Neodorcadion exornatum, a rare species in Romania (especially in Dobrogea), is also distributed in Bulgaria, European Turkey, Greece. In the collection there are specimens found in Dobrogea and Oltenia (Vârvoru de Jos).

Pedestredorcadion litigiosum is reported only from Dobrogea: Cernavodă (Fleck, 1905), Iglîța and Târgușor (Ester) (Montandon, 1906), Măcin (Montandon, 1908), Babadag (Panin & Săvulescu, op.cit.). In the Montandon’s collection there are specimens collected from Cernavodă and Măcin. The species occur in Bulgaria, Romania, Republic of Moldova ?, Ukraine ?.

From Romania the species *Pedestredorcadion holosericeum* is reported only from Moldova: Botoșani (Panin & Săvulescu, op.cit.), Baisa and Dorohoi (Andriescu, 1972). In the collection there are specimens collected from Botoșani, Dorohoi, Suceava. The species occur in Belarus, Poland, Central and South Russia, Romania, Ukraine, Near East.

Pedestredorcadion pusillum has been cited by Montandon (1908) from Zorleni and Mangalia, by Panin and Săvulescu (1961) from Lacul Sărat, Galați, Tecuci, Babadag. In the collection there are specimens collected at Bârlad Valley, Lacul Sărat, Babadag, Mangalia, Balta Albă. In the Cerambycidae Type Collection of the Sminthonian Institute two *Pedestredorcadion pusillum* syntypes coming from Băile Herculane and Bucharest were preserved (Lingafelter, Monné & Nearn, 2004-2009). The species occurs in East Europe: Republic of Moldova, Romania, South Russia, Ukraine.

Herophila tristis is a Southern and Central European species. It is reported only from Banat: Băile Herculane (Panin & Săvulescu, op.cit.; Ruicănescu, 1997) and Oglănic Valley, Porțile de Fier [Iron Gates] (Ruicănescu, 1992).

Cardoria scutellata is cited from Sibiu, Aiud, Geaca, Zau de Câmpie (Petri, 1912; Panin & Săvulescu, op.cit.). The species occurs in Central and East Europe, Near East. In the collection there is one specimen collected at Hagieni Forest.

From Romania, the species *Pilemia tigrina* is reported from Dej, Geaca, Zau de Câmpie (Petri, 1912), Deva (Panin & Săvulescu, 1961), Dealul lui Dumnezeu, Mârzești, Reserve „Valea lui David”, Natural Park „Grădiștea Muncelului-Cioclovina”, Natural Park „Iron Gate”, Ineu (Tatole et al., 2009). In the collection there are specimens collected at Ineu and Dumbrăveni Forest. *Pilemia tigrina* was included in the list of “Natura 2000” species from Romania (Tatole et al., 2009).

Parmena bicincta is an endemic species of Balkan Peninsula. *Oxyilia duponcheli* is an endemic species of South Balkan Peninsula (Albania, Bulgaria, Greece, Macedonia).

In the collection of „Grigore Antipa” National Museum of Natural History, there is one specimen of *Coptosia* collected from Valu lui Traian (Dobrogea). This is the only report for Romania.

Helladia praetextata occurs in Bulgaria, Romania, Ukraine and Near East. In the collection there are specimens from Ezechioi Forest (Southern Dobrogea). In Romania, until now, the species was found in Dobrogea (Panin & Săvulescu, 1961; Săvulescu & Popescu-Gorj, 1964).

Helladia adelpha is distributed in Cyprus, Near East, *Helladia humeralis* in Cyprus, Dodecanese Is., European Turkey, Near East, *Pedestredorcadion septemlineatum* in European Turkey, Near East

Westpalaeartic species: *Iberodorcadion fuliginator fuliginator* occurs in France, Germany, Switzerland, the Netherlands. *I. fuliginator meridionale* and *Albana m-griseum* occur in France and Spain.

Iberodorcadion navasi, *I. perezi hispanicum*, *I. neilense*, *I. seoanei seoanei*, *I. spinolae caunense* are endemic species from Spain.

The species *Agapanthia annularis*, *A. irrorata*, *A. sicala*, *Deroplia troberti*, *Parmena pubescens*, *P. solieri*, *Phytoecia erythrocnema*, *Pogonocherus neuhausi*, *Niphona picticornis* are found in the Mediterranean area.

In the Museum collections there are the following Eastpalaeartic species: *Mesosa longipennis*, *Oberea mixta*, *Pterolophia caudata*, *Eutetrappa chrysochloris* collected in Japan and included in collection by a material exchange with the Japanese specialists.

Oberea mixta is an endemic species of Japan.

Mesosa longipennis occurs in Japan and Korea; *Pterolophia caudata* in Russia, Japan, Korea, China; *Eutetrappa chrysochloris* in Russia (Sakhalin, Kuril Islands), Japan.

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CATALOGUL SPECIILOR PALEARCTICE DE LAMIINAE (COLEOPTERA:
CERAMBYCIDAE) DIN PATRIMONIUL MUZEULUI NAȚIONAL DE ISTORIE
NATURALĂ „GRIGORE ANTIPA” (BUCUREȘTI)
(Partea a V-a)

REZUMAT

Catalogul cuprinde datele referitoare la 112 specii și subspecii palearctice de coleoptere cerambycidae din subfamilia Lamiinae, păstrate în colecțiile Muzeului Național de Istorie Naturală „Grigore Antipa” (București).

Dintre cele 85 specii de Lamiinae, citate din fauna României, în colecțiile Muzeului sunt prezente 79 de specii. Dintre acestea se remarcă speciile *Oplosia cinerea*, *Agapanthia kirbyi*, *A. osmanlis*, *A. cynarae*, *Theophilea subcylindricollis*, *Deroplia genei*, *Neodorcadion exornatum*, *Pedestredorcadion litigiosum*, *P. holosericeum*, *P. pusillum*, *Herophila tristis*, *Cardoria scutellata*, *Pilemia tigrina*, *Coptosia* sp., *Helladia praetextata*, *Menesia bipunctata*, *Stenostola ferrea*, *Tetrops starkii*.

Parmena bicincta și *Oxyilia duponcheli* sunt specii endemice în Peninsula Balcanică.

Dintre speciile vestpalearctice amintim: *Albana m-griseum* și *Iberodorcadion fuliginator meridionale* (specii endemice în Franța și Spania).

Iberodorcadion navasi, *I. perezi hispanicum*, *I. neilense*, *I. seoanei seoanei*, *I. spinolae caunense* sunt specii endemice în Spania.

Agapanthia annularis, *A. irrorata*, *A. sicula*, *Deroplia troberti*, *Parmena pubescens*, *P. solieri*, *Phytoecia erythrocnema*, *Pogonocherus neuhausi*, *Niphona picticornis* sunt specii mediteraneene.

În colecțiile Muzeului se păstrează de asemenea specii estpalearctice: *Mesosa longipennis*, *Oberea mixta*, *Pterolophia caudata*, *Eutetrappa chrysochloris*, provenind din Japonia.

Oberea mixta este o specie endemică în Japonia.

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CONTRIBUTIONS TO THE KNOWLEDGE OF THE HERPETOFAUNA OF THE EASTERN JIU AND UPPER LOTRU DRAINAGE BASINS (SOUTHERN CARPATHIANS, ROMANIA)

ALEXANDRU IFTIME, OANA IFTIME

Abstract. The results of herpetological studies in the Eastern Jiu and Upper Lotru basins in the Parâng-Lotru-Șureanu mountain massif (Hunedoara and Vâlcea counties, Romania), are presented. 16 amphibian and reptile species were identified in the field in 33 sites investigated; these are presented together with data on their habitat association and intra-specific variability.

Résumé. On présente les résultats des études herpétologiques dans les bassins hydrographiques du Jiu oriental et du Lotru supérieur, dans le massif du Parâng-Lotru-Șureanu (départements de Hunedoara et Vâlcea, Roumanie). 16 espèces d'amphibiens et reptiles ont été identifiées sur le terrain dans 33 locations étudiées; elles sont présentées avec les données concernant leur biotope et leur variabilité intra-spécifique.

Key words: intramontane basins, amphibians, reptiles, records, distribution, habitat, variability.

INTRODUCTION

One of the most important mountain massifs, in terms of area and altitude, in the Southern Carpathians of Romania is the Parâng-Lotru-Șureanu massif. Our aim was to analyze the herpetofauna of two intramontane valley systems within this massif, the upper Lotru (with its tributary Latorița) and the Western Jiu (with its tributary Jieț), as they are interesting to correlate with the altitudinal and climatic particularities of this montane area. The herpetofauna of this area is sporadically known, all data being restricted to three localities: Câlcescu Lake, an alpine lake, where *Rana temporaria* is noted (Fuhn, 1960); Voineasa on the Lotru valley where Fuhn (1960) and Fuhn & Vancea (1961) found *Salamandra salamandra*, *Bombina variegata*, *Bufo bufo*, *B. viridis*, *Rana temporaria*, *Lacerta agilis*, *L. viridis*, *Zootoca vivipara*, *Podarcis muralis* and *Anguis fragilis*; and Petrila, on the Western Jiu, where Ghira et al. (2002) record *Lissotriton vulgaris*, *Mesotriton alpestris*, *Bombina variegata*, *Hyla arborea*, *Pelophylax ridibundus*, *Lacerta agilis*, *Zootoca vivipara* and *Podarcis muralis*¹. We have therefore tried to give a more detailed account of the distribution of amphibian and reptile species in the area by studying the upper basin of the Lotru above Voineasa, and the Latorița, Bănița and Jieț basins, not investigated to date, thus completing the knowledge of the herpetofauna of the Upper Lotru and Western Jiu basins, i. e. of the intramontane valleys of the Parâng-Lotru-Șureanu massif.

MATERIALS AND METHODS

Area description. Reaching an altitude of 2519 m. a.s.l., the Parâng-Lotru-Șureanu massif is the second highest in Romania after the Făgăraș Mountains. It is composed of several interconnected mountain ranges of variable extension and

¹ We follow mostly Speybroeck et al. (2010) for the nomenclature, with some exceptions, i.e. following Carretero et al. (2009) in the use of *Mesotriton*.

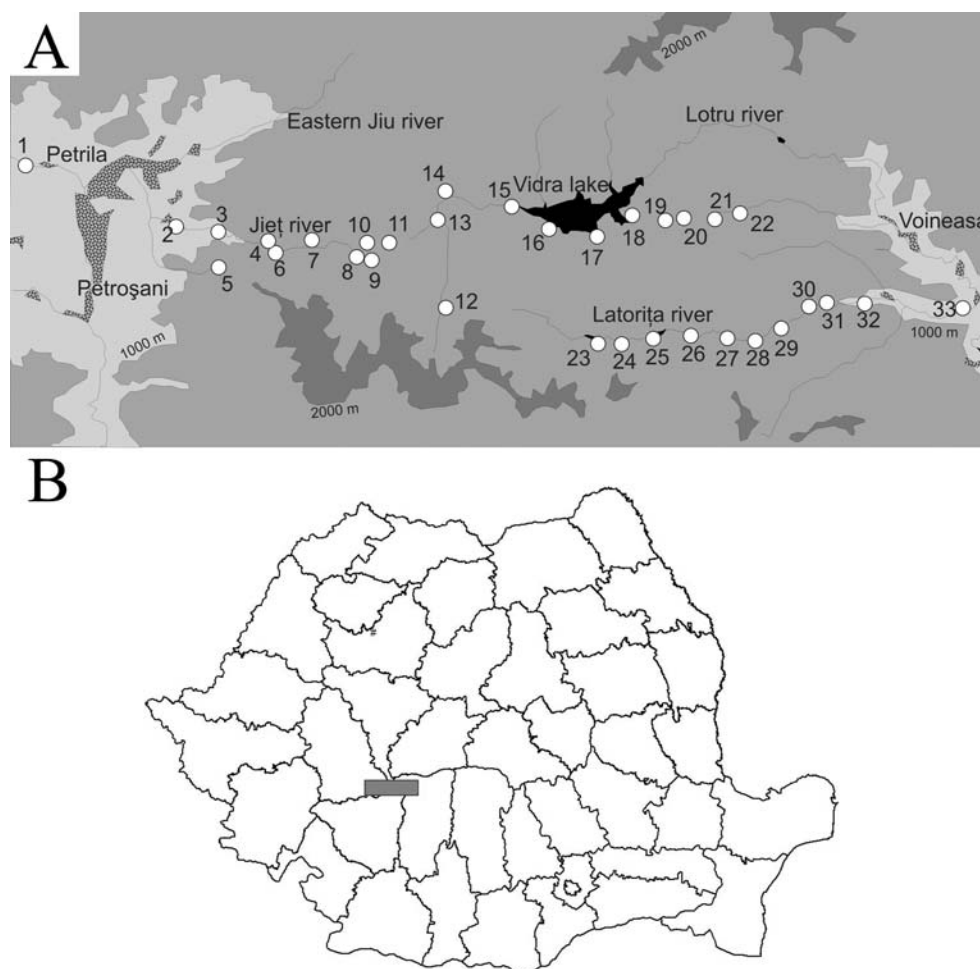


Fig. 1 - A, General location map of the investigated localities, numbered as in the text; B, Location of the study area on the map of Romania.

height: Parâng, Lotru, Șureanu, Căpățânii, Latoriței, of which the highest is the Parâng. This massif is drained by tributaries of the Olt River in the east, the Jiu River in the south-west and the Mureș River in the north-west. Of these, the Lotru, a tributary of the Olt, is the most important, creating a deep east-west intramontane valley, and having itself a quite large tributary, the Latorița. On the western versant, the Western Jiu, a tributary of the Jiu, and its tributary the Jieț, create two similar, but much shorter, roughly east-west oriented intramontane valleys, while another tributary of the Western Jiu, the Bănița, separates the Parâng-Lotru-Șureanu massif from another important division of the Southern Carpathians, the Retezat massif (Ghinea, 2002). The Lotru and its tributary Latorița have been dammed, several reservoirs being thus created: Vidra, Balindru, Malaia and Brădișor (on the Lotru), Petrîmanu and Galbenu (on the Latorița), of which the largest is Vidra (surface: 12.4 km²; average volume: 340 million m³), which occupies an intramontane basin on the uppermost course of the Lotru. The vegetation of this area is defined by altitude:

deciduous forests, dominated by sessile oak, hornbeam, maple and beech, between 500-800 m a.s.l.; beech forests between 800 and 1100 m a.s.l.; mixed forests of beech and coniferous species between 1100 and 1550 m a.s.l.; coniferous (spruce, fir and larch) forests between 1550 and 1800 m a.s.l; and above the last altitude, subalpine and alpine shrubs and grasses (Măciu et al., 1982; personal observations).

Methodology. This paper is based upon field work performed in July and August 2008, and May and June 2009. Amphibians were searched for in both terrestrial habitats and aquatic basins; due to altitudinal and climatic factors, in this area by May-June most amphibian species are in the water for reproduction. The study was carried following the active transects method (after Cogălniceanu, 1997). 33 stations were checked, with transect length between 200 and 1500 m, twice in most cases, three times when possible):

Table 1

The checked stations with their characteristics.

Station no.	Coordinates	Altitude (m)	Vegetation	Observations
1	45°26'47.4822" lat N 23°19'21.0534" long E	750	Mixed deciduous forest	
2	45°25'20.7552" lat N 23°25'21.6474" long E	750	Mixed deciduous forest clearing	With an artificial lake
3	45°25'2.1" lat N 23°26'53.7252" long E	793	Mixed deciduous forest	
4	45°23'25.5618" lat N 23°26'42.238" long E	1100	Beech and coniferous forest	In Jieț gorges
5	45°24'36.5076" lat N 23°29'52.0152" long E	1510	Beech and coniferous forest	
6	45°24'14.1618" lat N 23°30'14.8782" long E	1275	Beech and coniferous forest	
7	45°24'45.1836" lat N 23°31'42.6318" long E	1150	Beech and coniferous forest	
8	45°23'49.8624" lat N 23°34'32.577" long E	1400	Beech and coniferous forest	
9	45°23'35.109" lat N 23°34'42.1566" long E	1580	Coniferous forest	
10	45°24'33.0366" lat N 23°34'27.6342" long E	1350	Beech and coniferous forest	
11	45°24'42.5802" lat N 23°35'13.6752" long E	1600	Coniferous forest	
12	45°25'45.4764" lat N 23°37'9.8538" long E	1530	Coniferous forest	
13	45°22'58.0008" lat N 23°37'18.5052" long E	1300	Beech and coniferous forest	
14	45°26'49.8696" lat N 23°37'10.7796" long E	1550	Coniferous forest	
15	45°25'53.0652" lat N 23°39'51.1452" long E	1250	Beech and coniferous forest	
16	45°24'10.9956" lat N 23°41'57.213" long E	1250	Beech and coniferous forest	By Vidra reservoir

Table 1 (continued)

Station no.	Coordinates	Altitude (m)	Vegetation	Observations
17	45°24'45.1836" lat N 23°43'34.8558" long E	1250	Beech and coniferous forest	By Vidra reservoir
18	45°25'29.4276" lat N 23°45'53.283" long E	1300	Beech and coniferous forest	By Vidra reservoir
19	45°25'39.8388" lat N 23°47'25.3644" long E	1450	Beech and coniferous forest	
20	45°25'38.9712" lat N 23°47'59.0424" long E	1500	Beech and coniferous forest	
21	45°25'49.8018" lat N 23°49'45.336" long E	1400	Beech and coniferous forest	
22	45°26'9.762" lat N 23°51'28.2276" long E	1350	Beech and coniferous forest	
23	45°21'48.9744" lat N 23°44'6.99" long E	1350	Beech and coniferous forest	By Petrimanu reservoir
24	45°21'48.5418" lat N 23°45'41.8494" long E	1280	Beech and coniferous forest	
25	45°21'56.1384" lat N 23°46'35.3064" long E	1160	Beech and coniferous forest	By Galbenu reservoir
26	45°22'6.7764" lat N 23°47'56.8799" long E	1120	Beech and coniferous forest	
27	45°21'55.0548" lat N 23°50'9.1278" long E	1050	Beech and coniferous forest	
28	45°21'50.277" lat N 23°51'15.2532" long E	950	Beech forest	
29	45°22'24.1428" lat N 23°32'31.8828" long E	880	Beech forest	
30	45°23'0.6072" lat N 23°53'15.759" long E	800	Beech forest	
31	45°23'0.171" lat N 23°54'24.9726" long E	720	Mixed deciduous forest	
32	45°23'1.4748" lat N 23°55'41.6022" long E	700	Mixed deciduous forest	
33	45°22'55.398" lat N 24°0'16.6032" long E	680	Mixed deciduous forest	

For their disposition on the map see figure 1. Photographs were taken whenever possible.

RESULTS

16 species (eight of amphibians, eight of reptiles) were recorded by us (see table 2 for their occurrence in the checked transects):

Table 2

Species	Distribution in investigated sites	Observations
<i>Salamandra salamandra</i>	25, 26, 28, 30	
<i>Lissotriton vulgaris</i>	1	cf. <i>ssp. ampelensis</i>
<i>Mesotriton alpestris</i>	7, 12, 16, 17, 18, 19, 20, 21, 22, 27, 28	
<i>Bombina variegata</i>	1, 2, 3, 4, 7, 8, 10, 12, 13, 14, 18, 21, 22, 25, 27, 28, 29, 30, 31, 32, 33	
<i>Bufo bufo</i>	1, 7, 13, 17, 18, 19, 20, 21, 22, 24, 25	
<i>Hyla arborea</i>	1	
<i>Rana temporaria</i>	1, 4, 6, 7, 8, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29, 30, 31	
<i>Pelophylax ridibundus</i>	2	
<i>Lacerta agilis</i>	1, 2, 3, 4, 7, 10, 24, 25, 33	nominate subspecies; particular coloration forms present
<i>Lacerta viridis</i>	33	
<i>Zootoca vivipara</i>	4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 18, 19, 20, 23, 24, 25	melanism (all-black) coloration present
<i>Podarcis muralis</i>	3, 7, 11, 25, 29, 30, 31, 32, 33	
<i>Anguis fragilis</i>	7, 32, 33	<i>ssp. colchicus</i>
<i>Natrix natrix</i> *	29, 33	
<i>Zamenis longissimus</i> *	33	
<i>Vipera berus</i> *	5, 7, 10, 11	very dark (but not all-black) coloration present

The commonest species are *Mesotriton alpestris*, *Bombina variegata*, *Rana temporaria*, *Zootoca vivipara* (in both density and number of locations) and *Podarcis muralis* (which is found in fewer locations, but in dense populations).

DISCUSSIONS

Of the 16 species that we found, 13 were already recorded by previous workers; however, we contributed by greatly enhancing the number of locations for each species, beyond the three localities already investigated. The three snake species are apparently at their first record for the studied region (and are therefore marked by an asterisk in table 2); their presence is not surprising, considering their wide distribution in the Carpathians, including around the study area.

The only species unambiguously recorded in this area previously and not found by us is *Bufo viridis*, recorded by Fuhn (1960) at Voineasa, and possibly still present. Among reptiles, a record of *Vipera ammodytes* (no. 10) is placed by Fuhn & Vancea (1961) on their distribution map at Voineasa, while the text refers at that record as for Lotrioara (a locality confirmed by Krecsák et al., 2004). It is possible

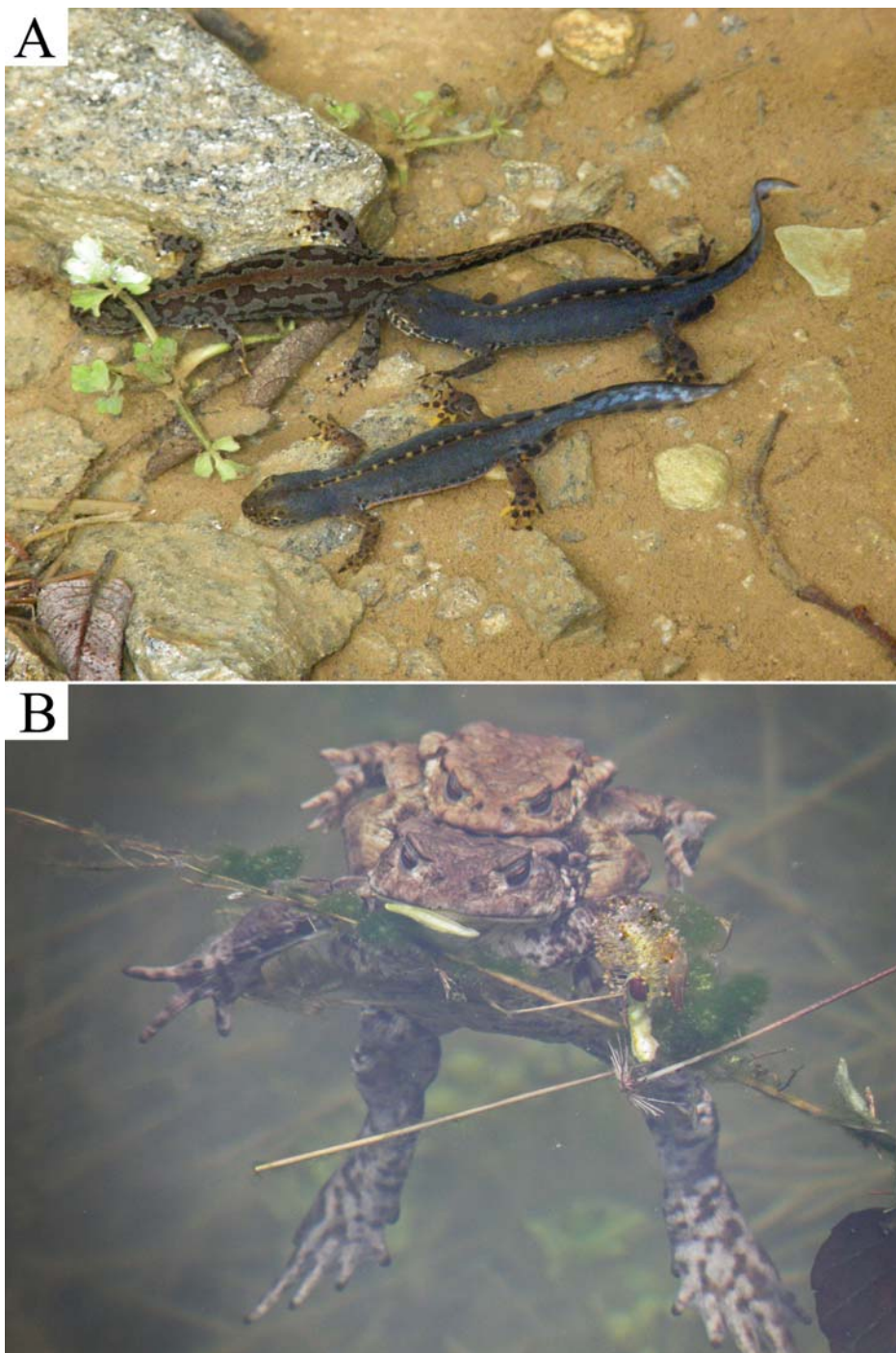


Fig. 2 - A, *Mesotriton alpestris*, one adult female and two adult males, by Vidra Lake; B, *Bufo bufo*, pair in amplexus, Galbenu dam lake. (Photos: A. Iftime)

that the record was wrongly placed on the map, but the possibility that *V. ammodytes* lives in the area requires more investigation.

The montane relief constrains the distribution of both amphibians and reptiles, but in different ways. Beyond the altitudinal limitation imposed by lower temperatures for thermophilous species, amphibians are limited by the relief dynamics, i.e. steepness of slopes that preclude formation of ponds or slower-flowing brooks, needed for amphibian reproduction; this is why newts are extremely scarce on the Jieț valley, which is very steep.

On east-west oriented valleys, the difference between the northern (i.e. south-oriented) and southern (north-oriented) versants is crucial, inasmuch as the south-oriented slopes receive substantially more sunshine and are consequently warmer. On the Jieț valley the difference is telling in terms of herpetofauna: the northern versant is inhabited by numerous species including *B. variegata*, *B. bufo*, *R. temporaria*, *L. agilis*, *Z. vivipara*, *P. muralis*, *A. fragilis* and *V. berus*, while the southern is only inhabited by *R. temporaria*, *Z. vivipara* and *V. berus*, by general distribution the most cold-tolerant species in European herpetofauna. The same phenomenon occurs on the upper Latorița valley. The uppermost Lotru valley (above the Balindru gorges, i. e. the basin of the large Vidra reservoir) also has an impoverished, cold-resistant herpetofauna: *M. alpestris* (Fig. 2 A), *B. variegata*, *B. bufo*, *R. temporaria*, *Z. vivipara*. *B. bufo* reproduces in the Galbenu dam lake (Fig. 2 B), but was not seen doing so in the other dam lakes in the area; less cryophilic species such as *Anguis fragilis* (Fig. 3 A), *Zamenis longissimus* (Fig. 3 B) and *Natrix natrix* (Fig. 4 A) are found together on the lower Latorița valley.

The *L. vulgaris* found on Bănița valley, a female, exhibits features (e.g. unspotted belly) suggestive of the subspecies *L. v. ampelensis*, which is found, pure or intergrading with the nominate subspecies, in Transsylvania, but also in the nearby Hațeg depression and Retezat Mountains (Ghira, 1989; Cogălniceanu et al., 2000; Rapiński et al., 2001; Babik et al., 2005); therefore we consider that these *L. vulgaris* may be either *ampelensis* or intergrades of this and the nominate subspecies.

We note the interesting variation of pattern and coloration in *L. agilis*, where we can find “typical” individuals with a brown, dark-spotted dorsal band, interrupted white vertebral line and lateral ocelli, but also specimens in which the dark spots in the dorsal band are replaced by ocelli, or specimens of the well-known “*erythronotus*” (red-backed) morph. Beside these, we found a male specimen in which the dorsal band is reddish as in *erythronotus* but has a darker median area and the lateral ocelli are anteriorly replaced by a marbling of reddish-brown hue on a yellow-green background (Fig. 4 B), and another male in which the dark spots of the dorsal band are practically fused and extending to cover the entire dorsal band, with the exception of the interrupted vertebral whitish line, the lateral ocelli are also thick and largely fused, and the green coloration of the jaws is tinged with blue (Fig. 5 A). These add to the extensive knowledge of variability in *L. agilis*.

Z. vivipara is also variable in pattern, and we have also seen a fully melanistic individual (Fig. 5 B). Fuhn & Vancea (1961) note, ap. Stugren, that melanistic *Z. vivipara* are relatively frequent in Cibin Mountains, not far from the study area; here, however, we could find only one melanistic specimen, among tens of specimens seen.



Fig. 3 - *Anguis fragilis*, adult male, showing spotting typical for ssp. *colchicus*, lower Latorița; B, *Zamenis longissimus*, adult, head detail, lower Latorița. (Photos: O. Iftime)

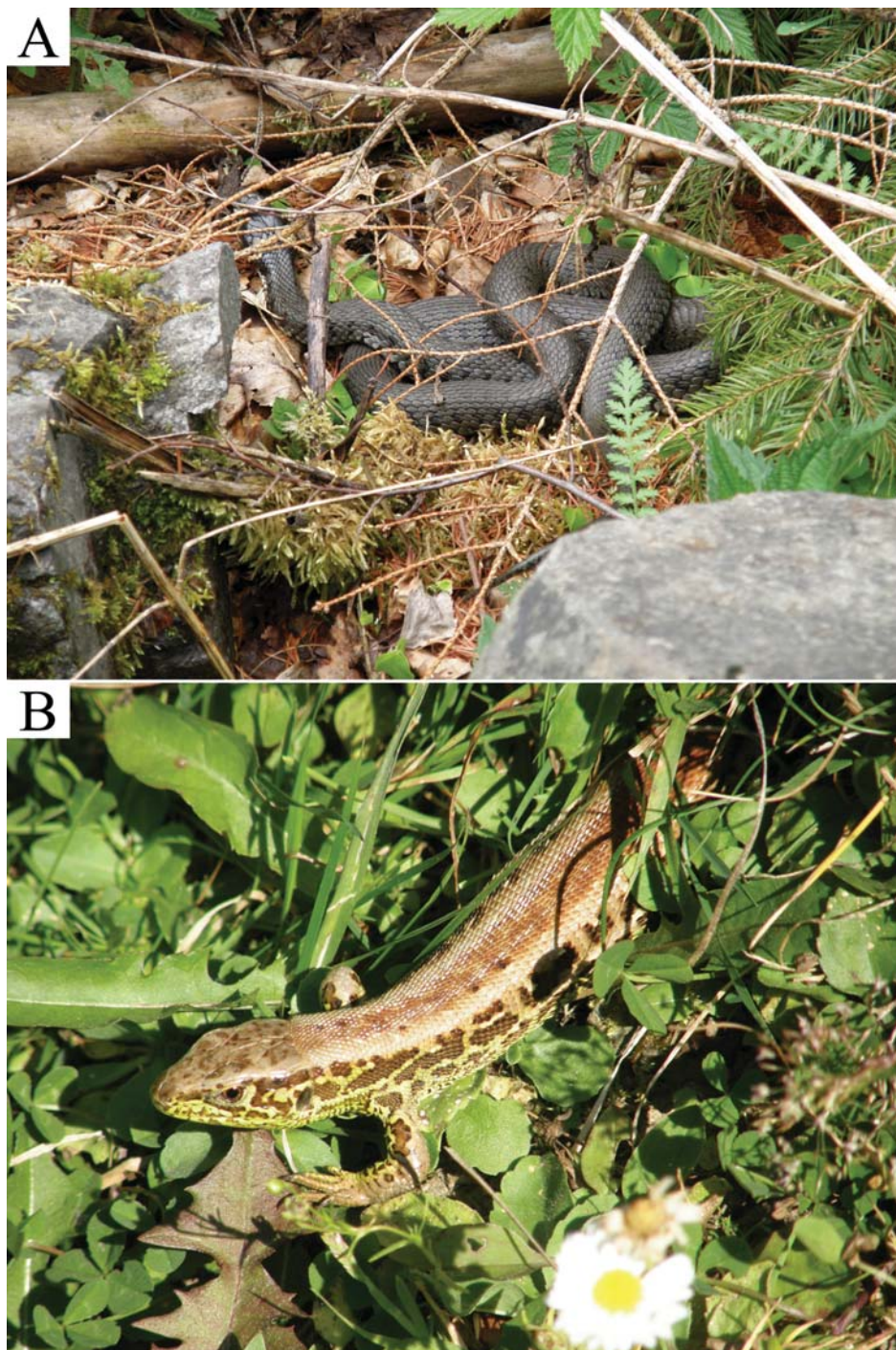


Fig. 4 - A, *Natrix natrix*, adult, Latorița; B, *Lacerta agilis*, adult male, Parâng Mt.; notice dorsal band and lateral marbled coloration. (Photos: A. Iftime)

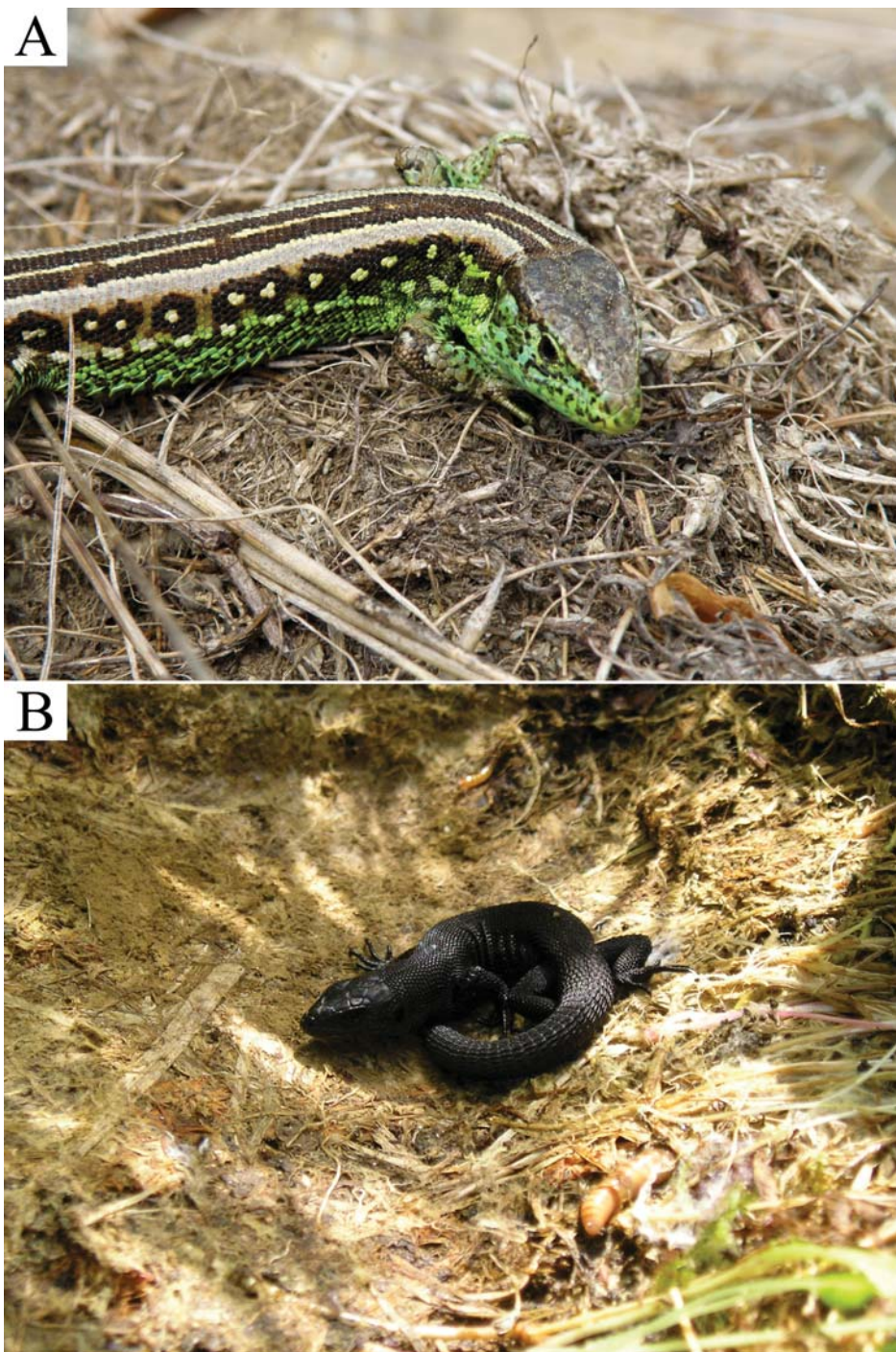


Fig. 5 - A, *Lacerta agilis*, adult male, Latorița; notice dorsal band and partly fused lateral ocelli. (Photo: A. Iftime); B, *Zootoca vivipara*, all-black male, Lotru pass. (Photo: O. Iftime)

In *V. berus* we note a very dark melanistic (but not completely black) colour morph, having very dark blackish-brown body coloration, on which darker typical markings (such as dorsal zig-zag band) are faintly visible. Whitish and reddish coloration appear on the head, chin and lower flanks, and the whole body has a satin-like, bluish-grey lustre. This morph was seen in one roadkilled specimen (Fig. 6 A) – however, the colour was not affected by death; the specimen was found short after being run over and was still moving. Other *V. berus* specimens seen had “typical” coloration, with rusty brown background and dark brown markings. It is interesting to note that under the rubric of melanistic coloration in *V. berus* are included individuals of quite different description in pattern per se (i.e. not only all-black individuals [see, as an example, fig. 6 B, a specimen from Finland], but also black specimens with variable amounts of white spotting, mostly on labials and chin, and very dark specimens with discernible zig-zag pattern; see, e.g., Terhivuo, 1990 for different frequency of melanistic adders with and without discernible zig-zag), nature of dark coloration (both overall darkening of pattern and fusing of black markings, so-called abundism or pseudomelanism, are included – see Boulenger, 1913) and ontogeny (some dark adders are born with “typical” contrasting coloration and gradually darken to the melanistic condition, others are born with it – see Forsman, 1995, and literature quoted). This, correlated with the unknown genetic background of melanism in adders (Strugariu & Zamfirescu, 2009), may explain the contradicting results obtained as to the ecological significance of melanism (see Forsman, 1995, and literature quoted), and argue for caution in expressing hypotheses upon such ecological significance, especially when these are based upon a very limited number of specimens (e.g., Strugariu & Zamfirescu, 2009).

The higher frequency of melanistic individuals in higher/ colder/ damper habitats, in both *Z. vivipara* and *V. berus*, points intuitively to a positive ecological significance, for such conditions, of the chromatic polymorphism that includes melanism (as melanistic individuals heat quicker), but in the forest-steppe adder subspecies *V. berus nikolskii* melanism is also very common (see, e.g., Zinenko et al., 2010), although this subspecies lives in a much warmer summer climate than *V. b. berus* populations in which black individuals are frequent – once again suggesting caution and thorough investigation before inferring causalities.

Our results create the image of a typical Carpathian amphibian and reptilian community in the study area, with a gradient in distribution placing less cold-tolerant species on the outskirts (e.g. on the lower Latorița valley, or the Bănița valley) while uplands and intramontane valleys are occupied by cryophilic species. The detailed distribution given here can still be completed, especially in respect of snakes, the low density of which means that populations can easily go undetected – in fact, to our knowledge, there are no previous recordings of snakes in the study area. As we consider that such species as *Bufo viridis*, *Vipera ammodytes* (see discussion above) and also *Coronella austriaca*, for which good conditions are present, may well be present in this area, further study is always welcome. Distribution data are useful for conservation purposes, as all amphibians and reptiles are protected (under different protective statuses) under national and European law (see, e.g., for Romanian law: L13/1993 and OUG 57/2007; for European law, Bern Convention CETS 104, and the Habitats Directive 92/43/EEC; see also Iftime, 2005). The interesting distribution of montane and cryophilic species also gives a



Fig. 6 - A, *Vipera berus*, very dark but not all-black subadult, road-killed, Jieř Gorges. (Photo: A. Iftime); B, *Vipera berus*, all-black specimen, Finland. (Photo: M. Niskanen)

good opportunity for long-term studies in the context of global warming and its predicted impact upon biodiversity (cf., e.g., Cogălniceanu et al., 2006).

UPDATE. Following a field trip subsequent to the redaction and submission of this paper (May 2010) we add the records of *Anguis fragilis* and *Vipera berus* at station 25.

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We wish to express thanks to Dr. Martti Niskanen for kindly allowing the use of his image of an all-black *Vipera berus*.

CONTRIBUȚII LA CUNOAȘTEREA HERPETOFAUNEI BAZINELOR JIULUI DE EST ȘI LOTRULUI SUPERIOR (CARPAȚII MERIDIONALI, ROMÂNIA)

REZUMAT

Sunt expuse rezultatele unor investigații herpetologice pe teritoriul bazinelor Jiului de Est și Lotrului superior, în masivul Parâng-Lotru-Șureanu (jud. Hunedoara și Vâlcea, România). Au fost identificate în teren 16 specii în 33 localități investigate; ele sunt prezentate împreună cu date privind prezența lor în diferite tipuri de habitat și variabilitatea lor intraspecifică.

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BIRD FAUNA LONG-TERM MONITORING IN THE ROMANIAN LOWER PRUT RIVER BASIN

CARMEN GACHE

Abstract. In the present paper, we give data on the bird' fauna's dynamic during the last 18 years in the Romanian Lower Prut River basin. This valley shelters a good level of the biodiversity being very well protected through the border status, but due the low level of the industrial development, too, despite an increasing of the human pressure in the last years. We recorded in this area some very rare breeding bird species for Romania - *Platalea leucorodia*, *Plegadis falcinellus*, *Limosa limosa*, *Recurvirostra avosetta*, *Himantopus himantopus*, *Luscinia svecica*, etc. but also some globally threatened species like *Phalacrocorax pygmeus*, *Aythya nyroca* or *Crex crex*. In this sector of the Prut River basin three Important Birds Areas (IBA) were delimited, all included in the "Romanian Nature 2000 Network".

Résumé. Dans ce travail, nous donnons des informations sur la dynamique de l'avifaune dans le secteur roumain du bassin de la rivière Prut au cours des 18 dernières années. Cette vallée abrite un bon niveau de la biodiversité étant très bien protégés par le statut des frontières, mais en raison du faible niveau de développement industriel, aussi, en dépit d'une augmentation de la pression de l'homme dans les dernières années. Nous avons enregistré dans ce territoire quelques très rares espèces d'oiseaux nicheurs pour la Roumanie - *Platalea leucorodia*, *Plegadis falcinellus*, *Limosa limosa*, *Recurvirostra avosetta*, *Himantopus himantopus*, *Luscinia svecica*, etc. mais aussi des espèces mondialement menacées comme *Phalacrocorax pygmeus*, *Aythya nyroca* ou *Crex crex*. Dans ce secteur du bassin de la rivière Prut, trois Zones de Protection Spéciale Avifaunique (ZPSA) ont été délimité, toutes inclus dans le "Réseau roumaine Natura 2000".

Key words: monitoring, birds, breeding species, SPA (Special Protection Area), lower Prut River basin, Romania.

INTRODUCTION

The Prut River valley has a length about 742 km on the Romanian territory, representing a natural border between Romania and Ukraine, respectively, Republic of Moldova.

The lower basin begin in the point of the confluence between the Prut River and its principal tributary river, Jijia, near Gorban village (Iași county), while the confluence with the Danube is near Galați city (Galați county). In this sector, the Prut River receives just the waters of some rivulets, with temporary courses and two small tributary rivers, Elan and Chineja. There were done some important hydro-technical arrangements in order to decrease the flooding risks, resulting some fisheries (Cârja – Mața - Rădeanu, Oancea, Vlădești) and one of the most important hydro-technical work in the eastern part of Romania, reducing the surface of Brateș Lake to one third from initial surface.

The climate is temperate-continental, with very dry and hot summers, respectively, dry and cold winters. Normally, the rainfalls present values about 600 mm/yearly; in the last five years, in this sector we recorded very strong dry periods but also two high flood events, in 2006 and in 2008, both during the last decade of July – beginning of August, the last representing the historical level of the Prut River's flows. Despite the control of the waters' flow through the dam Stânca -

Costești, in 2008, a flow level of 850 m/s was recorded in the hydrological point Stâncă, at least for 72 hours. These water level's oscillations have a great influence on the presence or absence of some natural small swamps and marshes areas in the lower part of Prut River basin, so on the vegetation and bird fauna's presence, too.

The Prut River basin is one of the poorest regions from Romania, representing the poorest area of the European Union, too (especially, in the North-eastern sector). But we must notice that, this territory still shelters a really high level of biodiversity, generally and of the bird fauna's diversity, especially, not only due the border status that permitted just a strictly checked presence of the people (local community, fishermen), but also due the low level of industrial development of the area – excepting the hydro-technical arrangements done in the sixty years of the last century, for decades, the principal activities in the area being the agriculture, grazing, fisheries activities and, only occasionally till now, hunting games.

In the lower Prut River basin, three Important Bird Areas were identified and established (Gache, 2002; Papp & Fântână, 2008): Cârja – Mața - Rădeanu ponds and Roșcani Forest, Prut River valley (Vlădești ponds – Frumușița) and Brateș Lake (the last two are belonging to the “Lower Meadow of Prut River” Natural Park), being included in the “Romanian Nature 2000 Network” (HG 1284/2007), while the sector Mața – Rădeanu is, also, part of the mentioned natural park. Two important ornithological studies were done in this territory in the last years, focused on the terns', respectively, herons' ecology and behaviour (Cazacu, 2007; Ignat, 2009).

MATERIAL AND METHODS

During the last 18 years (1992-2009), we visited the whole Romanian territory of the Prut River basin several times and covering more than 65 observatory stations following different aspects of the birds' fauna diversity, on the qualitative and quantitative dynamic of the avifauna in the area, paying a special attention to the breeding populations. We visited the area during the all ecological seasons, using the transect method, the band counting, the fixed point observations and the nocturnal recording for some bird species. Within all this study period, we observed the influence of different human activities on the ecosystems and biodiversity, too, while in the last years, we focused our attention on the impact of the climate evolution (very strong drought in 2007, impressive flooding phenomenon in 2006 and 2008 summers, practically in the same territory) on the bird presence and bird populations trend in this territory.

In the present paper, we are focusing our attention on the lower part of the Romanian Prut River basin, analysing the field data collected from the following observatory stations: Gura Văii Swamp, Fâlcu Swamps, Rânzești Swamps, Cârja – Mața – Rădeanu ponds, Pochina Swamp, Șovârca Swamp, Vlădești ponds, the Prut River valley between Vlădești village and Giurgiulești crossing-border point (Vlășcuța Swamp, Cotu Chiului ponds, meadow woodlands), Brateș Lake and fishery (Fig. 1). The tributary rivers have temporary courses and small lengths. The reed beds cover large surfaces in the Cârja and Vlădești areas. The humid meadows appear during the springs with high rainfalls. The woodlands are smaller than on the left side of the basin and the inside access is very difficult due the large marshes and swampy nearest areas.

RESULTS AND DISCUSSIONS

In the whole basin of the Prut River, we recorded 250 bird species (about 66% from the Romanian bird fauna), belonging to 42 families and 12 orders (Sibley & Ahlquist, 1990); between these, we must notice the presence of 56 bird species included in the Romanian Red Book of Vertebrates (Botnariuc & Tatole, 2005).

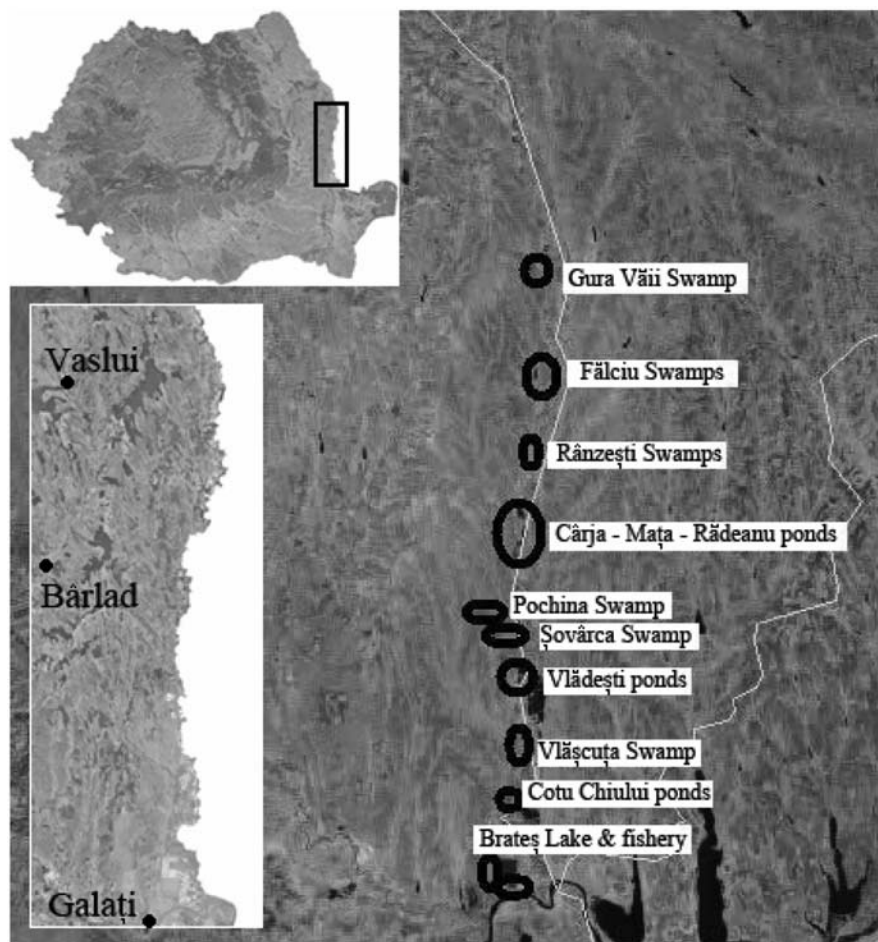


Fig. 1 - The observatory stations in the Lower Prut River basin (adapted from Geology.com, 2006).

In the lower sector of the Prut River basin, the bird fauna list include 218 species (Tab. 1), some of them met just one or twice during our study period (*Netta rufina*, *Circus cyaneus*, *C. macrourus*, *Calidris canutus*, *Numenius tenuirostris*, *Sterna nilotica*, *S. caspia*, *Nucifraga caryocatactes*), while 151 bird species are breeding or irregularly breeding in this territory, some of them being rare or very rare breeding species in Romania (*Platalea leucorodia*, *Plegadis falcinellus*, *Limosa limosa*, *Recurvirostra avosetta*, *Himantopus himantopus*, *Luscinia svecica*, etc.).

We notice an increasing of the bird diversity, including the incidentally or erratic species appearance in the last years of our study; it is possible that the wetland habitat losing and an increasing of the human interventions in the nearest areas forced the birds to search new sites for refuge, feeding or breeding, too. We have data about strong pressure on the left side of the Lower Prut River basin (infrastructure development, including a new railway building, the illegal activity of some sand, gravel and limestone quarries, the electrical fishing practice, etc.) that could produced big damages in the local ecosystems, disturbing the whole fauna, including the bird species that tried to find new sites for refuge, feeding or breeding.

Table 1

The bird species recorded in the Romanian Lower Prut River basin: phenology, breeding status, protection status.

No.	Species' name	Phenology		Breeding status (pairs)	Trends	Migration (individuals)	Frequency status	Birds' Directive	Romanian Red Book
		Lower Prut basin	Romania						
1.	<i>Podiceps cristatus</i>	SV	SV, RWV	20 - 60	+	80 - 100	C	-	-
2.	<i>Tachybaptus ruficollis</i>	SV	SV, RWV	6 - 10	-	40 - 60	F	-	-
3.	<i>Podiceps grisegena</i>	SV	SV	3 - 7	-	20 - 30	R	-	-
4.	<i>Podiceps nigricollis</i>	SV	SV	20 - 35	0	50 - 60	F	-	-
5.	<i>Phalacrocorax carbo</i>	SV	SV, RWV	30?	0	1800 - 2200	C	-	-
6.	<i>Phalacrocorax pygmeus</i>	SV	SV, RWV	10 - 12?	+	280 - 350	RR	A1	V
7.	<i>Pelecanus onocrotalus</i>	SV	SV	-	-	1100 - 1500	RR	A1	V
8.	<i>Botaurus stellaris</i>	SV	SV, RWV	8 - 14	-	*	F	A1	-
9.	<i>Isobrychus minutus</i>	SV	SV	20 - 35	0	*	F	A1	-
10.	<i>Nycticorax nycticorax</i>	SV	SV	25 - 50	+	90 - 120	F	A1	V
11.	<i>Ardeola ralloides</i>	SV	SV	15 - 30	+	*	RR	A1	V
12.	<i>Egretta garzetta</i>	SV	SV	30 - 60	+	120 - 160	F	A1	E
13.	<i>Ardea alba (Casmerodius albus)</i>	SV	SV, RWV	15 - 25	0	140 - 160	F	A1	E
14.	<i>Ardea cinerea</i>	SV	SV, RWV	40 - 65	+	140 - 200	C	-	-
15.	<i>Ardea purpurea</i>	SV	SV	10 - 15	0	20 - 50	RR	A1	E
16.	<i>Ciconia nigra</i>	SV	SV	2 - 3?	-	7 - 54	RR	A1	V
17.	<i>Ciconia ciconia</i>	SV	SV	8 - 15	-	4000 - 5000	F	A1	V
18.	<i>Plegadis falcinellus</i>	SV	SV	5 - 42	+	80 - 150	RR	A1	V
19.	<i>Platalea leucorodia</i>	SV	SV	10 - 45	+	110 - 220	F	A1	E
20.	<i>Cygnus olor</i>	SV, P	PM	10 - 12	+	500 - 700	F	-	-
21.	<i>Branta ruficollis</i>	P	WV	-	-	16 - 28	R	A1	E
22.	<i>Anser anser</i>	SV, WV	PM	10 - 12	+	5000 - 7000	C	-	-
23.	<i>Anser albifrons</i>	P, WV	WV	-	+	9800 - 13500	C	-	-
24.	<i>Anas platyrhynchos</i>	SV, P	PM, WV	26 - 58	+	1200 - 1600	C	-	-
25.	<i>Anas strepera</i>	SV	SV	8 - 12	0	60 - 80	RR	-	-
26.	<i>Anas acuta</i>	P	P, WV	-	-	80 - 360	RR	-	-
27.	<i>Anas penelope</i>	P	P, WV	-	0	180 - 320	F	-	-
28.	<i>Anas querquedula</i>	SV	SV, P	12 - 22	0	800 - 1500	C	-	-
29.	<i>Anas crecca</i>	P	P, WV, SV	-	0	120 - 280	F	-	-
30.	<i>Anas chipeata</i>	P, SV	P, SV	1 - 3?	0	180 - 220	F	-	-
31.	<i>Tadorna tadorna</i>	P	SV, RWV	-	-	18 - 32	RR	-	V

Table 1 (continued)

No.	Species' name	Phenology Lower Prut basin	Romania	Breeding status (pairs)	Trends	Migration (individuals)	Frequency status	Birds' Directive	Romanian Red Book
32.	<i>Netta rufina</i>	Er	SV, RWV	-	?	4 - 6	VR	-	E
33.	<i>Aythya fuligula</i>	P	WV, SV	-	0	70 - 90	F	-	-
34.	<i>Aythya marila</i>	P	WV	-	?	10 - 18	VR	-	-
35.	<i>Aythya nyroca</i>	SV, P	SV, RWV	18 - 22	0	320 - 400	F	A1	V
36.	<i>Aythya ferina</i>	SV, P	PM	20 - 40	+	1800 - 4700	C	-	-
37.	<i>Haliaeetus albicilla</i>	PM	PM	-	0	4 - 10	RR	A1	CE
38.	<i>Aquila heliaca</i>	PM	PM	-	?	1 - 3	R	A1	CE
39.	<i>Aquila clanga</i>	P	P, ?B	-	-	1 - 2	R	A1	CE
40.	<i>Aquila pomarina</i>	SV	SV	1 - 2	0	4 - 8	RR	A1	V
41.	<i>Hieraaetus pennatus</i>	P	P, SV	-	?	3 - 5	VR	A1	CE
42.	<i>Circus gallicus</i>	P	SV	-	0	4 - 8	RR	A1	V
43.	<i>Buteo buteo</i>	PM	PM	6 - 10	0	20 - 30	C	-	-
44.	<i>Buteo lagopus</i>	WV	WV	-	+	5 - 15	F	-	-
45.	<i>Pernis apivorus</i>	P, SV?	SV	1 - 3	?	8 - 14	F	A1	V
46.	<i>Accipiter gentilis</i>	SV	S	1 - 2	0	8 - 14	F	-	-
47.	<i>Accipiter nisus</i>	S	S, WV	1 - 2	0	12 - 15	F	-	-
48.	<i>Milvus milvus</i>	P	P	-	-	2 - 7	RR	A1	E
49.	<i>Milvus migrans</i>	P	SV	-	-	1 - 3	VR	A1	CE
50.	<i>Pandion haliaetus</i>	P, SV?	P	1?	0	6 - 10	RR	A1	V
51.	<i>Circus aeruginosus</i>	SV	SV, RWV	12 - 14	0	20 - 35	F	A1	-
52.	<i>Circus cyaneus</i>	Er	WV	-	?	1 - 2	VR	A1	-
53.	<i>Circus macrourus</i>	Er	P, ?SV	-	?	1 - 4	R	A1	E
54.	<i>Circus pygargus</i>	P	SV	-	?	4 - 6	R	A1	E
55.	<i>Falco peregrinus</i>	I	S, WV	-	+	6 - 10	R	A1	E
56.	<i>Falco columbarius</i>	WV	WV	-	+	10 - 14	RR	A1	-
57.	<i>Falco vespertinus</i>	SV	SV	7 - 10	-	26 - 30	RR	A1	V
58.	<i>Falco subbuteo</i>	SV	SV	10 - 15	+	25 - 40	F	-	-
59.	<i>Falco tinnunculus</i>	PM	PM	15 - 20	+	28 - 40	F	-	-
60.	<i>Perdix perdix</i>	S	S	40 - 60	+	80 - 120	F	-	-
61.	<i>Phasianus colchicus</i>	S	S	30 - 50	+	*	C	-	-
62.	<i>Coturnix coturnix</i>	SV	SV	40 - 60	0	120 - 160	F	-	-

Table 1 (continued)

No.	Species' name	Phenology		Breeding status (pairs)	Trends	Migration (individuals)	Frequency status	Birds' Directive	Romanian Red Book
		Lower Prut basin	Romania						
63.	<i>Grus grus</i>	P	P, ?B	-	?	12 - 30	VR	A1	V
64.	<i>Rallus aquaticus</i>	SV	PM	12 - 20	?	*	RR	-	-
65.	<i>Porzana parva</i>	P, SV?	SV	1 - 3?	?	*	VR	A1	-
66.	<i>Porzana porzana</i>	P, SV?	SV	2 - 4?	?	*	R	A1	-
67.	<i>Crex crex</i>	SV	SV	8 - 12	0	20 - 40	R	A1	V
68.	<i>Gallinula chloropus</i>	SV	SV	20 - 32	0	*	C	-	-
69.	<i>Fulica atra</i>	SV, P	PM	45 - 80	+	3000 - 4000	C	-	-
70.	<i>Vanellus vanellus</i>	SV	SV	25 - 50	+	5000 - 7000	C	-	-
71.	<i>Charadrius hiaticula</i>	Er	P	-	?	4 - 10	R	-	-
72.	<i>Charadrius dubius</i>	SV	SV	6 - 14	+	12 - 30	F	-	-
73.	<i>Pluvialis apricaria</i>	P	P	-	?	16 - 30	VR	A1	-
74.	<i>Pluvialis squatarola</i>	P	P	-	?	100 - 150	RR	-	-
75.	<i>Arenaria interpres</i>	P	P	-	?	18 - 42	RR	-	-
76.	<i>Calidris alba</i>	P	P	-	+	20 - 50	F	-	-
77.	<i>Calidris ferruginea</i>	P	P	-	0	40 - 70	F	-	-
78.	<i>Calidris alpina</i>	P	P	-	+	80 - 190	F	-	-
79.	<i>Calidris canutus</i>	Er	Er	-	?	2 - 5	VR	-	-
80.	<i>Calidris minuta</i>	P	P	-	+	160 - 220	F	-	-
81.	<i>Calidris temminckii</i>	P	P	-	+	180 - 250	F	-	-
82.	<i>Limicola falcinellus</i>	P	P	-	0	32 - 80	F	-	-
83.	<i>Gallinago media</i>	P	P	-	-	4 - 6	VR	A1	-
84.	<i>Gallinago gallinago</i>	P	P, ?B	-	-	18 - 40	R	-	-
85.	<i>Lymnocyrtus minimus</i>	P	P	-	+	24 - 52	RR	-	-
86.	<i>Numenius arquata</i>	P	SV	-	+	1200 - 1600	C	-	-
87.	<i>Numenius tenuirostris</i>	Er	Er	-	?	2	VR	A1	CE
88.	<i>Limosa limosa</i>	SV, P	P, ?SV	4 - 10?	+	5000 - 7000	C	-	-
89.	<i>Actitis hypoleucos</i>	P, SV?	SV	-	0	160 - 200	F	-	-
90.	<i>Tringa ochropus</i>	P	P	-	+	120 - 200	F	-	-
91.	<i>Tringa glareola</i>	P	P	-	+	120 - 200	F	A1	-
92.	<i>Tringa nebularia</i>	P	P	-	+	60 - 110	RR	-	-
93.	<i>Tringa stagnatilis</i>	P	P, SV	-	+	80 - 150	RR	-	-

Table 1 (continued)

No.	Species' name	Phenology		Breeding status (pairs)	Trends	Migration (individuals)	Frequency status	Birds' Directive	Romanian Red Book
		Lower Prut basin	Romania						
94.	<i>Tringa totanus</i>	P, SV	P, SV	-	+	1200 - 1800	C	-	-
95.	<i>Tringa erythropus</i>	P	P	-	+	1200 - 1500	C	-	-
96.	<i>Philomachus pugnax</i>	P	P	-	+	2500 - 3200	C	-	-
97.	<i>Recurvirostra avosetta</i>	SV	SV	2 - 3	+	50 - 60	RR	A1	V
98.	<i>Himantopus himantopus</i>	SV	SV	1 - 4	+	30 - 40	R	A1	E
99.	<i>Larus fuscus</i>	P	P, WV	-	0	8 - 12	RR	A1	-
100.	<i>Larus michahellis</i>	PM	S	40 - 60	+	400 - 800	C	-	-
101.	<i>Larus cachinnans</i>	SV, WV	S	10 - 14	+	80 - 120	F	-	-
102.	<i>Larus canus</i>	P	WV	-	0	6 - 26	R	-	-
103.	<i>Larus ridibundus</i>	PM	PM	70 - 110	0	450 - 800	C	-	-
104.	<i>Larus minutus</i>	P	P, ?B	-	?	18 - 22	RR	A1	-
105.	<i>Chlidonias niger</i>	SV	SV	12 - 24	-	300 - 600	RR	A1	-
106.	<i>Chlidonias hybridus</i>	SV	SV	450 - 950	+	2800 - 4000	C	A1	-
107.	<i>Chlidonias leucopterus</i>	SV	SV	2 - 4?	-	60 - 150	VR	-	-
108.	<i>Sterna (Gelochelidon) nilotica</i>	Er	SV	-	?	1	VR	A1	CE
109.	<i>Sterna caspia</i>	Er	P	-	?	1 - 2	VR	A1	-
110.	<i>Sterna hirundo</i>	SV	SV	30 - 100	+	350 - 500	C	A1	-
111.	<i>Sterna albifrons</i>	SV	SV	4 - 10	-	18 - 20	RR	-	E
112.	<i>Columba oenas</i>	SV	SV	18 - 32	+	80 - 150	F	-	-
113.	<i>Columba palumbus</i>	SV	SV, RWV	20 - 40	+	120 - 180	F	-	-
114.	<i>Streptopelia turtur</i>	SV	SV	18 - 35	0	60 - 110	RR	-	V
115.	<i>Streptopelia decaocto</i>	S	S	120 - 180	+	*	C	-	-
116.	<i>Cuculus canorus</i>	SV	SV	40 - 60	+	*	C	-	-
117.	<i>Athene noctua</i>	S	S	8 - 12	0	*	F	-	-
118.	<i>Bubo bubo</i>	S	S	1 - 3	-	*	R	A1	V
119.	<i>Asio otus</i>	S	S	10 - 18	+	*	F	-	-
120.	<i>Strix aluco</i>	S	S	4 - 6	?	*	F	-	-
121.	<i>Caprimulgus europaeus</i>	SV	SV	10 - 18	0	*	F	A1	-
122.	<i>Apus apus</i>	SV	SV	20 - 30	+	120 - 180	F	-	-
123.	<i>Alcedo atthis</i>	SV	PM	50 - 70	0	*	F	A1	-
124.	<i>Merops apiaster</i>	SV	SV	20 - 45	-	60 - 120	F	-	-

Table 1 (continued)

No.	Species' name	Phenology		Breeding status (pairs)	Trends	Migration (individuals)	Frequency status	Birds' Directive	Romanian Red Book
		Lower Prut basin	Romania						
125.	<i>Coracias garrulus</i>	SV	SV	4 - 8	-	18 - 24	R	A1	-
126.	<i>Upupa epops</i>	SV	SV	18 - 30	0	30 - 50	F	-	V
127.	<i>Picus viridis</i>	S	S	18 - 32	0	*	C	-	-
128.	<i>Picus canus</i>	S	S	4 - 10	-	*	RR	A1	-
129.	<i>Dryocopus martius</i>	WV	S	-	?	*	RR	A1	-
130.	<i>Dendrocopos major</i>	S	S	32 - 60	+	*	C	-	-
131.	<i>Dendrocopos syriacus</i>	S	S	40 - 60	+	*	C	A1	-
132.	<i>Dendrocopos minor</i>	S	S	22 - 30	0	*	RR	-	-
133.	<i>Dendrocopos medius</i>	S	S	8 - 12	-	*	RR	A1	-
134.	<i>Jynx torquilla</i>	SV	SV	10 - 14	?	*	F	-	E
135.	<i>Galerida cristata</i>	S	S	120 - 150	+	*	C	-	-
136.	<i>Alauda arvensis</i>	SV	PM	200 - 300	0	*	C	-	-
137.	<i>Lullula arborea</i>	SV	SV	12 - 30	-	*	F	A1	-
138.	<i>Riparia riparia</i>	SV	SV	180 - 320	+	2000 - 3000	C	-	-
139.	<i>Hirundo rustica</i>	SV	SV	200 - 300	+	2500 - 3000	C	-	-
140.	<i>Delichon urbica</i>	SV	SV	150 - 200	+	1200 - 2000	C	-	-
141.	<i>Anthus trivialis</i>	SV	SV	32 - 50	0	*	F	-	-
142.	<i>Anthus pratensis</i>	SV	P, SV	18 - 30	0	*	F	-	-
143.	<i>Anthus campestris</i>	SV	SV	35 - 60	+	*	C	A1	-
144.	<i>Anthus cervinus</i>	P	P	-	?	10 - 14	VR	-	-
145.	<i>Anthus spinoletta</i>	P	SV	-	?	18 - 25	R	-	-
146.	<i>Motacilla flava</i>	SV	SV	35 - 60	+	*	C	-	-
147.	<i>Motacilla cinerea</i>	P	SV, RWV	-	?	12 - 18	R	-	-
148.	<i>Motacilla alba</i>	SV	SV	30 - 60	0	*	C	-	-
149.	<i>Lanius collurio</i>	SV	SV	32 - 45	+	*	C	A1	-
150.	<i>Lanius minor</i>	SV	SV	35 - 50	0	*	C	A1	-
151.	<i>Lanius excubitor</i>	WV	PM, WV	-	+	40 - 60	RR	-	-
152.	<i>Oriolus oriolus</i>	SV	SV	60 - 100	+	*	F	-	-
153.	<i>Sturnus vulgaris</i>	PM	PM	180 - 300	+	8000 - 15000	C	-	-
154.	<i>Garrulus glandarius</i>	S	S	35 - 50	+	*	C	-	-
155.	<i>Pica pica</i>	S	S	40 - 80	+	*	C	-	-
156.	<i>Nucifraga caryocatactes</i>	Er	S	-	?	1 - 2	VR	-	-
157.	<i>Corvus monedula</i>	S	S	28 - 40	0	*	C	-	-
158.	<i>Corvus frugilegus</i>	S	S, WV	60 - 100	+	*	C	-	-

Table 1 (continued)

No.	Species' name	Phenology		Breeding status (pairs)	Trends	Migration (individuals)	Frequency status	Birds' Directive	Romanian Red Book
		Lower Prut basin	Romania						
159.	<i>Corvus corone cornix</i>	S	S	30 - 50	+	*	C	-	-
160.	<i>Corvus corax</i>	S	S	2 - 6	0	18 - 22	RR	-	E
161.	<i>Troglodytes troglodytes</i>	SV, RWV	SV, RWV	+	?	*	F	-	-
162.	<i>Locustella luscinioides</i>	SV	SV	10 - 15?	?	*	F	-	-
163.	<i>Locustella fluviatilis</i>	P, SV?	SV	1 - 3?	?	*	R	-	-
164.	<i>Acrocephalus scirpaceus</i>	SV	SV	+	+	*	C	-	-
165.	<i>Acrocephalus schoenobaenus</i>	SV	SV	+	+	*	C	-	-
166.	<i>Acrocephalus arundinaceus</i>	SV	SV	+	+	*	C	-	-
167.	<i>Hippolais icterina</i>	SV	SV	+	0	*	F	-	-
168.	<i>Sylvia atricapilla</i>	SV	SV	+	+	*	C	-	-
169.	<i>Sylvia nisoria</i>	SV	SV	+	-	*	R	-	-
170.	<i>Sylvia borin</i>	SV	SV	+	+	*	C	-	-
171.	<i>Sylvia communis</i>	SV	SV	+	+	*	C	-	-
172.	<i>Sylvia curruca</i>	SV	SV	+	+	*	C	-	-
173.	<i>Phylloscopus trochilus</i>	P	SV, P	-	?	*	F	-	-
174.	<i>Phylloscopus collybita</i>	SV	SV	+	+	*	C	-	-
175.	<i>Phylloscopus sibilatrix</i>	SV	SV	+	?	*	F	-	-
176.	<i>Regulus regulus</i>	PM	PM, WV	+	?	*	C	-	-
177.	<i>Ficedula parva</i>	SV	SV	+	?	*	F	A1	-
178.	<i>Ficedula hypoleuca</i>	SV	SV	+	?	*	F	-	-
179.	<i>Ficedula albicollis</i>	P, SV?	SV	+	-	*	R	A1	-
180.	<i>Muscicapa striata</i>	SV	SV	+	0	*	F	-	-
181.	<i>Oenanthe oenanthe</i>	SV	SV	+	+	*	F	-	-
182.	<i>Saxicola rubetra</i>	SV	SV	+	0	*	C	-	-
183.	<i>Saxicola torquata</i>	SV	SV	+	0	*	F	-	-
184.	<i>Phoenicurus phoenicurus</i>	SV	SV	+	0	*	C	-	-
185.	<i>Phoenicurus ochruros</i>	SV	SV	+	+	*	C	-	-
186.	<i>Erithacus rubecula</i>	SV	SV	+	+	*	C	-	-
187.	<i>Luscinia luscinia</i>	SV	SV	+	+	*	C	-	-
188.	<i>Luscinia megarhynchos</i>	SV	SV	+	+	*	C	-	-
189.	<i>Luscinia svecica cyanecula</i>	SV	P, SV	1 - 4	?	*	VR	A1	E
190.	<i>Turdus merula</i>	PM	PM	+	+	*	C	-	-
191.	<i>Turdus viscivorus</i>	P, WV	PM	-	0	*	F	-	-

Table 1 (continued)

No.	Species' name	Phenology		Breeding status (pairs)	Trends	Migration (individuals)	Frequency status	Birds' Directive	Romanian Red Book
		Lower Prut basin	Romania						
192.	<i>Turdus philomelos</i>	SV	SV	+	+	*	C	-	-
193.	<i>Turdus pilaris</i>	WV	PM, WV	-	+	*	F	-	-
194.	<i>Parus palustris</i>	SV	S	+	+	*	F	-	-
195.	<i>Parus caeruleus</i>	S	S	+	+	*	C	-	-
196.	<i>Parus major</i>	S	S	+	+	*	C	-	-
197.	<i>Aegithalos caudatus</i>	WV	S	-	?	*	F	-	-
198.	<i>Panurus biarmicus</i>	SV	S	+	+	*	F	-	-
199.	<i>Remiz pendulinus</i>	SV	PM	+	0	*	F	-	-
200.	<i>Sitta europaea</i>	S	S	+	+	*	C	-	-
201.	<i>Certhia familiaris</i>	S	S	+	?	*	F	-	-
202.	<i>Passer domesticus</i>	S	S	+	+	*	C	-	-
203.	<i>Passer hispaniolensis</i>	SV	SV	+	-	*	R	-	-
204.	<i>Passer montanus</i>	S	S	+	-	*	F	-	-
205.	<i>Fringilla coelebs</i>	PM	PM	+	+	*	C	-	-
206.	<i>Fringilla montifringilla</i>	WV	WV	-	+	*	F	-	-
207.	<i>Coccothraustes coccothraustes</i>	S	S	+	0	*	F	-	-
208.	<i>Pyrrhula pyrrhula</i>	WV	S	-	-	*	R	-	-
209.	<i>Carduelis chloris</i>	SV	S	+	0	*	C	-	-
210.	<i>Carduelis spinus</i>	WV	PM, WV	-	?	*	F	-	-
211.	<i>Serinus serinus</i>	SV	SV	+	?	*	C	-	-
212.	<i>Carduelis cannabina</i>	SV	PM	+	-	*	F	-	-
213.	<i>Carduelis carduelis</i>	S	S	+	0	*	C	-	-
214.	<i>Carduelis flammea</i>	WV	WV	-	-	*	F	-	-
215.	<i>Miliaria calandra</i>	S	PM	+	+	*	C	-	-
216.	<i>Emberiza hortulana</i>	SV	SV	+	-	*	R	AI	-
217.	<i>Emberiza schoeniclus</i>	PM	PM	+	+	*	F	-	-
218.	<i>Emberiza citrinella</i>	S	S	+	+	*	F	-	-

Legend:

Phenology: SV – summer visitor; WV – winter visitor; P – passage species; PM – partial migratory species; S – resident species; Er – erratic species; RWV – rare winter visitor; ?B – possible breeding species.

Breeding status: pairs' number? (for example, "1 – 3?") – estimated effectiveness for irregular or probably breeding species; + – unknown breeding population.

Trends: -/decreasing; +/increasing effectiveness; 0/constant or near constant effectiveness; ?/insufficient data.

Migration: * – unknown effectiveness.

Frequency status: C – common species; F – frequent species; RR – relatively rare species; R – rare species; VR – very rare species.

Birds' Directive: AI – bird species included in the Annex 1.

Romanian Red Book: E – endangered species; CE – critically endangered species; V – vulnerable species.

The distribution of the bird species in the area is unequal, the biggest diversity being recorded in the perimeters of the Cârja – Mața – Rădeanu and Vlădești ponds due the high variety of the habitats. The biggest breeding populations were recorded in these perimeters, too and in the inland nearest woodlands (Pogonești, Roșcani). During the years with dry summers, when the small marshes areas are losing the waters and the temporary flooding surfaces become dry, the breeding bird populations are concentrated on the fisheries ponds. But we must mention that the natural swamps Gura Văii, Fâlcu, Rânzești, Pochina and some marshes areas between Vlădești pond and Vlășcuța Swamp are very important, too, especially during the passage time.

In the same time, it is necessary to mention the diminishing of the aquatic surfaces including the fishery perimeters through the maintaining dry or transforming in agricultural lands of some former ponds in order to increase the economical benefits. The water's cost and the reduced worker personal in these fisheries determined the administration to keep a partial functional system; for example, in the Vlădești fishery, starting from 2000, the two northern large ponds are dry and were cultivated with maize and sunflower for some years. On the other side, in the Cârja fishery perimeters (there are two fisheries), approximately 45 – 50% from the initially surface is dry and abandoned, while some large ponds were abandoned with not deep waters, permitting the development of a rich aquatic vegetation. During the last five years, in this area the climate oscillated from very dry periods to very high rainfall level, determined flooding phenomenon and the appearance of some new marshes or swampy territories. All this factors influenced the breeding colonies or breeding territories' location and the effectives of the mostly breeding bird species, but also the sites and surface of the feeding perimeters in the Romanian lower part of Prut River basin.

For the majority aquatic and semi-aquatic bird species, we estimated the breeding populations and the trends of their effectives in the investigated area. As we can see in the table 1, these species are very important in the trophic chains of the wetland and aquatic ecosystems through their effectives. Some of them form breeding colonies; we recorded the most important grebes breeding colonies in Cârja – Mața – Rădeanu and Vlădești ponds' territory, presenting a slow but constant negative trends, while the breeding effectives of herons, egrets, Spoonbill (*Platalea leucorodia*) and Glossy Ibis (*Plegadis falcinellus*) are concentrated in the perimeters of the Cârja – Mața – Rădeanu ponds and we recorded a slow increasing of their breeding populations for most of species. For example, in 2006, there was certified the first certain breeding of the Glossy Ibis in the Prut River basin, with 35 pairs, while the Spoonbill is breeding species from the middle of '90, but presented a strong negative trend due the high pressure of the local community and, probably, changed the breeding site in North, on the Jijia ponds (Ignat, 2009); now, in the southern sector, Mața – Rădeanu ponds, these two species are breeding, presenting a slow increasing of their effectives. But we assume the possibility that, at least, the Glossy Ibis with other heron species are breeding in the southern part of the investigated area, in the flooding meadow woodlands nearest the confluence of the Prut River with the Danube River, where the access is very difficult and restrictive indeed.

Both species of storks (*Ciconia ciconia* and *C. nigra*) present a negative trend in the area, seeing a constant increasing of the unoccupied nests in the villages during the last ten years.

The tern and the gull colonies were identified in different locations one year to other. For example, at the beginning of our study, one of the most important mixed colonies (grebes and tern species) was located on the western pond in the Brateş fishery's perimeter. In the first years of this century, the water costs increased and the fishing production decreased, so the activity of this fishery became non-productive, so the administration decided to reduce the surface to just some small ponds around the administrative buildings (since 2006). In this way, the birds lost the suitable habitats and were forced to leave this territory. During the years with normal or high level of the rainfalls, we met these species breeding, divided in small colonies, in the natural small swamps and marshes areas, along the flooding protection dam, from Frumuşita to Vlădeşti villages. When these territories are dry, the birds are going in the perimeters of the fisheries Vlădeşti and Cârja – Maţa – Rădeanu.

The geese and duck species are breeding in the dense reed beds, especially, in the nominated two fisheries and in the natural swampy areas situated in the southern sector, recording a constant increasing of the breeding populations. We notice the irregular presence like breeding species of the Shoveler (*Anas clypeata*) and the constant breeding of one small population of Greylag Goose (*Anser anser*), concentrated in the quiet sites from the border area (between Vlădeşti fishery and Vlăşcuţa Swamp) and on the Maţa – Rădeanu ponds.

We have not enough information about the bird species that are breeding in the meadow forests because the access is difficult in most of these ecosystems; on one hand, the forests are far away to the villages, inside the strictly bordering area and we need specific permission to visit the perimeter, sometimes existing the risk (and danger) to met groups of people that try an illegal crossing border, too; on another hand, for large periods, the meadow forests are flooding. For this reason, we can just assume the presence and estimate the effectives of the breeding bird species in this ecosystem, taking point from recorded adult birds during the breeding season and the appearance of the juvenile birds in summer time. We believe that the highest importance for breeding season present the sector of the riverside forest nearest Giurgiuleşti (closed to the confluence with the Danube) and the sector of the meadow forest from Şiviţa to Vlădeşti villages. In these territories, it is possible the breeding of at least two pairs of Black Storks (*Ciconia nigra*) and we do not exclude the irregular breeding (at least!) of one pair of Osprey (*Pandion haliaetus*) – we met the birds during the breeding season on the left side of the basin (on the territory of the scientific reserve “Lower Prut”, Republic of Moldova), observing the adults fishing and flying down to the nest, in the meadow forest from the Romanian side of the river (June – July 2005). In these riverside forests, the cormorants (*Phalacrocorax* sp.) can breed, too – we met both species during the whole breeding season, in August appearing with juveniles. We have certain data on their breeding on the left side of the basin, but we cannot exclude the possibility of the same situation in the trees from the meadow forest on the right side of the valley, probably, together with some egrets and heron species pairs.

During the migration time, the birds' effectives record great values and this is the period when we met the most incidental species in the area. The aquatic species – grebes, cormorants, geese, ducks, gulls and terns – form flocks about hundreds or thousands individuals (Tab. 1).

The Prut River is an important flyway for some species present in the investigated area with very large flocks like *Ciconia ciconia*, *Anser anser*, *A.*

albifrons, *Anas platyrhynchos*, *A. querquedula*, *Aythya ferina*, *A. nyroca*, *Fulica atra*, *Vanellus vanellus*, *Numenius arquata*, *Limosa limosa*, *Tringa totanus*, *Tringa erythropus* and *Philomachus pugnax*. The pelicans (*Pelecanus onocrotalus*) are searching for food in the fishery perimeter; we recorded flocks about 600 – 1000 individuals in Vlădești pond area (July - August), while the Cârja ponds represent the northern limit where we met this species in the Prut River basin, in groups of no more than 180 birds.

In this period, we recorded the biggest effectives for some species that, normally, appear in small groups: the Black Stork (*Ciconia nigra*) – 54 individuals, on Vlășcuța swamp, 10 October 2002; the Pintail (*Anas acuta*) – 352 individuals, on the Fâlcu Swamps, 17 April 2003; the Shelduck (*Tadorna tadorna*) – 32 individuals, on the Vlădești ponds, 12 November 2006; the White-tailed Eagle (*Haliaeetus albicilla*) – 27 September 2007, 2 adults on Șovârca Swamp (acrobat flying for fishing) and one juvenile bird on the Vlădești ponds; the Red Kite (*Milvus milvus*) – 7 individuals, flying from Cotu Chiului to Vlădești pond direction, 26 September 1993.

The trends of the recorded bird species effectives give an image about the dynamic of bird fauna diversity in the area. As we can see in the figure 2, the mostly bird species present a positive trend in this part of the Prut River basin, but these are not represent more than 42.20% from the whole bird fauna; for 14.67% from the identified bird species, we recorded a decreasing of their breeding and migration time effectives and just 24.31% bird species present constant effectives in this territory. Unfortunately, for almost the fifth part from the recorded bird fauna (18.80%), we have not enough data to estimate their effective trends and some of them appear in danger neither at the national level nor in the whole area of distribution.

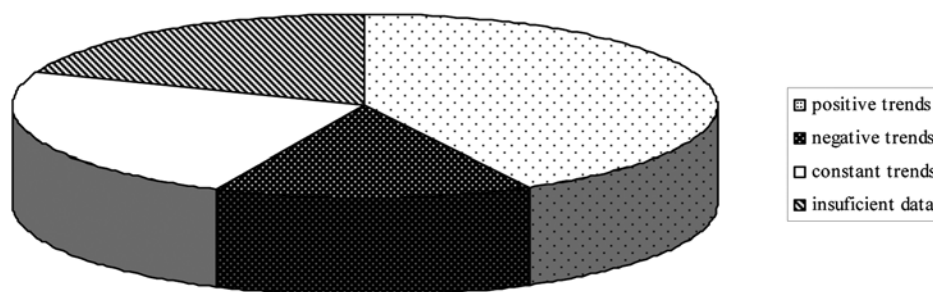


Fig. 2 - The bird species trends in the Lower Prut River basin.

Regarding the frequency status, we recorded 69 common species (present in all observation points with suitable habitats), 75 frequent species (recorded in mostly sites with appropriate habitats), 34 relative rare species and 23 rare species (birds observed just in few places from the investigated area and only in some period of the year), respectively, 17 very rare species (met few times or just in specific observation points during our study).

In the Lower Prut River, we recorded 65 bird species included in the Annex 1 of the Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds, representing important criteria in the biodiversity conservation strategy of the European Union – these bird species shall be subject of

special conservation measures concerning their habitats in order to ensure their survival and the reproduction in their area of distribution. From these bird species, we recorded 35 certainly breeding species, some of them with important effectives (*Botaurus stellaris*, *Ixobrychus minutus*, *Ardea purpurea*, *Platalea leucorodia*, *Aythya nyroca*, *Falco vespertinus*, *Crex crex*, *Chlidonias hybridus*, *Lanius minor* and *Anthus campestris*) and another 6 bird species could be at least probably or irregular breeding species in the area, but part of these species have a negative trend, especially, during the last five years.

We notice, also, the presences in the investigated area of 49 bird species from the 56 bird species recorded for the whole Romanian Prut River basin that are included in the Romanian Red Book of Vertebrates (Botnariuc & Tatole, 2005): 20 vulnerable species, 15 endangered species and 7 critically endangered species (Fig. 3). Some of these species are breeding in the lower part of the Prut River basin with different effectives (*Phalacrocorax pygmeus*, *Nycticorax nycticorax*, *Ardeola ralloides*, *Egretta garzetta*, *Ardea alba*, *A. purpurea*, *Platalea leucorodia*, *Plegadis falcinellus*, *Sterna albifrons*, etc.), other are seeking food in this territory during the breeding season or just in passage (*Pelecanus onocrotalus*, *Tadorna tadorna*, *Hieraaetus pennatus*, *Circus gallicus*, *Milvus migrans*, etc.), while other appears just incidentally (*Netta rufina*, *Numenius tenuirostris*, *Sterna caspia*, etc.).

The human relation with the bird fauna is relatively positive, till now. The fisheries administration accepts the presence of the aquatic and semi-aquatic birds, but for the fish-eating bird species (pelicans and cormorants), they try to find non-aggressive measures to drive away. In the perimeter of the Rădeanu ponds, there existed the intention to use this area like hunting territory, but the change of this territory's status through it including in the "Lower Meadow of Prut River" Natural Park forced the administration abandon this project. As we saw on the 13th September 2009, the hunting games are organised in the northern sector of the ponds (on the territory of Cârja I and Cârja II fisheries) and this have strong influence on the bird fauna's presence. We recorded at least six points of hunting during that day and we recorded just approximately 100 birds there, most of them Coots (*Fulica atra*) and isolated individuals of Ferruginous Duck (*Aythya nyroca*), while in the southern part of the ponds (Mața - Rădeanu), there were concentrated the mostly bird groups, including a flock about 360 individuals of Greylag Goose (*Anser anser*) and three pairs of Mute Swan (*Cygnus olor*) with juvenile birds.

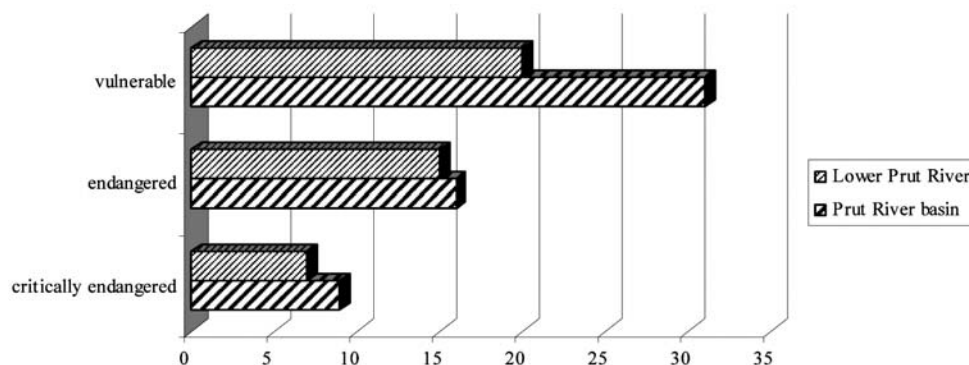


Fig. 3 - The bird species categories included in the Romanian Red Book of Vertebrates recorded in the lower part of the Prut River basin.

The reed's extraction has not a high importance in this part of the Prut River basin and the local community respecting the seasonal laws nature. But the reed's arson, especially in the spring time, can produce big damages, killing numerous animals and disturbing the breeding season of the birds that are building their nests in perimeter of the reed beds (grebes, herons, egrets, spoonbills, ibises, geese, swans, ducks, etc.).

We recorded the abandonment of some ponds in the existing fisheries that became non-productive in the present economic situation. This has a strong influence on the biodiversity in the area due the lost of wetland surfaces; for example, the Brateş fishery reduced its activity and lost more than 80% of the pond areas, abandoning or transforming its surfaces in agricultural lands. The birds, which used these ponds like breeding (terns, grebes, warblers) and feeding territories (grebes, herons, waders, gulls and terns, etc.) had disappeared from the area. We believe that these birds gone upper on the valley, on the temporary swamps between Giurgiuleşti and Vlădeşti or in the perimeter of Vlădeşti fishery ponds. At least for some species (*Chlidonias* sp.), this fact was verified in field (Cazacu, 2007).

As we saw during the last years, one problem for the bird fauna stability is the absence of the waters inside the meadow forests and in the natural swampy or marshes areas. There exist, also, interest to develop projects of ecological restoration of some lost wetlands in the lower part of the Prut River basin, inside the natural park; these can bring the solution for the biodiversity increasing and, also, for the temporary water stocking during the flooding periods.

In the last two – three years, we observed the appearance of numerous windy measuring systems in order to create wind farms in this territory. In a monitoring program done in Vaslui county, we recorded a seriously impact of the pillars with systems of wind parameter measures on the small passerines. We met birds died through the impact with the wires that are fixing the pillars in the ground. These wires are thin and grey, so, seems to be, practically, invisible for the small birds that are flying in the area. We assume that one or more wind farms in this region will represent a high risk for the bird and bat fauna in the area due high importance of the bird migration flyway along the Prut River basin (probably, for bats, too, but there are not any study on this group presence in this region).

Conclusions

The lower part of Prut River basin still preserves a high biodiversity level, the bird fauna being really rich.

At first side, the breeding bird species diversity and effectives record high values, but for the mostly species the breeding populations have a slowly negative trend in the last years.

During the migration time, this territory is sheltering not only a great bird fauna's diversity but big effectives of aquatic and semi-aquatic bird species, too.

The human pressure is still low in the Romanian sector of the lower Prut River basin, but increased in the left side.

The water level and the diminishing of the aquatic surfaces, including through the collapse of the fisheries represent the greatest impact factor for the bird fauna diversity in the area.

The wind farm development seem to be a major risk factor for the birds in the absence of one rigorous preliminary monitoring study in the future wind farms' perimeters and neighbourhoods.

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MONITORIZAREA AVIFAUNEI DIN SECTORUL ROMÂNESC AL BAZINULUI
INFERIOR AL PRUTULUI

REZUMAT

Prezentăm informații cu privire la dinamica avifaunei în sectorul românesc al bazinului inferior al Prutului pe parcursul ultimilor 18 ani. Această vale adăpostește o biodiversitate ridicată, fiind foarte bine protejată prin statutul de frontieră, dar și ca urmare a nivelului scăzut al dezvoltării industriale, în ciuda unei creșteri a presiunii umane în ultimii ani. În acest teritoriu, au fost identificate unele specii de păsări clocitoare rare și foarte rare în România - *Platalea leucorodia*, *Plegadis falcinellus*, *Limosa limosa*, *Recurvirostra avosetta*, *Himantopus himantopus*, *Luscinia svecica*, etc. dar și unele specii protejate pe plan global cum sunt *Phalacrocorax pygmeus*, *Aythya nyroca* ori *Crex crex*. În acest sector al bazinului râului Prut, au fost delimitate trei Aarii de Importanță Avifaunistică (A.I.A.), toate fiind incluse în Rețeaua "Natura 2000" din România.

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DIURNAL BIRDS OF PREY (AVES) FROM LETEA FOREST (THE DANUBE DELTA BIOSPHERE RESERVATION, ROMANIA)

VIOREL POCORA

Abstract. Letea Forest has always represented a favorable place for the nesting of preying birds. In the past 3 decades, in Letea Forest, as well as in the entire Danube Delta, the number of species of birds of prey has fallen dramatically. In the current paperwork we tried to analyze the situation of the species of diurnal birds of prey identified in Letea Forest. During the study, that took place between November 2003 until September 2009, there were 24 species of preying birds observed, from which 6 are nesting species (*Circus aeruginosus*, *Haliaeetus albicilla*, *Falco vespertinus*, *F. subbuteo*, *F. tinnunculus*, *Buteo buteo* and *Pernis apivorus*), and the rest are winter guests, passing species and species with accidental presence in the study area.

Résumé. La forêt Letea a toujours représenté un endroit favorable à la nidification des oiseaux rapaces. Au cours des trois dernières décennies, dans la forêt Letea, comme dans tout le Delta de Danube, le nombre d'espèces d'oiseaux de proie a considérablement diminué. Dans ce travail, nous avons essayé d'analyser la situation des espèces de rapaces diurnes identifiés dans la forêt Letea. Après l'étude réalisée depuis Novembre 2003 jusqu'à Septembre 2009 dans la forêt Letea ont été observées 24 espèces de proie, dont 7 sont nidificatrices (*Circus aeruginosus*, *Haliaeetus albicilla*, *Falco vespertinus*, *F. subbuteo*, *F. tinnunculus*, *Buteo buteo* et *Pernis apivorus*), les autres sont des visiteurs d'hiver, des espèces de passage et des espèces accidentelles.

Key words: Letea Forest, ornithofauna, ecology, diurnal preying species.

INTRODUCTION

The diurnal birds of prey are a very important regulator factor for the ecosystem. Being situated on one of the last layers of the trophic pyramid, they are affected by any action made on the habitat. Thus these birds can be considered ecological indicators which are offering alarming signals in case of the appearance or persistence of problems that affect the biodiversity of the respective area. In order to detect these changes we need to know the situation and evolution at local level of this group of birds.

In Romania the diurnal birds of prey were studied little, while at local level the studies were fragmented and directed to the avifauna and not particularly on this group. Though, many times, the studies made on the avifauna, in general, can't cover all the species of diurnal birds of prey, because this group needs the application of some special work methods. Our study comes in completing the data obtained until now, offering an overview on the preying birds at local level, also trying to determine the causes of the disappearance on some species from the study area.

The data presented in this paper are not definitive, but represent a starting point for the following studies on the diurnal birds of prey, at the level of Letea sand bank as well as at the entire territory of the Danube Delta. The collected data will also help at a better estimation of the birds of prey effectiveness, locally as well as at national level.

The Danube Delta (Delta Dunării, in Romanian) was a shelter for nesting for the diurnal birds of prey for the species that nested in Dobrogea. Starting with the beginning of the past century many authors have pulled alarm signals about the disastrous situation of the preying species from Dobrogea, and from all over Romania. Letea Forest, as part of the Danube Delta, represents a place with conditions for the nesting of preying birds. According to the data from specialized literature, in the past century there were 16 species of birds of prey reported as being present in Letea Forest: *Neophron percnopterus* (Kiss, 1985), *Haliaeetus albicilla* (Cătuneanu, 1973; Klemm, 1973; Kiss, 1985; Stănescu et al., 1985; Ciochia, 1992), *Pandion haliaetus* (Linția, 1954; Radu et al., 1962; Stănescu et al., 1985; Cătuneanu, 1973; Ciochia, 2001), *Circaetus gallicus* (Stănescu et al., 1985; Tâlpeanu, 1967; Ciochia, 2001), *Pernis apivorus* (Tâlpeanu, 1967; Cătuneanu, 1973; Stănescu et al., 1985; Ciochia, 1992; Cuzic, 2004), *Milvus migrans* (Stănescu et al., 1985; Petrescu, 1988), *Falco cherrug* (Klemm, 1973; Kiss, 1985; Kiss & Rékási, 1991; Ciochia, 2001), *Aquila pomarina* (Cătuneanu, 1973), *Circus cyaneus* (Stănescu et al., 1985), *Circus aeruginosus* (Cătuneanu, 1973; Stănescu et al., 1985), *Buteo buteo* (Stănescu et al., 1985), *Falco vespertinus* (Cătuneanu, 1973; Stănescu et al., 1985; Papadopol & Tâlpeanu, 1986; Patriche & Mancu, 2006), *Falco tinnunculus* (Cătuneanu, 1973; Stănescu et al., 1985; Papadopol & Tâlpeanu, 1986; Patriche & Mancu, 2006), *Falco subbuteo* (Cătuneanu, 1973; Stănescu et al., 1985), *Accipiter gentilis* (Ciochia, 2001), *Accipiter nisus* (Stănescu et al., 1985; Ciochia, 2001).

The forest has suffered a lot along the time because of the damages made by the inhabitants, as well as the armies, which had an important quarter here, during the war of Crimea, therefore, only some virgin forest patches exist. After the war, the demands of the population becoming more insistent, Hasmacul Mare was exploited on a surface of 58 ha, from the most luxuriant part of the forest. This exploitation, which still threatens to go on, was stopped in 1922, after the intervention of the Naturalists Society, thus saving in time a rest of the most beautiful portion of Hasmacul Mare (Georgescu, 1928). The forestry cultures installed after 1932 had a big influence on the stabilization of mobile sands from Letea sand bank. Without their existence C. A. Rosetti and Letea villages, as well as the agricultural terrains would be subdued to sanding (Costin, 1964).

The technology of plantation of the white poplar has evolved as follows: in 1967-1968 the white poplar was planted in intercalated rows with box-thorn and oleaster; in 1971-1972 the white poplar was planted in intercalated rows with red box-thorn, on higher levels acacia being planted, in the disposition of 2x2. In 1973 the poplar was planted in the disposition of 3x3m (1100 trees/ha), with acacia on higher areas and tatarian maple on lower areas (Filip, 1974).

All the plantations that took place in this period had a beneficial role on the birds of prey. *Haliaeetus albicilla* prefers to build its nest in top of high poplars, in the case of the individuals inside the forest. *Falco vespertinus* prefers to occupy the nests of Magpie built on red box thorn or willow trees, more rarely on poplars, for nesting. *Falco tinnunculus* prefers to occupy the nests of Crow built in poplars.

MATERIAL AND METHODS

The ornithological observations from the protected area Letea Forest, the Danube Delta Biosphere Reservation (Fig. 1), were made from November 2003 to September 2009. For carrying on this study, field trips extended up to 15 days per month were made, mainly consisting of all aspects that characterize the periodical changes of a biocenosis.

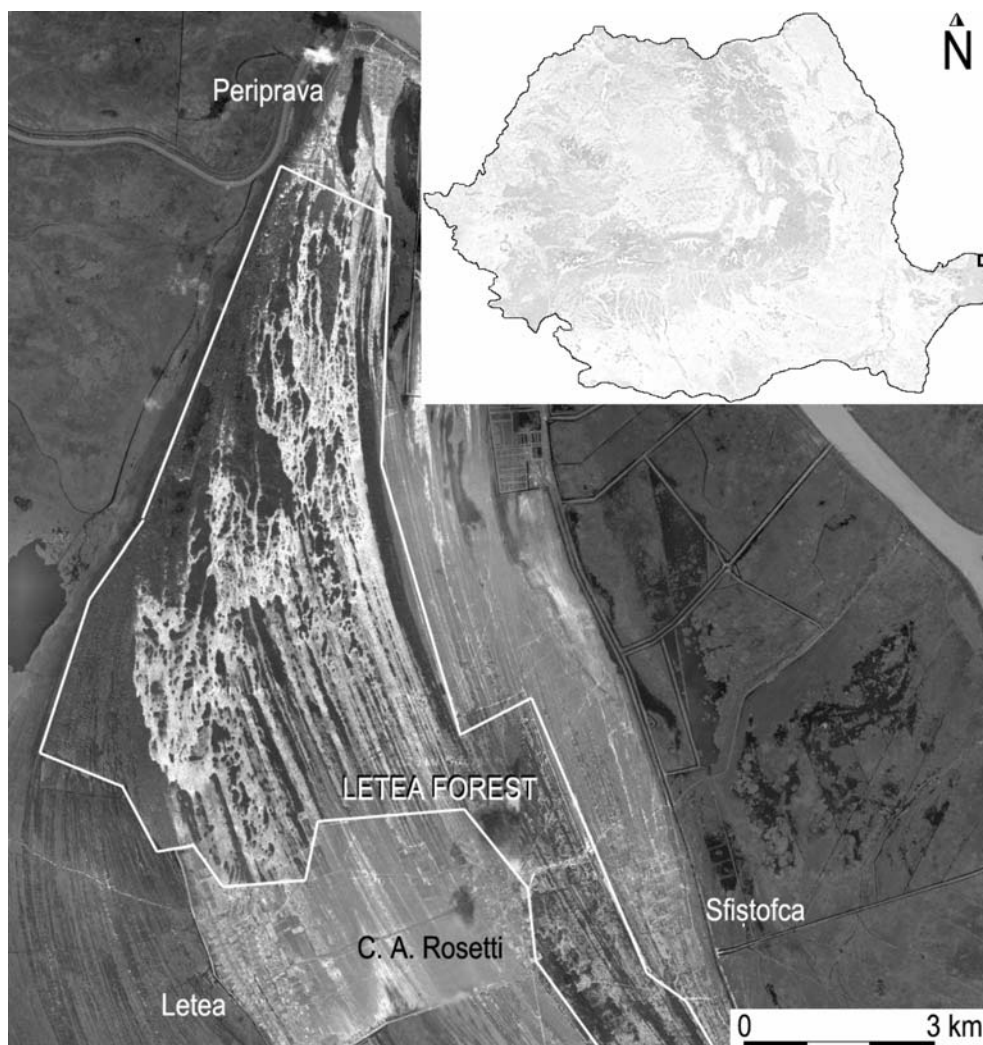


Fig. 1 - Letea sand bank, study area.

The observation methods used in doing this study were the method of transects and the method of observations from fixed point. The transects were made by crossing the forest in length from south to north. The method of transects was used to estimate the species of diurnal birds of prey which spend the winter in the study area. For carrying on this objective there were made transects monthly, during October – April. The observations from fixed point were made in the highest point from the center of the forest (“Dunele de nisip” or “Dunele lui Omer”) and the southern border of the forest in the field between Letea and C. A. Rosetti localities, for the estimation of the populations of birds in migration. The observations were made regularly, 1 week per month during 15th of August – 15th of November for the autumn migration, and the 15th of March – the 15th of May for the spring migration. For qualitative and quantitative observations we used binoculars (8x40; 10x50;

15x50) and a field glass (15-45x60). The location of the nests was set with the help of GPS Garmin Legend HCx, and later, with the help of the coordinates, the distances between nests was settled, mainly for the white-tailed eagle.

Study area (Fig. 1). On the surface of Letea sand bank, from the forestry background area of 5395.7 hectares, an area with integral protection regime was delimited – Letea with 2825 hectares. The integral protected area Letea is located on the sand bank with the same name, one of the oldest sand banks of the delta, being delimited at north by the southern limit of Nebunu Lake, at east by the communal road Periprava – C. A. Rosetti, up to 1.5 km north of C. A. Rosetti locality, at south, from the communal road Letea – C. A. Rosetti, on a straight line north – east – south west, with a distance of about 2 km and then on west, on a distance of about 2 km up to the southern limit of Hasmacul Ivancencu, at west by the western limit of forestry formations of the Letea sand bank. This area is neighbored by the tampon areas: Matita – Merhei – Letea in a surface of 22,260 hectares and the economical area Popina II, natural forests and forests planted from U.P.I. Letea located at south of C. A. Rosetti locality up to Cardon and by the area with agricultural use on the Sulina, Cherhanouiu, Şchiopu, Pocora and Mahomed sand banks, etc. Thus, the surface of forestry background Letea Forest represents 1.56% from the surface of the delta which is located on Romanian territory between the channels of the Danube (Petrescu, 1975).

The natural vegetation is formed of very different associations, starting with the ones of semi-desert, with elements of dry steppe on the top of the dunes, to the mixed deciduous forests and swamp associations. These associations vary a lot on very small surfaces, based on the relief, the level of phreatical water, the edifice conditions and micro-climate (Costin, 1964).

The forest appears under the form of stripes wide of 10-250 m, approximately oriented in north-south direction. They develop on the flatten coasts of the dunes to which they correspond in direction. Such a forest stripe in the delta is called “hasmac” in Romanian. Hasmacul Mare, located at the east of the forest, has a length of 10 Km, covering a surface of 130 ha and it is the largest hasmac. Other hasmac, smaller, are Târla Popii, Schiopul, Cruşina, Ivancencu, Grădina lui Omer and others. In the floristic specter of these hasmac we mention species of trees as: oak (*Quercus robur*, *Q. pedunculiflora*), ash (*Fraxinus angustifolia*, *F. palissae*), elm (*Ulmus foliacea*), white poplar (*Populus alba*), gray poplar (*Populus canescens*), aspen (*Populus tremula*); shrubs such as: sloe (*Prunus spinosa*), common hawthorn (*Crataegus monogina*), dog rose (*Rosa canina*), barberry (*Berberis vulgaris*), wild privet (*Ligustrum vulgare*), sea buckthorn (*Hyppophae rhamnoides*), french tamarisk (*Tamarix gallica*); hanging plants such as: wild grape (*Vitis sylvestris*), common ivy (*Hedera helix*), common hop (*Humulus lupulus*), old man’s beard (*Clematis vitalba*), and the most interesting liana with a length of 25 m (*Periploca graeca*).

An extension of the liana *Periploca graeca* is observed in the areas of high dunes, through seed (Ciocârlan, 1996).

The trees that grow in the hasmac don’t have a linear form given by the concurrence, the trunk being curved, sinuous with many calluses coming from wounds and more layers are observed:

- the first layer is located in deeper depressions formed of penduculate oak with lower raise, black alder (*Alnus glutinosa*) and sometimes willow;
- the second layer is made of ash and oak;
- the superior layer is made of poplar, which reaches 30-40 m height.

RESULTS AND DISCUSSIONS

The research periods were chosen such that they'll cover all seasons and, as much as possible the most diverse meteorological conditions. Most often during migrations, we oriented during some observation days also after some meteorological conditions (sudden cooling of the air, excessive warming, strong storms) that appear in Europe and especially in the northern or southern areas of the study area. Taking into account the seasonal variations we tried to identify in each year, practically, the optimal periods of observation, and also to follow the effects that some delays in the climatic change might have, we tried to obtain data also in the periods of minimal activity of the birds. Under these circumstances, we acted at doing some long tracks of observation, which generally included a large area along the forest. We walked the entire way and made identification using binoculars, after the sing or calling of existent species. A numerical evaluation also was made.

Using a thermometer we obtained the temperatures during the most important parts of the day (at the beginning, the middle and at the end of the track), we determined the direction and speed of the wind, we also wrote down other meteorological aspects such as the nebulosity, precipitations, etc. The tracks and obtained results allowed us to trace the most important moments of the diverse fenological aspects following, linked to this, to apply, adequate to the studied area, the method of finding of some more detailed avicenological elements.

As a results of the study made within period November 2003 to September 2009, we identified 24 species of diurnal preying birds, out of which 7 were nesting in the study area (*Haliaeetus albicilla*, *Buteo buteo*, *Pernis apivorus*, *Circus aeruginosus*, *Falco subbuteo*, *F. vespertinus*, *F. tinnunculus*), 4 species of winter guests (*Circus cyaneus*, *Buteo lagopus*, *Accipiter nisus*, *A. gentilis*), 5 species are present during migration period (*Milvus migrans*, *Falco cherrug*, *Accipiter brevipes*, *Aquila pomarina*, *Buteo vulpinus*), and 6 species are present in the study area accidentally (*Pandion haliaeetus*, *Circaetus gallicus*, *Hieraeetus pennatus*, *Buteo rufinus*, *Aquila chrysaetos*, *A. clanga*). *Falco peregrinus* and *Falco columbarius* are present sporadically in Letea Forest during winter, but don't stay too long in the study area.

Haliaeetus albicilla (Linnaeus, 1758) (white-tailed eagle)

Data about the nestling of this species in Letea Forest are provided by: Cătuneanu (1973), Stănescu et al. (1985) and Ciochia (1992). In Letea Forest the white-tailed eagle is nestling only in very high poplars, of about 25-30 m height. The nest is massive and can have a diameter of 160-240 cm, and the depth of 80-100 cm. It is kept for long periods of time and consolidated each year. Because of this the nest can reach amazing dimensions, some nests can collapse because of the weight. That was the case of nest no 5, which we found in January 2007, in the north-eastern part of Hasmacul Ivancencu. A supporting branch has torn down, and the nest has dropped away, ready to fall.

In the period 2004-2009 there were inventoried 5 nests of white-tailed eagle, from which 4 are in good condition, and one is mostly destroyed. Comparing the data from literature we noticed that the nesting areas preferred by white-tailed eagle are the same as 40 years ago (west border of the forest – Burduja Brook, Dunes of sand – Hasmacul Târla Popii), all of them being located in the western part of the forest. Besides the old locations, now there are 2 new locations as follows: Hasmacul Bercea and near Cardon village, in the hermitage area.

From the information got from the workers from Silvicultural Canton Letea, and from the natives, many of the white-tailed eagle nests present in the forest in the period 1970-1990 were destroyed by natural causes (falling of trees because of old age). The current nests are approximately built in the same areas where the old ones were. Most of the white-tailed eagle nests are built in the western part of the forest, near the lake complex Mătița – Merhei. Nest no 3 is uncommon because it's layered. The first nest is at 5 m under the top of the tree, and the second is 2 m under the first one. We've closely analyzed these 2 nests; the nest that is lower is degraded, and the material from which it's composed is old and rotten, and the one on top is in good condition. Taking this into account we're considering that the lower nest is old, and the one on top was built when the old one could not be used anymore. Looked from different points it seems to be a layered nest, but in reality it is a degraded nest under and a good one above. The distance from the nests varies from 1073 m to 10046 m (Tab. 1).

Table 1

The distance from white-tailed eagle nests from Letea Forest.

	Nest 1	Nest 2	Nest 3	Nest 4
Nest 1		2077 m	3003 m	10046 m
Nest 2	2077 m		1073 m	9042 m
Nest 3	3003 m	1073 m		8041 m
Nest 4	10046 m	9042 m	8041 m	

The brooding is formed of 2-3 eggs and is laid at the end of February – the beginning of March. We noticed that, if the birds were disturbed from the nest during the breeding period, they left the nest. Such a case took place in 2008 in nest no 1; the pair of white-tailed eagle stood in the nest during February and March, and at the end of March they left the nest and it's possible that they occupied nest no 2, which was free until that time. We believe that the birds left the nest because of the woodcutting in the nearing. In 2009 we controlled the white-tailed eagle nests at the end of March, and the nests 2, 3 and 4 were occupied by adults that were breeding. On the 25th of April 2009 we controlled the white-tailed eagle nests and found that nest no 3 was abandoned by the adults. This was caused because a poplar near the nest fell over the poplar in which the nest was built. The old nest from lower level was destroyed and only the one from above was left, that is the one that was used by adults for nestling. In the table from below we present the white-tailed eagle nests situation during 2004-2009.

Table 2

The situation of white-tailed eagle nests from Letea Forest.

No nest/ year	nest 1	nest 2	nest 3	nest 4
2004	Occupied	unused	Occupied	Occupied
2005	unused	Occupied	Occupied	unused
2006	Occupied	Occupied	Occupied	Occupied
2007	Occupied	unused	Occupied	unused
2008	unused	Occupied	Occupied	Occupied
2009	unused	Occupied	unused	Occupied

From the table 2 we can see that there are nests that are not occupied each year; an explanation could be the avoiding of parasites (Petrescu, 1988). The number of nestling in each nest was of 2, only in 2007 in nest 3 there were 3 nestling (Tab. 3). Near the nest there were 3 dead cows, and at the beginning of April we noticed how one of the adults was feeding from one of the bodies. All 3 nestling left the nest at the beginning of June. We don't have any information if the nestling survived after leaving the nest. In 2008 the pair from nest no 2 only had one nestling, probably because it began to breed later, at the middle of March. We noticed that within the study area perimeter these white-tailed eagle prefer to feed in the slop area during spring, summer, autumn and sometimes during gentle winters, when the lakes are not frozen.

Table 3

White-tailed eagle nestling situation during 2004 – 2009.

nests	Number of nestling per year					
	2004	2005	2006	2007	2008	2009
Nest 1	2	0	2	2	0	0
Nest 2	0	2	2	0	1	2
Nest 3	2	2	2	3	2	0
Nest 4	2	0	2	0	2	1

The white-tailed eagle is a predator, good hunter, it feeds mostly on aquatic birds (bald coots and herons), also attacks large bird colonies, mammals (rabbits, muskrats, etc.), and sometimes feeds on dead bodies (Petrescu, 1988). The pellets that we found near the white-tailed eagle nests are large and of irregular forms. Their length varies from 75 mm to 110.5 mm, and the height between 60.3 mm and 72 mm. We've analyzed the leftovers found near the nest and the ones from the pellets. They belonged to the species: *Fulica atra*, *Phasianus colchicus*, *Platalea leucorodia*, *Egretta* sp., *Columba* sp., *Lepus europaeus*, *Capreolus capreolus*, but we also found fish remains belonging to the species: *Cyprinus carpio*, *Stizostedion lucioperca*, *Exos lucius*. Sometimes they can feed on dead animals. In 2007, we noticed an adult from nest 3 feeding on a dead horse near the nest. They hunt fishes mostly during spring; this can be explained that during April-May the carps go to shallow waters to lay the roe, this way becoming an easy prey. The white-tailed eagle usually fishes in shallow waters, either by walking in the water, or by catching fishes from the surface with the claws from flight (Petrescu, 1988). On May 2008 we noticed a white-tailed eagle adult that was carrying a grey heron nestling. On April 2009, near nest no 3, we found the remains from 10 individuals of *Fulica atra*, one *Phasianus colchicus*, one *Columba oenas*, one *Lepus europaeus* and from one *Cyprinus carpio*.

Haliaeetus albicilla was more numerous during autumn migration period, so on 27th November 2004 we noticed 22 individuals that were moving from north to south-west, and on 2nd October 2006 we noticed 9 individuals.

We believe that the situation of the 4 nests of white-tailed eagle from Letea Forest is good, at least for the 2 nests (nests 2 and 3) from the strictly protected area. For the other 2 nests from the tampon area, the situation is a little more difficult because during the period when the birds are beginning to breed there are days in which the wood exploitation is made near the nests. Even if the qualified persons for

bird protection from the area are declaring that during the breeding period all activities are interrupted, we had the opportunity to see how trees were cut near the nests.

Circus aeruginosus (Linnaeus, 1758) (western marsh harrier)

It is a sedentary species, a breeding species during summer. Inside the forest, for breeding and hunting, it prefers the peripheral areas where there is reed, as it is in the western part near Merhei Lake, or in the north, north-eastern part near the former piscicultural basins Popina II and in Nebunu Lake area near Periprava locality. During the study period, on Letea sand bank surface, there were localized 22 nests (Tab. 4), from which 6 were situated near the forest as follows: 4 nests in the western part of the forest, near Merheiul Mic lake, and 2 nests in the north-eastern part of the forest, near the former piscicultural basins Popina II. Taking into consideration that the area covered by reed from Letea sand bank is very large, we believe that the number of nestling pairs of this species is bigger.

Buteo buteo (Linnaeus, 1758) (common buzzard)

It can be met in different types of habitat, from small forest areas to large forests, with open areas with small vegetation and even in forest areas with small glades. It can also be found in large agricultural areas, but with trees used for breeding (Hagemeijer & Blair, 1997; Forsman, 2003). In Letea, the common buzzard is breeding in trees, usually in the third superior part of them. It mostly breeds in the areas of Hasmacul Mare, Hasmacul Ivancencu and other large hasmac from inside the forest. During the study period (2004-2009), the number of breeding pairs was constant; we managed to find, each year, 3 occupied nests, only in 2009, we identified 4 nests (Tab. 4). Also 3 breeding pairs were observed during 1980 period (Petrescu, 1988).

Falco tinnunculus Linnaeus, 1758 (common kestrel)

Usually, for breeding, they occupy crow nests, but we also found them, more rarely, using magpie nests. They use the nests from the periphery of the forest, located at heights (12-15 m), which offer a good visibility. The nests can be found rather easily; especially that one of the parents is always in the adjacent area, even if the nestling is larger. In the past, the common kestrel was also using the nests from high voltage poles between the localities Sfiștofca - C. A. Rosetti – Letea (Petrescu, 1988); we haven't found any nests on high voltage poles in the present time. We noticed that the distance between the nests is big (minimum 1000 m), but it can also nestle near other species of preying birds, as *Falco vespertinus*. In the adjacent area of C. A. Rosetti locality, we noticed a nest of common kestrel located on box thorn, at 5 m away from a red-footed falcon nest. During the study period we identified 38 nests belonging to the species (Tab. 4). In 2007, we localized 6 nests, from which 4 were situated on poplars in crow nests, one was situated on box thorn in a magpie nest and one was located on box thorn in a crow nest, both at 5 m height. In 2008, we localized 8 nests; 4 were situated on poplars, in hooded crow nests, one was on box thorn in a hooded crow nest, and 3 were on box thorn in magpie nests. In 2009, we identified 11 nests; 5 nests were located on poplars, in hooded crow nests, 4 were on box thorn, in hooded crow nests, and 2 were on box thorn in magpie nests. For Letea Forest, *Falco tinnunculus* is partially migratory species, because during winter only males can be seen, these also being in a smaller number, approximately 2-5 individuals.

Table 4

The nests situation for the diurnal sedentary and partially migratory preying species from Letea Forest during 2004-2009.

Species name	2004	2005	2006	2007	2008	2009
<i>Haliaeetus albicilla</i>	3	2	4	2	3	2
<i>Circus aeruginosus</i>	2	4	3	5	4	4
<i>Buteo buteo</i>	3	3	3	3	3	4
<i>Falco tinnunculus</i>	4	5	4	6	8	11

Pernis apivorus (Linnaeus, 1758) (honey buzzard)

In the past, it was quoted in more lines as breeding species in Letea Forest (Tălpeanu, 1967; Stănescu et al., 1985; Petrescu, 1988; Ciochia, 1992). During the study we noticed that the honey buzzard was present in Letea Forest during the autumn migration period. During summer, the honey buzzard can be observed very rarely: on the 27th of June 2007, 3 young individuals that were flying above the sand dunes; on the 9th of July 2007, 2 individuals; on the 9th of May 2008, one individual and on the 11th of June 2008 one adult near Cardon hermitage. As breeding area, it prefer the level of columbidaes, rich in leaf-bearing forests, with many clearings and arid terrains, where it can easily find food (Ciochia, 1992). We haven't managed to identify any nest because this species builds them at big heights, and during incubation, as well as during the growing of the nesting, the couple is providing the camouflage of the nest with green twigs with leafs. We're mentioning that, in the present, the honey buzzard has an uncertain breeding, because we haven't identified any nests or sure information to confirm the breeding.

A big number of individuals was noticed during the autumn migration, on 4th of September 2006 a migration front of 526 individuals around 3.30 p.m., were flying at low altitudes, and on the 5th of September 2006, 160 individuals, noticed during an observation day. In 2007, between the 2nd of September and the 17th of September period, we noticed 735 individuals, the largest number being of approximately of 400 individuals on the 12th of September, and during the 10th – 12th of September 2008 we noticed 43 individuals.

Petrescu Eugen sustains that the honey buzzard is still breeding in Letea Forest, because on June 2004, he noticed an adult individual that was feeding on a bee nest near Hasmacul Hudacov (pers. com.).

Falco subbuteo Linnaeus, 1758 (hobby)

Nowadays, this species is well represented in the bird fauna of the forest. The hobby arrives in the nestling area at the end of April, beginning of May. The earliest was noticed on the 23th of April 2009, and the most belated arrival was on the 2nd of May 2007. It leaves Letea area in the first decade of October (10.X). It breeds in other bird nests (crows, magpies). Usually, it uses the nests from poplars at high altitudes (15 m), with good visibility. We identified the bird breeding in nests from low altitudes (6 m), on willow or box thorn. The nests occupied by the hobby were located at the periphery of small hasmacs or at the edge of tree groups from outside the forest. During the study, we localized 45 nests occupied by this species (Tab. 5). In 2007, we identified 14 nests which were distributed as follows: 9 nests were placed on poplars at high altitudes (above 18 m), 2 nests on ash tree, 2 nests on

willow tree and one on box thorn, at 6 m altitude, in a magpie nest. In 2008, we identified 12 nests, from which 10 were located on poplars, one on ash tree and one on willow tree, all in hooded crow nests. In 2009, we identified 15 nests, from which 9 were placed on poplars, 3 nests on ash tree, 2 nests on willow tree and one on box thorn at about 8 m height.

Falco vespertinus Linnaeus, 1766 (red-footed falcon)

In the present it's a breeding species in the area, being a summer guest. It arrives in Letea Forest in the last decade of April (20.IV) and leaves it in the second half of September (24.IX). We noticed that in Letea Forest is a gregarious species, breeding in the old colonies of crows or magpies; it mostly uses for breeding the peripheral areas of the forest, usually near the agricultural terrains and plains. It likes to breed in the area between C. A. Rosetti and Cardon, this being surrounded by large plain areas rich in food. In C. A. Rosetti – Cardon area, it breeds in a very limited area, sometimes the distance between nests being of maximum 4 m. It also breeds inside the forest, but in a smaller number, and the nests are much more isolated from one another. We localized 3 nests inside Letea village, in the agricultural terrains area near the farms; all of them were located on acacia trees. In 2007, a pair of *Falco vespertinus* tried to take hold of a nest of magpie located in the middle of Letea village, but because this happened during the 1st of May celebration, the phonic disturbance caused by tourists has driven away the birds from the nest. This falcon hunts along with *Falco tinnunculus*, without any territorial disputes being noticed.

In the study period (2004-2009), we identified 108 nests of red-footed falcon (Tab. 5). From the 21 nests found in 2007, 11 nests were made on box thorn in magpie nests, 5 nests were on box thorn in crow nests, 3 were in crow nests on poplars, one was in a crow nest on acacia tree and one was in a magpie nest on acacia tree. In 2008, from 16 identified nests 8 were located on box thorn in magpie nests, 3 were placed on box thorn in hooded crow nests and 5 were located on poplars in hooded crow nests. The height at which the nests were located varies from 2.5 m up to 12 m, but most of them were located at 5 m height, those being the ones on box thorn. In 2009, from 17 identified nests, 8 nests were located on box thorn in magpie nests, 4 were placed on box thorn in hooded crow nests, 5 were on poplars in hooded crow nests. In 2008, we noticed that the birds have changed the place of the colony. The colony was located by the road that links the localities C. A. Rosetti and Sulina. We believe that because of the large number of cars on the road in 2008, the birds preferred to leave the old breeding area and occupied the abandoned nests from the poplars inside the hasmac. In 2009, the number of cars grew up, and the birds changed the place of the colony, once again, this time taking over the nests located far away from the road.

During spring migration period, large flocks of *Falco vespertinus* were noticed, on 28th of April 2004, from 8⁰⁰ to 16⁰⁰ o'clock we noticed 440 individuals; on 5th of May 2007 we noticed a flock of 140 individuals; on 2nd of May 2008 we noticed 180 individuals at 18³⁰ o'clock, and on 5th of May 2008 we noticed 45 individuals that spend the night in the forest near the sand dunes. During the autumn migration period, on 24th of September 2009 we noticed 47 individuals, on the southern edge of the forest, near Letea locality.

Table 5

The nests situation for summer guests preying species
from Letea Forest during 2004-2009.

Species name	2004	2005	2006	2007	2008	2009
<i>Falco subbuteo</i>	8	12	11	14	12	15
<i>Falco vespertinus</i>	18	17	19	21	16	17
<i>Pernis apivorus</i>	?	?	?	1?	1?	1?

Circus cyaneus (Linnaeus, 1766) (hen harrier)

It was identified during 1979-1981 as an uncertain breeding species for Letea Forest (Stănescu et al., 1985). After our observations this species is a winter guest for Letea Forest; the migrating individuals can be observed in this area starting with the first half of October (15.X), and stay here until the last decade of March (24.III). *Circus cyaneus* can be observed while hunting, in the opened areas between hasmac, in the agricultural terrain areas near the localities, in Sărăturile Letea area and the salt areas near the formal piscicultural basins Popina II. It was noticed, most of the time, hunting at low altitudes, at 2-6 m above the ground. The number of individuals observed during the study period is presented in table 6.

Buteo lagopus (Pontoppidan, 1763) (rough-legged buzzard)

Until now the specie hasn't been quoted as being present in Letea Forest. The rough-legged buzzard arrives in the study area starting with the second half of November (20.XI), leaving the area in the last decade of March (25.III). In the last 2 years the species was observed in the area later, around the beginning of December. Thus, in 2007, the first individual observed was on the 6th of December. We consider that the late presence of this species in the study area is due to high temperatures that were recorded in the entire country at the beginning of winter. The rough-legged buzzard can be met, while hunting, in the western part of the forest, in the reed areas. We noticed the species as being present inside localities as well.

Table 6

The number of observed individuals belonging to *Circus cyaneus*
and *Buteo lagopus* species during cold period.

Observation period	Number of field work	Individuals observed of <i>Buteo lagopus</i>	Individuals observed of <i>Circus cyaneus</i>
15.11.2003 - 24.03.2004	13	6	9
15.10.2004 - 24.03.2005	14	6	15
15.10.2005 - 24.03.2006	14	5	12
15.10.2006 - 24.03.2007	27	3	15
15.10.2007 - 21.02.2008	9	4	8

Accipiter nisus (Linnaeus, 1758) (sparrowhawk)

There are data on the species that bred 20 years ago in Letea Forest (Petrescu, 1988), but in the last years it has been quoted as being a winter guest (Ciochia, 2001). In the last 4 years we identified the species as being a winter guest. Comparing to the other preying species that are winter guests, the Eurasian sparrowhawk arrives early in the area. It can be observed starting with the last decade of August (30.VIII) until the first half of March (8.III). It can be met, while

hunting, as well as inside the forest, in open areas or inside the localities near the forest. The number of individuals that spend the winter in the forest is small (Tab. 7).

Table 7

The number of individuals belonging to *Accipiter nisus* species that were observed during winter field work.

Observation period	Number of field work	Observed individuals
15.11.2003 - 8.03.2004	13	7
30.08.2004 - 8.03.2005	29	14
30.08.2005 - 8.08.2006	28	12
30.08.2006 - 8.03.2007	38	19
30.08.2007 - 21.02.2008	15	18

Accipiter gentilis (Linnaeus, 1758) (goshawk)

During 1977-1980, in Letea Forest only one breeding pair was present (Petrescu, 1988). Kiss J. B. mentions the presence of the goshawk in Letea Forest in 1996 (Ciochia, 2001). Our observations show that the goshawk is met in the study area during wintry aspect, being present in the forest from the 18th of September to the 19th of March. During the autumn passage period, a large number of individuals can be observed, and during winter a small number of individuals can be seen.

Milvus migrans (Boddaert, 1783) (black kite)

During 1973-1980 it was quite a frequent species, about 15-18 breeding pairs living in Letea Forest. The number of breeding pairs began to lower, and in 1986 there were only 2 pairs left (Petrescu, 1988; Stănescu et al., 1985). Based on our observation, we consider that it's passage species for Letea Forest, because it was observed only during migration period. We first observed the species on the 29th of May 2004 (2 individuals flying above Hasmacul Mare) and another 2 individuals on the 6th of September 2006, over Omer Dunes. In 2008, we noticed an individual of black kite on the 10th of September, around 5.30 p.m.

Falco cherrug Gray, J. E., 1834 (saker falcon)

In 1981 and 1982, in Letea Forest, there was only one breeding pair each year (Kiss, 1985). It is believed that the disappearance of this species is linked to the disappearance of the white-tailed eagle and black kite nests, which they usually occupy (Botnariuc & Tatole, 2005). At present, this species is met during passage period. We observed it for the first time on the 7th of September 2006 while migrating, above the sand dunes from inside the forest, and after, on the 23th of April 2007 at the southern edge of Hasmacul Ivancencu, an immature who was flying grazing with the top of trees.

Falco peregrinus Gmelin, 1788 (peregrine falcon)

We met this species only twice during the study period; on the 12th of December 2006 in the northern part of Hasmacul Mare, when it was following a flock of 10 individuals of *Columba palumbus*, and the second time on the 28th of November 2007, near the southern part of C. A. Rosetti locality.

Falco columbarius Linnaeus, 1758 (merlin)

For the first time, we observed this species on the 26th of January 2007, near Letea village. The bird was resting in an acacia tree; when we got closer it flew and stopped in a poplar inside a housekeep. We have observed the species once more on the 28th of November 2007, in the southern part of Hasmacul Ivancencu; it was sitting on the top of an oak tree of about 15 m height.

Aquila pomarina Brehm, C. L., 1831 (lesser spotted eagle)

The first data on the presence of this species in Letea Forest dates from 1958, when it was observed in the western part of the forest, near the colony of pelicans (Cătuneanu, 1973). At present, it was observed during passage, on the 22nd of March 2004 near Cardon locality. Other observations are from autumn migration period. Above the sand dunes, on the 18th of September 2006, there were observed 11 individuals, on the 1st of October 2006: 2 individuals, and on the 2nd of October 2006: 5 individuals; in 2007, we observed 2 individuals on the 4th of September, above Hasmacul Mare. On the 9th of May 2008 we noticed an immature which was resting in a tree near Hasmacul Hudacov, and on 11th of September 2008 we noticed 10 individuals above the forest, being in migration.

Pandion haliaetus (Linnaeus, 1758) (osprey)

The first information about the presence of this species in Letea Forest are given by Dionisie Linția, which, in May 1923 observed an individual above the forest (Linția, 1954). Radu D. observed a individual at a time in August-September 1953, in September-October 1954, in May-June 1955, finding it, together with Tălpeanu, breeding between 17-20 of June 1960 in Letea Forest (Cătuneanu, 1973). Stănescu et al., after the study made during 1979-1980, mentions the presence of the osprey as a breeding species in Letea Forest (Stănescu et al., 1985). Ciochia mentions in the paper-work *Aves Danubii, Păsările Dunării de la izvoare la vărsare*, that the species *Pandion haliaetus*, once bred in the Danube Delta, Letea Forest, but did not mention in which year, neither the source from which the information was taken (Ciochia, 2001). At present this species can be accidentally met in Letea Forest, we observed one individual on the 21st of May 2004 flying above Hasmacul Ivancencu and another individual on the 17th of April 2006 flying over Hasmacul Mare. In 2008 we observed the osprey during the autumn passage: on the 10th of September one individual, on the 11th of September one individual and on the 12th of September, 2 individuals.

Circaetus gallicus (Gmelin, 1788) (short-toed eagle)

During 1973-1986 it bred in Letea Forest (Stănescu et al., 1985; Petrescu, 1988; Ciochia, 2001). Currently the short-toed eagle can be observed on Grindul Letea only accidentally. We noticed, on the 28th of March 2004, one individual that was hovering above the sand dunes; another individual on the 5th of July 2004 was hovering above Hasmacul Ivancencu, and another individual, on the 14th of August 2006 that was flying above the acacia plantation from Cardon.

Buteo rufinus (Cretzschmar, 1829) (long-legged buzzard)

We have observed this species for the first time on the 26th of May 2004, on the plain between the localities Letea and C. A. Rosetti; 2 young individuals were feeding on the field. We've got closer to them for several times, but it didn't seem to

disturb them, when we've got closer for more than 30-40 m they were flying 100-200 m after which they placed on ground again. We've observed them in the morning at about 8.30 a.m., and in the evening around 6.00 p.m. they were in about the same place. On the 23rd of September 2009 we noticed an individual flying on the southern part of Hasmacul Ivancencu.

Buteo buteo vulpinus Gloger, 1833

We noticed the species for the first time during autumn migration period. It flies solitary, rarely forms flocks (maximum 5 individuals). First observation took place on the 17th of September 2007, 2 individuals passed through at a difference of 2 hours; on the 9th of September 2007 3 individuals passed in 7 hours, and on the 12th of October 2007 we observed 4 individuals that passed above Hasmacul Mare.

Aquila chrysaetos (Linnaeus, 1758) (golden eagle)

We noticed, on the 22nd of February 2008, one immature in second year that was hovering above Hasmacul Mare. After 2 hours the same individual was observed also above Hasmacul Mare, but more in the north, near Periprava locality, hovering above the forest, after which he was flying slowly to the north.

Aquila clanga Pallas, 1811 (greater spotted eagle)

We identified 2 adult individuals, on the 20th of February 2008, that were hovering above the former piscicultural area Popina II.

Hieraaetus pennatus (Gmelin, 1788) (booted eagle)

We observed only the species one time, on the 15th of May 2008, one adult individual, opened phase, in flight, near the sand dunes.

Accipiter brevipes (Severtzov, 1850) (levant sparrowhawk)

It is present during migration, usually in the first half of September. We observed one individual on the 3rd of September 2006, 2 individuals on the 7th of September 2007 and one individual on the 19th of September 2007. In 2008, the bird was observed during migration on the 8th of September (one individual), other 4 individuals on 9.IX and one individual on the 11th of September.

Conclusions

After the study did in Letea Forest, we identified 24 diurnal birds of prey. From the 24 species, 7 are breeding in the study area (*Haliaeetus albicilla*, *Buteo buteo*, *Pernis apivorus*, *Circus aeruginosus*, *Falco subbuteo*, *F. vespertinus*, *F. tinnunculus*), 4 are winter guests (*Circus cyaneus*, *Buteo lagopus*, *Accipiter nisus*, *A. gentilis*), 5 are present during migration (*Milvus migrans*, *Falco cherrug*, *Accipiter brevipes*, *Aquila pomarina*, *Buteo vulpinus*) and 6 species are accidentally present in the study area (*Pandion haliaetus*, *Circaetus gallicus*, *Hieraaetus pennatus*, *Buteo rufinus*, *Aquila chrysaetos*, *A. clanga*). *Falco peregrinus* and *Falco columbarius* are sporadically present in Letea Forest, during winter, but they don't station for a long time in the study area.

According to the data from the specialized literature, during 1960 – 1985, in Letea Forest the number of breeding birds of prey species was of 14 (*Haliaeetus albicilla*, *Pandion haliaetus*, *Circaetus gallicus*, *Pernis apivorus*, *Milvus migrans*, *Buteo buteo*, *Circus aeruginosus*, *C. cyaneus*, *Accipiter gentilis*, *A. nisus*, *Falco*

cherrug, *F. subbuteo*, *F. vespertinus*, *F. tinnunculus*), the present days we only identified 7 species (*Haliaeetus albicilla*, *Buteo buteo*, *Pernis apivorus*, *Circus aeruginosus*, *Falco subbuteo*, *F. vespertinus*, *F. tinnunculus*).

We consider that a deeper involvement is necessary, of local authorities in applying protection norms for the birds of prey from Letea sand bank.

The number of nests of white-tailed eagle has remained unchanged in the last 3 decades, but if no steps will be taken to stop uncontrolled tourism with auto vehicles inside the strict protected areas, we could assist at the abandonment of the nests by the white-tailed eagle.

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PĂSĂRILE RĂPITOARE DE ZI DIN PĂDUREA LETEA (REZERVAȚIA BIOSFEREI DELTA DUNĂRII, ROMÂNIA)

REZUMAT

Pădurea Letea a reprezentat întotdeauna un loc propice pentru cuibăritul păsărilor răpitoare. În ultimele trei decenii, în Pădurea Letea, la fel ca în toată Delta Dunării, numărul speciilor de păsări răpitoare a scăzut considerabil. În lucrarea de față am încercat să analizăm situația speciilor de răpitoare de zi identificate în Pădurea Letea. În urma studiului, realizat în perioada noiembrie 2003 până în septembrie 2009, în Pădurea Letea au fost monitorizate 24 specii de răpitoare dintre care 7 sunt cuibăritoare (*Circus aeruginosus*, *Haliaeetus albicilla*, *Falco vespertinus*, *F. subbuteo*, *F. tinnunculus*, *Buteo buteo* și *Pernis apivorus*), restul sunt oaspeți de iarnă, specii de pasaj și specii cu apariție accidentală în zona de studiu.

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PHENOLOGY AND BIOMETRICS OF MOUSTACHED WARBLER *ACROCEPHALUS MELANOPOGON* (PASSERIFORMES: SYLVIIDAE) IN ROMANIA

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MIRCEA GOGU-BOGDAN, COSTICĂ ADAM

Abstract. A complete list of all records on the Moustached Warbler (*Acrocephalus melanopogon*) available in Romania was compiled from literature and completed with new records based on field studies, examination of museum collections and data gathered from ringing campaigns of Romanian Ornithological Ringing Centre during 1990 – 2010. The record review is complemented by distribution map. Biometric data of caught specimens are presented and supplemented by data from the literature of other specimens from Romania.

Résumé. On présente une révision des données de phénologie et de distribution de la Lusciniole à moustaches (*Acrocephalus melanopogon*) en Roumanie, y compris les données de la littérature, auxquelles nous avons ajouté nos propres observations, les données obtenues en examinant les collection des musées, ainsi que les données provenant des campagnes de baguage de la Centrale Ornithologique Roumaine; entre les années 1990 et 2010. La révision de ces signalements est illustrée par un carte de distribution. On présente aussi les données biométriques des exemplaires capturés ainsi que celles indiquées dans la littérature pour les exemplaires provenant de Roumanie.

Key words: Moustached Warbler, *Acrocephalus melanopogon*, distribution, Palaearctic Region, the Danube Delta, Romania.

INTRODUCTION

The nominated race of Moustached Warbler, *Acrocephalus melanopogon melanopogon* (Temminck, 1823) is spread across southern Europe, eastern Ukraine, western Turkey and northwestern Africa (Pearson, 2006) and is a sedentary or partially migratory to migratory birds, from north of the breeding range moving south to winter (Cramp, 1992). A revision of the status of population through Europe was made by Leisler (1973). The wintering sites are chiefly in coastal areas (especially estuaries) and islands in the Mediterranean region. According to Cramp (1992), the populations in southern France, Catalonia, Mallorca, and northwestern Italy are mostly sedentary or partial migrants to east, while the populations in inland areas such as Austria and northern Balkans winter in very small numbers in eastern Sicily. Most of them winter on coasts of northern and central Italy, former Yugoslavia, and northern and central Greece. The northern limit roughly follows the 4°C January isotherm, thus the winter range lying within permanently frost-free areas. In Romania the Moustached Warbler is reported as a summer visitor and breeding species in large effective by some authors, aspect that will be commented further.

MATERIAL AND METHOD

Ringing campaigns of migrant birds were developed in the Danube Delta and Razelm-Sinoe Lagoon Complex between 2004 and 2010, and from a total of 22,500

ringed passerines, 110 were Moustached Warbler. All caught specimens were measured and weighed. The biometric measurements were taken following the recommendations of Svenson (2006), as follows: the length of the flattened wing, the R3 length; the tarsus length from the notch on the back of the intertarsal joint to the toes joint; the bill length measured to the feather margin (F); the roundness of the tail considered as the difference between the tip of longest (median) and the tip of shortest (external) tail-feathers while the tail is closed; all caught specimens were weighed using a Pessola microline scale. Regarding the interpretation of distribution maps from atlases of breeding birds in Romania we have used the coding system provided by Lehrer & Lehrer (1990).

RESULTS AND DISCUSSIONS

Moustached Warbler (Figs 2, 3) is a rare species in Romanian bird fauna, dates on its distribution being scarce, resumed especially to Banat and the Danube Delta, with some mentions from Transylvania (see *Records*). Linking all records from literature with phenological data, supplemented by our data gathered from the Romanian Ornithological Centre ringing campaigns, it shows a discontinuous areal, and certainly the east part of the country overlapping on a migration corridor, which seems to follow the Black Sea coasts. The winter records from Satchinez Reserve (Timiş county), as mentioned by Leisler (1973) and Cramp (1992) are only wrong interpretations the information from Nadra (1962). Linția (1946) notes that the species has also been collected in 1835 in Banat near the Bega Channel by Neumann and Petenyi, and mentions it as a pretty common species in Banat, even though the configuration of the ponds had suffered a lot of changes (o.n. compared to 1835) around the areas where there were standing and flowing waters, surrounded by reed, rush and small bushes. On the Black Sea shore north of the Danube Delta in Ukraine, only one specimen has been ringed in 1989, comparing with 62 specimens ringed in Romanian part of the Black Sea shore at Histria from 1990 to 1994, Scegolev & Marinov (1997).

RECORDS

Original records: - Letea (Danube Delta, Tulcea county) 1 specimen ringed in 22.IX.2009; 42 specimens (15 adults and 27 juveniles) ringed between 18-23.IX.2010; - Sfântu Gheorghe (Danube Delta, Tulcea county) 1 adult female catch on 27.V.1979 by Maria Paspaleva (unpublished informations); 23 specimens (one adult and 22 juveniles) ringed between 19.VII-12.X.2008 (Romanian Ornithological Centre database); - Sahalin Island (Danube Delta, Tulcea county) one juvenile ringed in 10.VIII.2008 (Romanian Ornithological Centre database); - Grindul Lupilor (Razelm-Sione Lagoon Complex) 2 adults caught/only 1 ringed in 20.VII.1980 by Maria Paspaleva (unpublished informations); 42 specimens (38 adults and four juveniles) ringed between 13.IX-29.X.2004 (Romanian Ornithological Centre database).

Published records: - Sărmaşu, Cluj region (Schenk, 1917, in Leisler, 1973), 1 spec./03.VII.1910, Salmen, 1982); - Satchinez (Timiş county) 1 adult ♂ inv. no. 434 in collection of The Banat Museum Timişoara, collected by Linția D., in 23.III.1936, (Linția, 1944; Nadra, 1972; Kiss, 2005), breeding, present between III-IX, (Rasajski & Kiss, 2004); observed in VI, VII, IX (Kiss, 1999); - Bega Channel (Timişoara?, Banat region), where the species was collected in 1835 by Neumann and Petenyi, information taken by Linția (1946) from Frivalddszky, 1891, with the mention that it is a pretty common species in Banat although the configuration of

ponds has changed (o.n. from 1835) wherever there are standing or flowing waters; surrounded by reeds, reed, rush and bushes; - Valea lui Mihai (Bihar county) 8 clutches totalizing 40 eggs of *Acrocephalus melanopogon*, collected between 1932-1937, in Ladyslau Dobay collection from Criş-Rivers Region Museum from Oradea, with inventory numbers as follows: 1/4, 16.05.1932 (inv. no. 1134); 1/4 14.05.1933 (inv. no. 3702); 1/4, 16.05.1933 (inv. no. 3703); 1/6, 10.05.1934 (inv. no. 1143); 1/5, 10.05.1934 (inv. no. 1144); 1/4, 23.05.1934 (inv. no. 2626); 1/5, 17.05.1936 (inv. no. 1145); 1/4, 11.06.1937 (inv. no. 1133), (Beczy, 1971, 1975); - Ciumbud (Alba county) 1 adult ♂ collected in 15.VII.1887, in Aiud Museum of Natural Sciencies, (Lorincz, 1980 in Klemm & Kohl, 1988); - Zăul de Câmpie (Mureş county) in 27.08.1930 (Keve, 1973); - Iernut (Mureş county) 1 specimen observed in 25.VI.1979, (Klemm & Kohl, 1988); - Sulina (Danube Delta, Tulcea county) 1 adult ♂ inv. no. 5176 in "Grigore Antipa" National Museum of Natural History (GANMNH), collected by Maria Paspaleva in 06.VIII.1975, (Papadopol & Tâlpeanu, 1987), 3 specimens ringed 2 km South of Sulina in VIII.1975, (Paspaleva & Tâlpeanu 1980); - Gârla Împuţita (Danube Delta, Tulcea county) 8.5 km south of Sulina, 1 adult specimen ringed in 08.X.1976, (Paspaleva & Tâlpeanu, 1980); - Sahalin Island (Danube Delta, Tulcea county) 1 spec. in VIII.1977, (Paspaleva & Tâlpeanu, 1980); - Histria (Constanţa county), 17 specimens ringed in VIII-IX.1991, (Weber, 1991; Laiu, 1992), 22 specimens ringed in 4-24.IX.1993, (Weber, 1993), 8 specimens ringed in 22.VIII-09.IX.1994, (Weber, 1995); - Nuntaşi Lake (Histria) 3 specimens in 23-27.VIII.1992, (Just & Weber, 1992); - Maliuc, Furtuna Lake (Danube Delta, Tulcea county) 2 juveniles captured between 22-28.VIII.2001, (Ion & Ion, 2002); - Nufăru (Danube Delta, Tulcea county) 1 specimen observed in 19.V.1974, (Vaucher, 1975); - Grindul Lupilor (Razelm-Sinoe Lagoon Complex, Tulcea county) 8 specimens ringed between 2004 - 2006 as follows: 1 spec./2004; 4 specs/2005; 3 specs/2006, (Kalocsa et al., 2007);

Possible records: - Dobrogea *sensu lato*, mentioned by Alleon (1886), under the name "*Cettia melanopogon* Z. Gerbe" with the mention that "it is less abundant and hardly observed" - probably the first record of Moustached Warbler in Romania; - Danube Delta *sensu lato*, Dombrowski, 1912; Radu, 1974, 1979 as nesting species; Paspaleva & Tâlpeanu (1980) as nesting species; "locally breeding in red-beds", Munteanu (2006); - Aiud (Kovats & Lorincz, 1992) probably doubtful identification; - Maramureş and Crişana regions *sensu lato*, Leisler (1973), doubtful as cited by Linţia (1946), with no mentions from the quoted author.

Records from Romanian Ornithological Centre Ringing campaigns:

Within the period 1940-1970, Romanian Ornithological Centre has reported a single ringed specimen, Cătuneanu (1999). For the situation of ringed Moustached Warbler between 1990 and 2004 see records.

Data gathered during ringing campaigns developed between 2004 and 2010 in the Danube Delta shows that out of more than 22,500 ringed passerines, *Acrocephalus melanopogon* was present in a very small number (110 specimens) which means less than 0.5%, one more argument that the Moustached Warbler is a rarity even in the Danube Delta. Detailed accounts of the capture of Moustached Warbler during these campaigns are as follows: Grindul Lupilor, between 07.IX-01.XI.2004, 10,527 passerines were ringed, including 43 M.W. caught from 13.IX to 29.X (0.4% of total ringed passerines); Sfântu Gheorghe, between 07.IX-01.XI.2007, 7,284 passerines ringed and no specimen of M.W.; Sfântu Gheorghe, between 19.VII-26.X.2008, 4497 passerines ringed including 23 M.W. caught from 19.VII to 12.X (0.51% of total ringed passerines); Sahalin Island, between 25.VII-01.VIII.2008, 495 passerines were

In Romania the Moustached Warbler appear as a regular migrant during spring from the end of March to the beginning of May, and in autumn from September to October, Dombrowski (1912). Based on data gathered from 1976 to 1981 Ciochia (1992) considers it as breeding species in the Danube Delta (U.T.M. quadrants PL.4; QL.2; PK.3; QK.1) and “possibly breeding” in PL.2 and ER.1 in the west of the country. In the Provisory Atlas of Romanian Breeding Birds (Weber et al., 1994), the Moustached Warbler is mentioned as “probably breeding” in 9 U.T.M. quadrants (PK.1; PK.2; PK.3; QK.1; PL.4; QL.3; ET.3; ES.2; ER.1) with an effective between 10,000 and 20,000 breeding pairs.

Regarding the distribution of the Moustached Warbler south of Danube, in Bulgaria it is dispersed in single localities mainly along the Black Sea coast and the River Danube, with confirmed breeding only at Durankulak Lake (o.n. Bulgarian Dobrogea) in 2002 “probably single pairs, up to not more than five pairs at Durankulak Lake”, and with observations during the breeding period along the Danube River at Srebarna Lake, Ilieva et al. (2007). The breeding population in Serbian Banat is estimated at 50 – 100 breeding pairs, Rasajski & Kiss (2004).

Phenology of Moustached Warbler in Romania based on all records.

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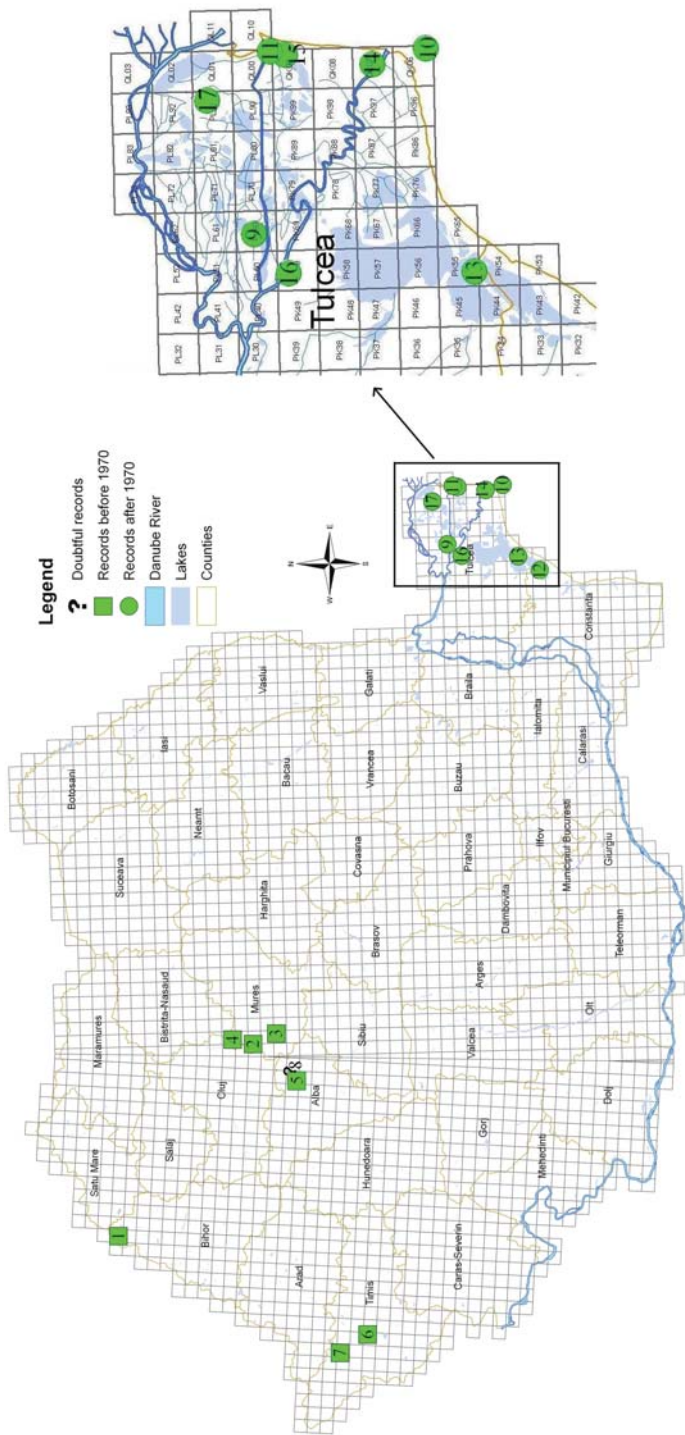


Fig. 1 - The distribution map of *Acrocephalus melanopogon* in Romania (U.T.M. quadrants 10x10km). 1-7, Records before 1970 as follows: 1 - Valea lui Mihai (Bihor county); 2 - Zăul de Câmpie (Mureș county); 3 - Iernut (Mureș county); 4 - Sârmașu (Cluj county); 5 - Ciurbrud (Alba county); 6 - Bega Chanel (Timișoara?, Timiș county); 7 - Satchinez (Timiș county); 8 - Aiud (Alba county), doubtful record; 9-16, Records after 1970 as follows: Danube Delta (Tulcea county): 9 - Maliuc, Furtuna Lake; 10 - Sahalin Island; 11 - Sulina; 12 - Histria; 13 - Grindul Lupilor; 14 - Sfântu Gheorghe; 15 - Gârla Împușita; 16 - Nufăru; 17 - Letea.

BIOMETRICS

Measurements value of available museum specimens, and other recorded specimens from Romanian Ornithological Centre database are presented in table 3. Also, a short analyze of biometric measurements (mean \pm Standard Deviation) of Moustached Warbler ringed from 2004 to 2010 are presented in table 2. The obtained values do not show significant differences between analyzed specimens and values from literature, Cramp (1992) and Svenson (2006).

Table 2

Biometrics measurements (average \pm SD) of live caught specimens of *Acrocephalus melanopogon* in Romania from 2004 to 2010.

	Wing length (mm)	R3 length (mm)	Tarsus (mm)	Bill (mm)	Body weight (g)	Rounded of Tail
Unsexed adults	57.428 \pm 2.052	41.847 \pm 2.564	21.093 \pm 0.734	11.135 \pm 0.507	10.828 \pm 0.805	10.54 \pm 1.479
Variation interval	51 - 61	37 - 46	20.2 - 23.1	10.33 - 12.3	9.5 - 13.4	9 - 12.2
Sample number	(56)	(23)	(15)	(15)	(60)	(5)
Juveniles	55.31 \pm 2.037	41.131 \pm 3.56	20.823 \pm 0.973	10.961 \pm 0.533	10.246 \pm 0.857	9.885 \pm 0.992
Variation interval	52 - 60	33 - 49	19.1 - 22.5	9.7 - 12.2	8.5 - 13.5	7.9 - 11.4
Sample number	(29)	(45)	(26)	(26)	(43)	(14)
Total (ad. + juv.)	56.639 \pm 2.319	41.248 \pm 3.283	20.861 \pm 0.964	11.019 \pm 0.519	10.583 \pm 0.878	10.057 \pm 1.133
Variation interval	51-61	33-49	18.4-23.1	9.7-12.3	8.5-13.1	7.9-12.2
Sample number	(83)	(66)	(42)	(42)	(98)	(19)

Table 3

Biometrics measurements of previous recorded specimens of *Acrocephalus melanopogon* from Romania.

Age & sex	Collecting place & date	Total length (mm)	Wing length (mm)	Tail length (mm)	Tarsus (mm)	Bill (mm)	R3 length (mm)	Reference
Ad ♂	Danube Delta	-	56	48	21	10	-	Dombrowski (1912)
Ad ♂	Danube Delta	130	59	47	20	11	-	Dombrowski (1912)
Ad ♂	Danube Delta	-	56	47	20	10	-	Dombrowski (1912)
Ad ♀	Danube Delta	-	56.5	48	21	10	-	Dombrowski (1912)
Juv	Danube Delta	128	56	47	20	10	-	Dombrowski (1912)
Juv	Danube Delta	127	55.5	46	21	9.7	-	Dombrowski (1912)
Juv	Danube Delta	-	56	47	20	9.7	-	Dombrowski (1912)
Ad	Razelm-Sinoe Lagoon Complex/ 20.VII.1980	-	55	41	21	-	-	M. Paspaleva (unpublished info.)
Ad	Razelm-Sinoe Lagoon Complex/ 20.VII.1980	-	58	50	20	-	-	M. Paspaleva (unpublished info.)
Ad ♀	Sfântu Gheorghe - Danube Delta/ 27.V.1979	-	57	47	20	-	-	M. Paspaleva (unpublished info.)
Ad	Gârla Impuțita - Danube Delta/ 08.X.1976	-	58	50	21	-	-	M. Paspaleva (unpublished info.)
Juv	Sulina - Danube Delta/ 06.VIII.1975	-	55	44	20	-	-	M. Paspaleva (unpublished info.)
-	Sulina - Danube Delta/ 06.VIII.1975	-	56	52	20	-	-	M. Paspaleva (unpublished info.)
Ad ♂	Sulina - Danube Delta/ 06.VIII.1975	130	60	53	21.7	10.85	42	GANMNH collection (inv. no.: 5176)

After analyzing all this data it is easy to observe that concrete breeding records in Romania are very scarce, based only on few clutches collected in the first half of the 20th Century in Transylvania (see breeding records).

For the Danube Delta, the only certain proof of breeding is the catching of an adult female with advanced incubation patch at Sfântu Gheorghe, by Maria Paspaleva in 27.V.1979 (unpublished information). The other “breeding mentions” for the Danube Delta can be considered doubtful as they are not based on materials or concrete mentions. This absence of breeding data for such a long period of time shows that most probably the Moustached Warbler was an occasional or accidental breeding species in Romania, probably in small number of pairs and for short periods of time. We do not totally exclude the possibility that it could breed in small numbers in the Danube Delta, but for sure the effectives from the literature are overestimated. The data accumulated so far in the last years show that it is a regular migrant at least in the autumn passage over the Danube Delta and Razelm-Sinoe Lagoon Complex.



Fig. 2 - A ringed specimen of *Acrocephalus melanopogon* (Letea, the Danube Delta, September 2010). (Photo: V. Pocora)

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Fig. 3 - *Acrocephalus melanopogon* caught at Letea, the Danube Delta, in September 2010. (Photo: V. Pocora)

FENOLOGIA ȘI BIOMETRIA PRIVIGHETORII DE BALTĂ *ACROCEPHALUS MELANOPOGON* (PASSERIFORMES: SYLVIIDAE) ÎN ROMÂNIA

REZUMAT

Este prezentată o revizie a datelor de fenologie și distribuție ale privighetorii de baltă (*Acrocephalus melanopogon*) în România, incluzând datele publicate în literatură, la care am adăugat observațiile proprii, datele obținute din examinarea colecțiilor din muzee și datele provenite din campaniile de inelare ale Centralei Ornitologice Române între 1990 și 2010. Revizia acestor semnalări este ilustrată pe o hartă de distribuție. Sunt prezentate de asemenea datele biometrice ale exemplarelor capturate și datele biometrice din literatură ale exemplarelor provenind din România.

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ȘURA MARE CAVE (ROMANIA), THE MOST IMPORTANT KNOWN HIBERNATING ROOST FOR *PIPISTRELLUS PYGMAEUS* LEACH, 1825 (CHIROPTERA: VESPERTILIONIDAE)

DUMITRU MURARIU, VICTOR GHEORGHIU

Abstract. The Sura Mare cave from Romania is one of the largest roost for hibernating colonies of bats with more than 40,000 individuals. *Pipistrellus pipistrellus* and *P. pygmaeus* are prevalent species with more than 34,000 individuals in mixed colonies. Other 6 bat species are less represented (e.g. *Rhinolophus ferrumequinum* only 500 individuals) but *Miniopterus schreibersii*'s colony counts 3,500 individuals. From the total of 8 identified bat species, 5 are a priority according to the European Union legislation: *Rhinolophus ferrumequinum*, *Myotis myotis*, *M. oxygnathus*, *Barbastella barbastellus* and *Miniopterus schreibersii*.

Résumé. On a investigué, du point de vue chiroptérologique, seulement les premiers 850 m, en partant de l'entrée principale, de la Grotte Șura Mare, longue de 11.123 m. Les auteurs font une analogie avec la grotte Huda lui Papară, car elles se ressemblent par l'hauteur et la largeur du portal, mais aussi parce qu'elles abritent plus de 76.000 chauve-souris (cf. Coroiu et coll., 2006), avec la mention que cette dernière a été investiguée sur toute sa longueur. Dans la Grotte Șura Mare, *Pipistrellus pipistrellus* est l'espèce dominante (avec environ 30.600 individus), tandis que *P. pygmaeus* a été estimé à environ 3.400 individus. La seconde espèce de cet abri (avec 3.500 individus) a été *Miniopterus schreibersii*, qui a connu un déclin drastique de sa population au cours des dernières 50 années et mérite l'inclusion dans le programme national de monitoring. D'autres espèces prioritaires (conformément à la législation européenne) sont: *Rhinolopus ferrumequinum*, *Myotis myotis*, *M. oxygnathus*, *Barbastella barbastellus*. Pour cette raison, les auteurs proposent que la Grotte Șura Mare soit déclarée aire protégée.

Key words: bat hibernation colony, important roost in Europe, *Pipistrellus pygmaeus*.

INTRODUCTION

Geographic localization and genesis: The Șura Mare cave is situated at about 1 km North-East from the last houses in Ohaba Ponor village, locality Pui, Hunedoara County. It is disposed on the southern slope of Fruntea Mare Hill in southern part of the Sebeș Mountains, at 460 m a.s.l. The U.T.M code is FR 64 and geographic coordinates are: 23°5'43"E and 45°34'15"N. This cave was mentioned by Bleahu et al. (1976).

After Mitrofan et al. (1985), the Șura Mare Cave is in the plate of the Tithonic limestone overlapped on the Sebeș crystalline mountains since the lower Pleistocen. The difference of level between the edge of contact of crystalline with limestone from the collecting basin of surface waters is Strei Valley at a level difference of 500 m (waters spring at the entrance of Șura Mare cave). In the area there is a strong process of water erosion, especially in the places and existing diaclasses from limestone deposits. The result was an intense process of karstification, resulting numerous sinkholes and many active caves (Orghidan et al., 1984).

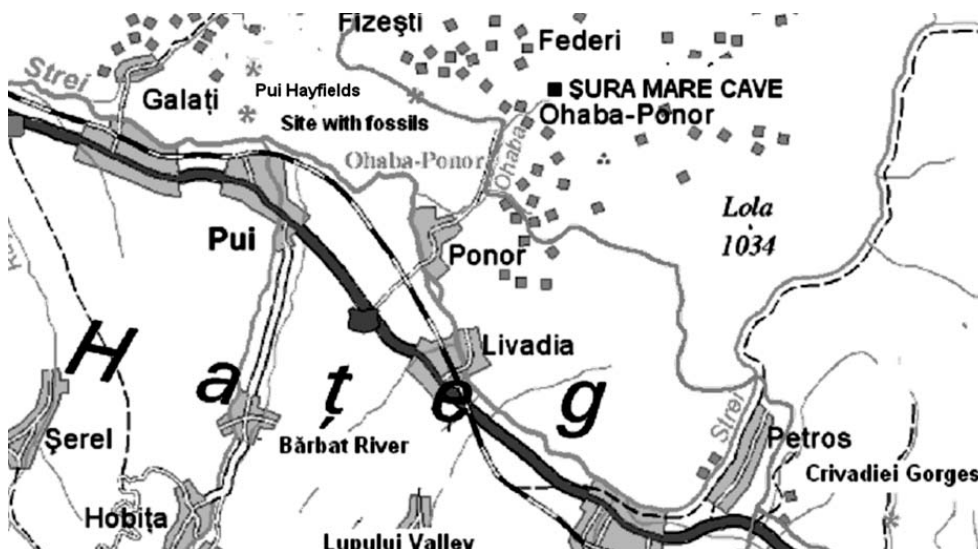


Fig. 1 - Geographic location of Șura Mare Cave (black square) in Grădiștea de Munte – Ciclovina Natural Park.

Short history:

First investigations in the cave were made in 1929 by two local people (Schalder and Toma Enciu). After Ponta (1989) these people entered 600 m in the cave. Starting with 1931, the geologist I. Gherman entered with a boat and investigated 700 m from the entrance and published a detailed description of the cave (Gherman, 1934; Ponta, 1989, with a correction of the first descriptions). An attempt of Orghidan and Codreanu (1950) was interrupted by large blocks of stones collapsed from the cave's ceiling. Starting with 1954, Dumitrescu, Orghidan and Tanasachi explored and mapped the first km of the cave (Orghidan et al., 1984). That programme was initiated by the Romanian Geological Institute in order to identify the deposits of guano.

Investigations continued with observations on bat colonies (Dumitrescu et al., 1962 – 1963; Dumitrescu et al., 1963). In 1964, Orghidan, Botoșăneanu and Dumitrescu investigated over 2 km of the cave length. They coloured (with fluorescein) the main points of the drainage from cave in the underground river and established main sources and the reservoir. These results were published by Dumitrescu et al. (1967). One Romanian and two Romanian-English expeditions were organized in 1967 – 1969, visiting 4.5 km up to one not passing siphon/chimney very close to Large Falls. During the next 30 years, some amateur speleologists established a total length of 11,123 m, with 425 m positive difference of level.

Summary description:

Șura Mare is a large and active cave with a main gallery of 30 m high and 2 – 3 m wide and an irregular ceiling. The entrance is very large (37/13 m), oriented towards South. The main gallery is oriented to North-East and is interrupted by several large halls, the terminal one being the largest. The first hall, situated at 120 m from the entrance, is of 45/35 m and 30 m high. The underground river receives

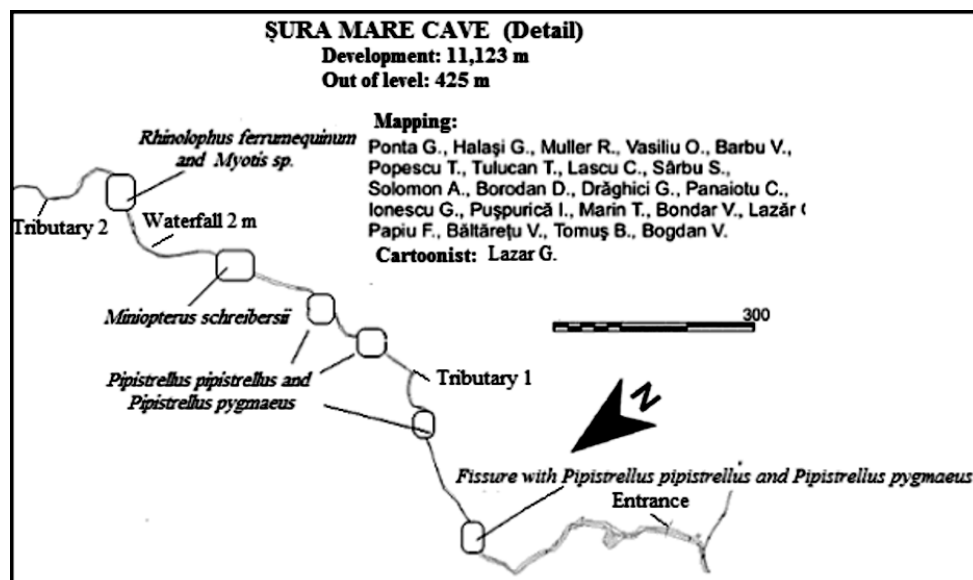


Fig. 2 - The sector with chiropteran colonies situated in the first 850 m from the entrance in Şura Mare Cave, total length being of 11,123 m.

seven tributaries originating in the Ponor Valley's waters which disappear at the Blind lane of Ponor. The first tributary rises from Dosul Lăcşorului pit and the second, from Ponor Leorda Cave (Ponta, 1989). The third tributary forms a gallery with two floors continued with Mendip Hall where there are the largest and nicest calcites and basins from Romania. Marin (2000) reported a new exploration of the cave.

Climate:

Şura Mare is a warm cave with a great thermal reserve, very wet and has a fan produced by the underground river. Temperature (during the visit period) was 1.7-26°C outside; 1.7-26°C at the entrance; 2.1-13.6°C in the air; 6.2-7.2°C in water; 6.4-10.5°C close to walls (very deep).

METHODS

The authors investigated Şura Mare Cave at: 13 August 2002, 1 December 2002, 5 March 2003, 19 June 2003.

Estimation of the bat number.

The following two methods were used:

- the division of the bats which form compact colonies, into three categories: 1 - large sized bats (e.g. *Myotis myotis/oxygnathus*); 2 - medium sized bats (e.g. *Miniopterus schreibersii*); 3 - small sized bats (*Pipistrellus pipistrellus*/*P. pygmaeus*). For each of the three categories, we deduced the following: 1. The number of the large sized bats which are included in a 20/20 sq cm is of 30-32 individuals; it results that the number of the individuals present in a 1 sq m colony is of about 750-800 individuals; 2. The number of the medium sized bats included in a

15/15 sq cm is of about 45-48 individuals; it results that the approximate number of individuals present in a 1 sq m colony is of about 2000-2100 individuals; 3. The number of the small sized bats included in a 10/10 sq cm is of about 30-34 individuals; it results that the number of individuals present in 1 sq m colony is of about 3000-3400 individuals. After the estimation of the colony surface and the species identification which belong to the respective population, we made the estimation of the number of individuals. This method was also used for the estimation of the bat populations uniformly spread (*Rhinolophus ferrumequinum*) and after we counted the bats from a square, we extrapolated the results to the entire occupied surface.

RESULTS AND DISCUSSIONS

Bats localization: Observations were made in the Main Hall at 1400 m distance from the entrance. The large hibernating bat colonies included *Pipistrellus pipistrellus* and *P. pygmaeus* (as dominant species), *Miniopterus schreibersii*, *Nyctalus noctula*, *Barbastella barbastellus*, *Myotis myotis/oxygnathus*, *Rhinolophus ferrumequinum*. Among the isolated individuals or small groups of *Pipistrellus pipistrellus* and *Pipistrellus pygmaeus*, basing on bat detector registrations, it was reported the existence of the species *P. pygmaeus* in the Romanian fauna (Gheorghiu & Murariu, 2002). In table 1, the observations on the numerical distribution of the chiropteran population, in site, on 01.12.2002, are minutely presented. Table 2 includes morphometrical data resulted from some bat species (*Pipistrellus pipistrellus*, *P. pygmaeus*, *Nyctalus noctula*, *Barbastella barbastellus* and *Rhinolophus ferrumequinum*) on the same date, captured in the crevices (Fig. 3). The synthesis of the obtained information, on 05.03.2003, is included in table 3, because it was considered that the details are not significantly different from those resulted on 01.12.2002.

Table 1

Observation sheet in the hibernating period

Observers' name: Victor Gheorghiu, Viorel Nistor				
Date of observation: 1.12.2002; Starting hour of observation: 11.30				
Number of persons who attended observations: 6; Duration of observation: 9 hours				
Outside air temperature: 1.7 C				
Weather in the previous night: clouded sky, light snowing				
Relative humidity in the cave: very high; active and permanent				
Not visible changes comparing with the last visit				
Localization (see the map)	Genus, species	Number of individuals	Distribution	Temp. (°C)
Main gallery about 340 m from the entrance	<i>Pipistrellus pipistrellus/ P. pygmaeus</i> - in 3 large crevices at 3-5 m high	approximately 4500	colony	Air t.: 6.6 Wall t.: 8.1 Water t.: 7.2
approximately 340 m	<i>Nyctalus noctula</i> - crevice	20-30	colony	Air t.: 6.6 Wall t.: 8.2

Table 1 (continued)

Localization (see the map)	Genus, species	Number of individuals	Distribution	Temp. (C)
approximately 340 m	<i>Barbastella barbastellus</i>	4-5	colony	Ibidem
approximately 390 m	<i>Pipistrellus pipistrellus</i> and <i>P. pygmaeus</i> - parietal; 7 m high	approximately 6500	colony	Air t.: 8.1
approximately 450 m	<i>Pipistrellus pipistrellus</i> / <i>P. pygmaeus</i> - parietal; 35-40 m high	approximately 8000-9000	colony	Ibidem
approximately 520 m	<i>Pipistrellus pipistrellus</i> and <i>P. pygmaeus</i> parietal; 20 m high	approximately 6000	colony	Ibidem
approximately 550 m	<i>Miniopterus schreibersii</i> - parietal; 25 m h.	approximately 3000-3500	colony	Ibidem
approximately 670 m	<i>Pipistrellus pipistrellus</i> / <i>P. pygmaeus</i> parietal + vault; 40 m high	approximately 8000	colony	Ibidem
approximately 670 m	<i>Myotis</i> sp. (medium size); parietal; 20 m high	approximately 2000	colony	Ibidem
approximately 690 m	<i>Rhinolophus ferrumequinum</i>	approximately 500-600	spread	Ibidem
along all way	<i>Myotis myotis</i> / <i>oxygnathus</i>	approximately 150-170	isolated	Ibidem

Note: Doubtlessly, the number of *Pipistrellus* groups, possibly *Miniopterus*, are more numerous because of the wall's sinuosities, crevices and the height where the bat colonies are hidden. In addition, our observations were made at only 850 m away from the entrance, and, as it was mentioned, the total length of the cave is 11,123 m.

Table 2

Sheet of bats evidence of collected bats.

Observer's name: Victor Gheorghiu
Date of observation: 1 Dec. 2002; Hour of starting observation: 13.30. Hour of the end of observation: 14.10
Number of experienced persons who collected: 1
Method of collecting: snap net
Motivation of bat collecting: identification, measurements, weighting
Bat collecting was made inside the cave with a 30 cm diameter hand net (area = 0.09 m ²) or directly by hand, from the walls.

Table 2 (continued)

Hour of first capture: 13.30; Hour of last capture: 14.05					
Total number of collected bats: 12; Number of species collected: 5					
No injuries to bats in the identification time					
Details on collected bats					
Hour	Species	Sex	Age	Length of the forearm (mm)	Weight (g)
13:30	<i>Nyctalus noctula</i>	♀	adult	54.83	30.7
	<i>Rhinolophus ferrumequinum</i>	♂	adult	59.01	22.8
	<i>Myotis myotis</i>	♀	adult	59.36	25.7
	<i>Pipistrellus pygmaeus</i>	♂	adult	30.43	5.1
	<i>Pipistrellus pygmaeus</i>	♂	adult	30.01	5.0
	<i>Pipistrellus pygmaeus</i>	♂	adult	30.79	5.2
	<i>Pipistrellus pygmaeus</i>	♀	adult	31.24	5.4
	<i>Pipistrellus pipistrellus</i>	♂	adult	31.82	5.1
	<i>Pipistrellus pipistrellus</i>	♂	adult	31.31	5.5
	<i>Pipistrellus pipistrellus</i>	♀	adult	31.75	5.6
	<i>Pipistrellus pipistrellus</i>	♀	adult	32.09	5.9
	<i>Pipistrellus pipistrellus</i>	♂	adult	32.28	5.3
	<i>Barbastella barbastellus</i>	♂	adult	38.67	9.9
14:45	<i>Barbastella barbastellus</i>	♀	adult	42.07	10.5

From this location, placed at about 4 m high, sufficient specimens could be collected to which we made a correct identification and could establish the density ratio of these two species.

Table 3

Bat species observed in hibernating winter 2002 – 2003.

ȘURA MARE CAVE	BIOLOGICAL CYCLE - Hibernation	
Genus and species	DATE OF OBSERVATIONS	
	1 December 2002	5 March 2003
<i>Rhinolophus ferrumequinum</i>	600	150
<i>Pipistrellus pipistrellus</i> / <i>Pipistrellus pygmaeus</i>	34000	34000
<i>Nyctalus noctula</i>	30	
<i>Barbastella barbastellus</i>	5	
<i>Miniopterus schreibersii</i>	3500	3000
<i>Myotis</i> sp.	2000	
<i>Myotis myotis/oxygnathus</i>	170	70
TOTAL INDIVID.	40305	37220

After Murariu et al. (2007), the Șura Mare cave is one of the greatest hibernating roosts from Romania with an impressive colony of more than 40,000 individuals, the dominant species (about 34,000 individuals) being *Pipistrellus pipistrellus*/*P. pygmaeus*. Thus, the Șura Mare cave is comparable with Huda lui Păpară from the Western Carpathians. In the last one, the maximum number of recorded individuals was of 76,330 (03.03.2005), belonging to six species

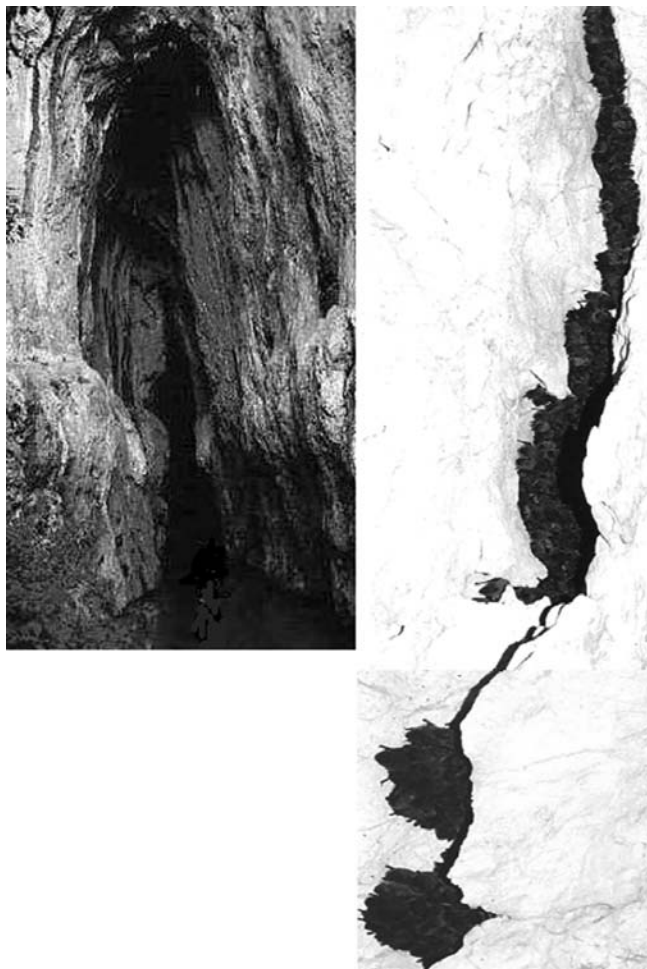


Fig. 3 - Left: The main entrance of Sura Mare Cave, 37 m high and 13 m wide; Right: The crevices of 3-3.5 m long and roosts of a hibernating bat colony with thousands of *Pipistrellus pipistrellus* and *P. pygmaeus*.

(*Miniopterus schreibersii*, *Pipistrellus pipistrellus*, *Myotis myotis/oxynathus*, *Rhinolophus euryale*, *R. ferrumequinum*) out of which 90% belong to the species *Miniopterus schreibersii* and *Pipistrellus pipistrellus* (Coroiu, Viehmann & David, 2006). Also, from the morphological point of view there are numerous resemblances between Şura Mare cave and Huda lui Papară cave: huge portals at the entrances, very high ceilings; both caves are active so that there is a constant temperature inside, of over 6°C; they are caves with an extremely difficult route which can be covered only with special equipment; thus the bats are not disturbed during the hibernation. Up to now, *Pipistrellus pygmaeus* was not reported from Huda lui Papară cave.

We consider that the diminishing of the present population of *Pipistrellus* (ca. 34,000 individuals) from the Şura Mare cave, in comparison with the 100,000 individuals reported by Prof. Margareta Dumitrescu in the '60s, is not due to a direct

threat on bats. The present information on the lower number of bats is according to the general tendency of numerical decreasing of all chiropteran species populations of Europe, because of the pesticide pollution from the '70s.

In occurrence with typical species, *Pipistrellus pygmaeus* was identified, too. The number of individuals of this last species is only 1/10 comparing with *P. pipistrellus*. The ratio 1/10 between these two species was estimated after collecting, identification and counting of bat individuals hidden in a 3 – 3.5 m length crevice in the cave's wall. Under these circumstances the number of *Pipistrellus pygmaeus* individuals is minimum of 3,400, making this roost to be considered one of the most important roosts of Europe for the hibernation of this species and the second of Romania, considering its size, after Huda lui Papară cave for mixed colonies (6 bat species) in hibernation.

Other species: *Rhinolophus ferrumequinum* (maximum 600 hibernating individuals); *Myotis myotis/oxygnathus* – isolated individuals are not more than 170 individuals spread up to the all length of the investigated gallery. An unitary colony of *Myotis* sp. (aproximately 2,000 individuals estimated in December 2002) was not found again at the end of hibernating period. We suppose the factors which determined the change of locations of colonies observed in December were the unusual length of winter with very low temperatures. The winter lasted until the end of April 2003. This applies to *Rhinolophus ferrumequinum*, *Miniopterus schreibersii*, *Pipistrellus pipistrellus* and *P. pygmaeus*.

Only 30 individual of *Nyctalus noctula* were directly observed. But considering the very large number of crevices and hidden places in the ceiling the number of Noctule is much larger. These places were not accessible, but we noticed movement around them, and dead specimens or skeletons were collected from the floor and cliffs. That is why we estimate this species with more than 1,000 individuals in this cave.

Barbastella barbastellus was also present in a low number (only 5 individuals) directly observed. The additional individuals could have been hidden in the halls of the cave's walls, inaccessible places for direct observations.

The results are not exhaustive because on one side some hidden spaces with bats might exist, on the other one, from the total of 11,123 m length of the cave only 850 m were surveyed, with only clearly visible bat colonies .

Conclusions

Pipistrellus pipistrellus is the dominant species in Șura Mare cave and *P. pygmaeus* approx. 1/10 (3,400) from the total number of individuals of these two species.

Miniopterus schreibersii was the second species (after *Pipistrellus*) with large colonies (counting about 3,500 individuals in December 2002). In the summer time, there were no nursery colonies. Trying to collect by net, only two specimens of *Pipistrellus pipistrellus* were found.

Species *Rhinolophus ferrumequinum*, *Myotis myotis*, *M. oxygnathus*, *Barbastella barbastellus* and *Miniopterus schreibersii* are prior species with special status of protection according to the European Community's legislation. This is the reason why documentation for Șura Mare cave started in order to be declared a protected area.

Bat hibernating colonies change their place in the cave according to variation of temperature; in December most colonies were observed close to the entrance and in March they moved deeper.

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PEȘTERA ȘURA MARE (ROMÂNIA), CEL MAI IMPORTANT ADĂPOST CUNOSCUT PENTRU HIBERNAREA SPECIEI *PIPISTRELLUS PYGMAEUS* LEACH, 1825 (CHIROPTERA: VESPERTILIONIDAE)

REZUMAT

Din totalul lungimii Peșterii Șura Mare (11.123 m) au fost investigați, din punct de vedere chiropterologic, doar primii 850 m, de la intrarea principală. Autorii fac analogii cu peștera Huda lui Papară, deoarece sunt asemănări în privința înălțimii și lățimii portalului, dar și în privința adăpostirii pentru hibernare a peste 76.000 lilieci (cf. Coroiu și colab., 2006), cu mențiunea că această din urmă peșteră a fost investigată în totalitatea ei.

În Peștera Șura Mare, *Pipistrellus pipistrellus* este specia dominantă (cu aproximativ 30.600 indivizi), iar *P. pygmaeus* a fost estimat la aproximativ 3.400 indivizi.

A doua specie din acest adăpost (cu 3.500 indivizi) a fost *Miniopterus schreibersii* care a cunoscut un declin drastic al populației în ultimii 50 de ani și trebuie să fie inclusă în programul național de monitorizare.

Alte specii prioritare (cf. legislației europene) sunt *Rhinolophus ferrumequinum*, *Myotis myotis*, *M. oxygnathus*, *Barbastella barbastellus*. Din acest motiv, autorii propun ca Peștera Șura Mare să fie declarată arie protejată.

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BAT GEOGRAPHIC DISTRIBUTION NORTH OF THE CARPATHIANS

BRONISŁAW W. WOŁOSZYN, ANDREA PERESWIET-SOLTAN

Abstract. Recent bat fauna in the area North of the Carpathians (Poland) consist of 25 species (2 Rhinolophidae and 23 Vespertilionidae). 25 bat species recorded so far from Poland can be divided into three groups: 1. Species limited to the southern Poland, occurred in the Polish Segment of the Carpathians (Beskidy Mts.), the Sudety Mts., and the Kraków-Częstochowa Upland; 2. Species with North-eastern limit of the distribution in the West and Central Poland, for example *Myotis myotis*; 3. Species with unlimited distribution on Polish territory, occurred also in the North-eastern Poland.

Résumé. La faune actuelle de chauve-souris de la zone du nord des Monts Carpates (sud de la Pologne) est formée de 25 espèces (2 Rhinolophidae et 23 Vespertilionidae). En Pologne, le mode de distribution nous montre un gradient de latitude. Ce gradient prononcé du sud-ouest vers le nord-est reflète le passage d'un climat atlantique vers un climat continental. Une croissance récente de la faune du nord des Carpates, tant du point de vue systématique que de la densité de la population a trois causes: la récupération de la faune de chauve-souris après la crise écologique apparue dans la seconde moitié du siècle précédent (i.e. *Rhinolophus hipposideros*, *Myotis emarginatus*); la migration récente de quelques espèces de chauve-souris vers le sud de la Pologne (*Rhinolophus ferrumequinum*, *Myotis blythi*, *Pipistrellus kuhlii*); la confirmation de la présence d'espèces récemment décrites (*Myotis alcathoe*, et probablement *Plecotus macrobullaris*).

Key words: Chiroptera, species richness gradient, enrichments of bat fauna, southern Poland.

INTRODUCTION

Bats are more numerous in tropical and subtropical regions, but three families: Molossidae, Rhinolophidae, and Vespertilionidae are adapted to the cooler climate and distributed in temperate zones too, as it is in case of Palaearctic Region. Thus, the appearance of every bat species depends on geographical position. We can also observe these phenomena in the Carpathian Mountains (Fig. 1).

MATERIAL AND METHODS

Pattern of bat distribution North of the Carpathians

Of the 45 European bats species, 32 are reported from the Carpathians Mts. This means about 70 % of whole European bat fauna. This area is an important eco-region offering suitable conditions for hibernation, shelters for nursery colonies and foraging areas (Wołoszyn & Bashta, 2001; Wołoszyn et. al., 2008).

In periods of harsh climate (Pleistocene) the range of the bats could have been even more restricted, excluded to roost areas lying in the basin of the Mediterranean.

In warmer periods the bats migrated to the North, colonized the Carpathian Basin, and in optimum climate crossed the barrier of the Carpathians and colonized the mountain areas.

Ecological corridors across the Carpathian Mts. are very important for bat migration to the North. Their existence enabled dispersion of bats to the Mediterranean from Pleistocene roosts during postglacial period (Fig. 2).



Fig. 1 - Distribution pattern of horseshoe bats (Rhinolophidae) North of the Mediterranean Region. Numbers from 1 to 6 show the number of horseshoe bat species occurring in a region.

Fig. 2 - A possible eco-corridor of bat migration to the North during Late Pleistocene and Holocene along of the Carpathians Range; BMS – Balkan – Mediterranean Segment, PS – Pannonia Segment, NCS – North Carpathians Segment.

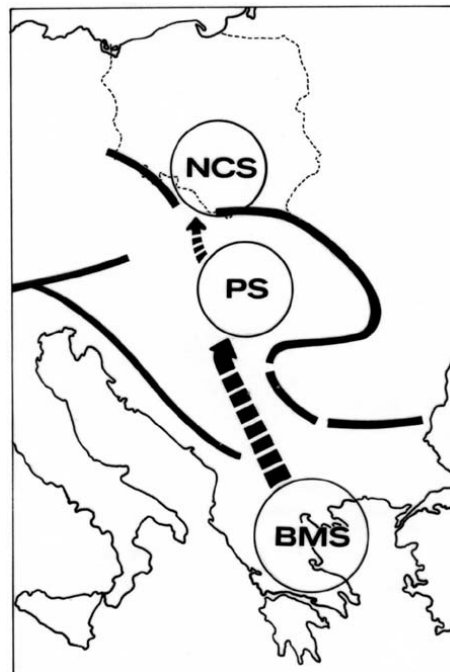


Table 1

Latitude gradient of bat species distribution along of the Carpathian Mountains
(after Pereswiet-Soltan & Wołoszyn, 2009).

Region \ Taxa	Families		Genus		Species	
	N	%	N	%	N	%
South Carpathian Mountains (and Balkan Peninsula)	4	100	11	100	32	100
Pannonian Region	3	75	10	91	29	91
Southern Poland (North Carpathians)	2	50	9	82	25	78
North of Poland	1	25	7	64	17	53

Biogeographic aspects of bat distribution in Poland

Recent bat fauna in the area North of the Carpathians (Southern Poland) consists of 25 species (2 Rhinolophidae and 23 Vespertilionidae) (Sachanowicz & Ciechanowski, 2005; Sachanowicz et al., 2006; Wołoszyn, 2001 a, 2004).

RESULTS AND DISCUSSIONS

List of bat species from Poland

Family Rhinolophidae

RHH	Lesser horseshoe bat	<i>Rhinolophus hipposideros</i> (Bechstein, 1800)
RHF	Greater horseshoe bat	<i>Rhinolophus ferrumequinum</i> (Schreber, 1774)

Family Vespertilionidae

MYM	Mouse-eared bat	<i>Myotis myotis</i> (Borkhausen, 1797)
MBO	Lesser mouse-eared bat	<i>Myotis blythii</i> (Tomes, 1857)
MBE	Bechstein's bat	<i>Myotis bechsteinii</i> (Kuhl, 1817)
MYN	Natterer's bat	<i>Myotis nattereri</i> (Kuhl, 1817)
MEM	Geoffroy's bat	<i>Myotis emerginatus</i> (Geoffroy, 1806)
MYS	Whiskered bat	<i>Myotis mystacinus</i> (Kuhl, 1817)
MYB	Brandt's bat	<i>Myotis brandtii</i> (Eversmann, 1845)
MAL	Alcathoe bat	<i>Myotis alcathoe</i> van Helversen and Heller, 2001
MDA	Daubenton's bat	<i>Myotis daubentonii</i> (Kuhl, 1817)
MDS	Pond bat	<i>Myotis dasycneme</i> (Boie, 1825)
VMU	Parti-coloured bat	<i>Vespertilio murinus</i> Linnaeus, 1758
ENI	Northern bat	<i>Eptesicus nilssonii</i> (Keyserling et Blasius, 1839)
ESE	Serotine bat	<i>Eptesicus serotinus</i> (Schreber, 1774)
PIP	Common pipistrelle	<i>Pipistrellus pipistrellus</i> (Schreber, 1774)
PPY	Midget pipistrelle bat	<i>Pipistrellus pygmaeus</i> (Leach, 1825)
PIN	Nathusius' pipistrelle	<i>Pipistrellus nathusii</i> (Keyserling et Blasius, 1839)
PIK	Kuhl's Pipistrelle	<i>Pipistrellus kuhli</i> (Natterer, 1819)
NLA	Giant noctule	<i>Nyctalus lasiopterus</i> (Schreber, 1780)
NYN	Common noctule	<i>Nyctalus noctula</i> (Schreber, 1774)
NYL	Leisler's noctule	<i>Nyctalus leisleri</i> (Kuhl, 1817)

PAR	Common long-eared bat	<i>Plecotus auritus</i> (Linnaeus, 1758)
PAS	Grey long-eared bat	<i>Plecotus austriacus</i> (Fischer, 1829)
PAM	Alpine long-eared bat	<i>Plecotus macrobularis</i> Kuzjakin, 1956*
BAR	Barbastelle	<i>Barbastella barbastellus</i> (Schreber, 1774)
MIS	Schreiber's bat	<i>Miniopterus schreibersii</i> (Kuhl, 1817)*

Acronyms and English names are given as based on: Wołoszyn, 2001 a (modified following the most recent data), Latin names: Annex 1, Agreement on the Conservation of Populations of European Bats, EUROBATS, 1991.

Three different types of bat faunas overlap in Poland (Horaček et al., 2000), which makes this a territory of a special interest from the zoogeographical viewpoint:

1. Boreal zone;
2. Northwestern temperate zone;
3. Southern European (Northern Mediterranean).

A gradient of species richness may be identified in Poland. Bat species density responded almost linearly to change in latitude. The pronounced South-West to North-East gradient reflects both latitude gradient of bat distribution and also transition from an Atlantic to a continental climate (Sachanowicz et al., 2006; Wołoszyn, 1994, 2001) (Tab. 2). We can observe loss of species number along this gradient.

Thus, the appearance of every bat species depends on geographical position. In southern Poland it is possible to meet a higher number of species than in territories located further to the North. Several southerly species reach their northern range limits in Poland. However, it needs to be noted that bats could easily be an object of passive transport for large enough distances, the reason why the finding of a single representative of a species far from its original areal extent does not really provide evidence of permanent occurrence.

Three species of bats are characteristic to Polish segment of the Carpathians: *Rhinolophus ferrumequinum*, *R. hipposideros* and *Myotis emarginatus*. These species reach their North limits in this region (Fig. 3) (Sachanowicz & Ciechanowski, 2005; Wołoszyn, 2001 b, c, d). In figures 4 and 5, the distribution of two bat species in Poland is presented.

Table 2

Appearance of bats in different regions of Poland
(partly based on Wołoszyn, 1994, 2001 and Sachanowicz & Ciechanowski, 2006).

Group 1: Species which occupy large areas and could be found throughout Poland	MYS, MYB, MDA, MDS, MYN, PIP, PPY, PIN, ESE, ENI, VMU, NYN, PAR, BAR
Group 2: Species limited in their occurrence to southern, central-western and North-western Poland	MYM, MBE, NYL, PAS, NLA,
Group 3: Species occurring in southern Poland (Carpathians, Sudetes, Krakow-Częstochowa Upland).	RHF, RHH, MEM MBO, MAL
Group 4: Species not found so far in Poland; but their occurrence here is still possible	PAM, MIS



Fig. 3 - Pattern of bat distribution in Poland: 1. Species limited to the Southern Poland, occurred in the Polish Segment of the Carpathians (Beskidy Mts.), the Sudety Mts., and the Kraków-Częstochowa Upland (lower spot); 2. Species with North-eastern limit of the distribution in the West and Central Poland (middle spot); 3. Species with no limit of distribution on Polish territory, occurred also in the North-eastern Poland (higher spot).

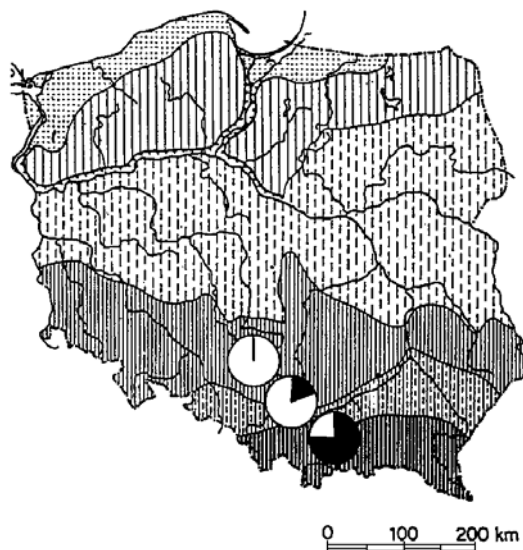


Fig. 4 - Frequency of Lesser horseshoe bat (*Rhinolophus hipposideros*) in three localities in: the Southern Poland (from the South-East to the North-West): Diabla Dziura Cave (Polish Segment of the Carpathians), Nietoperzowa Cave, (Kraków – Częstochowa Upland: Southern part), Na Świniuszcze Cave (Kraków – Częstochowa Upland: northern part). Circle denotes 100 % of bat population recorded at the site, darkened part of a circle denotes percentage contribution of Lesser horseshoe bat (after Wołoszyn, 1996).

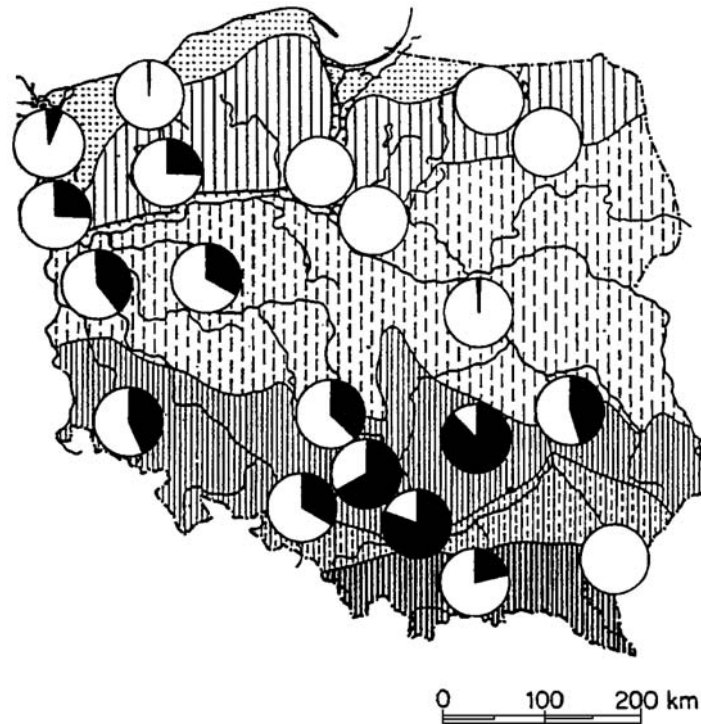


Fig. 5 - Frequency of Mouse-eared bat (*Myotis myotis*) in different localities in Poland. Circle denotes 100% of bat population recorded at the site, darkened part of a circle denotes percentage contribution of Mouse-eared bat (after Wołoszyn, 1996).

Conclusions

Recent bat fauna in the area north of the Carpathians (Southern Poland) consists of 25 species (2 Rhinolophidae and 23 Vespertilionidae).

Pattern of bat distribution in Poland shows latitudes gradient. The pronounced south-west to the north-east gradient reflects transition from an Atlantic to a continental climate.

Recently observed process of enrichments of bat fauna north of the Carpathians, both from systematic and population density points of view, is due to three reasons:

- recuperation of bat fauna after ecological crisis which occurred in the second half of the past century (i.e. *Rhinolophus hipposideros*, *Myotis emarginatus*);
- recent migration of same bat species to Southern Poland (*Rhinolophus ferrumequinum*, *Myotis blythi*, *Pipistrellus kuhlii*);
- confirmation of the existence of some newly described bat species (*Myotis alcathoe*, and probably *Plecotus macrobullaris*).

RĂSPÂNDIREA GEOGRAFICĂ A LILIECILOR LA NORDUL CARPAȚILOR

REZUMAT

Fauna actuală de lilieci în zona de nord a Munților Carpați (sudul Poloniei) cuprinde 25 de specii (2 de *Rhinolophidae* și 23 de *Vespertilionidae*). Modelele de distribuție ale speciilor de lilieci din Polonia prezintă un gradient latitudinal. Gradientul pronunțat pe direcția sud-vest spre nord-est reflectă de fapt tranziția de la climatul Atlantic la cel continental.

Îmbogățirea recentă a faunei de lilieci de la nordul Carpaților, atât din punct de vedere sistematic cât și al densității populației, are la bază următoarele trei cauze:

- recuperarea faunei de lilieci după criza ecologică apărută în a doua jumătate a secolului trecut (i.e. *Rhinolophus hipposideros*, *Myotis emarginatus*);
- migrația recentă a unor specii de lilieci spre sudul Poloniei (*Rhinolophus ferrumequinum*, *Myotis blythi*, *Pipistrellus kuhlii*);
- confirmarea prezenței unor specii de lilieci nou descise (*Myotis alcathoe*, și probabil *Plecotus macrobullaris*).

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BATS HIBERNATING IN UNDERGROUND SHELTERS OF MAŁE PIENINY MOUNTAINS (THE CARPATHIAN MOUNTAINS, SOUTHERN POLAND)

WOJCIECH J. GUBAŁA, BRONISŁAW W. WOŁOSZYN

Abstract. Six bat species were observed during winter censuses in years 2005-2009: Lesser horseshoe bat, Mouse-eared bat, Daubenton's bat, Whiskered/Brandt's bat, Northern bat and Brown long-eared bat. *Rhinolophus hipposideros* was most numerous (67% of all bats recorded). Largest hibernaculum on Polish side of range was mine Bania w Jarmucie, with maximum 29 bats during a single control, through the years of research number of species and individuals was increasing. Rarely seen in Outer Carpathians *Eptesicus nilssonii* winter roost was found in Homole Ravine Reserve.

Résumé. Six espèces de chauve-souris ont été observées pendant les recensements d'hiver au cours des années 2005-2009: petit rhinolophe, chauve-souris murine, vespertilion de Daubenton, murin de Brandt, sérotine boréale et oreillard. *Rhinolophus hipposideros* a été la plus nombreuse (67% de toutes les chauve-souris observées). Le plus grand hibernaculum de la zone investiguée en Pologne a été la mine de Bania w Jarmucie, avec un maximum de 29 chauve-souris pendant un seul contrôle, le nombre d'espèces et d'individus croissant au cours des années de recherches. Bien que rarement vu en-dehors des Carpates, un point d'hivernage de *Eptesicus nilssonii* a été découvert dans la réserve de Homole Ravine.

Key words: Southern Poland, Małe Pieniny Mountains, hibernation, *Rhinolophus hipposideros*, six species.

INTRODUCTION

Małe Pieniny is a mountain range in South-East of Poland and northern Slovakia, 14 km long and 4 km broad (Nyka, 2008). Highest point is Wysoka Mt. – 1050 m a.s.l., whole range is formed mainly by limestones with small amount of rocks of volcanic origin (andesite). On the Polish side 48 caves and 3 old mines were found so far (Gubała, 2006 a; Gubała & Urban, 2007), only few of them have right conditions for hibernation of bats.

First report about bats from Pieniny Mountains comes from Sitowski (1922). He described 7 species from this region. Next study also comes from Sitowski (1948), describing 13 species. Following publications only repeated Sitowski's species list or mentioned single observations (e.g. Kowalski, 1953; Ruprecht, 1983; Postawa et al., 1994). Since 1991, Bat Protection Group proNatura conducting their research, in years 1991-1995, they carried out winter censuses in caves and old mines (Paszkievicz et al., 1995) and several summer studies and observations in Właściwe and Małe Pieniny Mountains (Paszkievicz et al., 1998; Szkudlarek & Paszkievicz, 2001). Since 2004 winter censuses and swarming activity are conducted by members of Chiropterological Information Centre and Pedagogical University of Krakow (Gubała, 2006 b).

METHODS

All sites were checked for bats twice in winter: in December, at the beginning of hibernation period and in February/March. Bats were identified to species level without pulling off the walls, due to problems of proper identification whiskered/Brandt's bat. Those species were count together as *M. mystacinus/ brandtii*. Only electric LED-light was used.

RESULTS AND DISCUSSION

During winter censuses within the period 2005-2009, six bat species were observed: Lesser horseshoe bat (*Rhinolophus hipposideros*), Mouse-eared bat (*Myotis myotis*), Daubenton's bat (*Myotis daubentonii*), Whiskered/Brandt's bat (*Myotis mystacinus/brandtii*), Northern bat (*Eptesicus nilssonii*) and Brown long-eared bat (*Plecotus auritus*) - 33% of bat fauna recorded in whole Pieniny Mountains (18 species) (Wołoszyn & Gałosz, 2000; Szkudlarek & Paszkiewicz, 2001).

Rhinolophus hipposideros was the most numerous, the species representing 67% of all recorded bats (Fig. 1); more than 20 individuals were observed during a single census. Largest hibernaculum on Polish side was old mine – Bania w Jarmucie - up to 29 individuals during control (Fig. 2). In that site four more species were found: *M. myotis*, *M. daubentonii*, *M. mystacinus/brandtii* and *P. auritus*. Low number of horseshoe bats, despite large maternity roost in the attic of church in village Jaworki - over 120 individuals (Paszkiewicz et al., 1998), is probably caused by existence of a bigger hibernaculum on the Slovak side of range - Aksamitka cave, where up to 270 bats were recorded (Gubała, unpublished data) or unknown site on Polish side of range. Through years of research, significant increase of number of bats and species was observed, from maximum 3 bats in 1994 (Paszkiewicz et al., 1995) to almost 30 in Bania w Jarmucie in discussed period. It is hard to tell if this increase was caused by growth on maternity roosts or is an effect of protection ("grill" type steel bars in entrance of the mine), nevertheless - works implemented for protection and adjusting microclimate of some undergrounds should improve bat populations' status (Gubała & Urban, 2007). Many new sites, mainly caves in natural reserves in the area, were found throughout the years (Gubała, 2006 a; Gubała & Urban, 2007). These sites are very important for rare and endangered species during hibernation period but probably several shelters are still unknown – it could be indicated based on number of individuals on maternity roosts in whole Pieniny Mountains (unpublished data, Paszkiewicz et al., 1998).

Acronyms used in figures: RHH – *Rhinolophus hipposideros*, MYM – *Myotis myotis*, MDA – *Myotis daubentonii*, MSB – *Myotis mystacinus/brandtii*, ENI – *Eptesicus nilssonii*, PAR – *Plecotus auritus*.

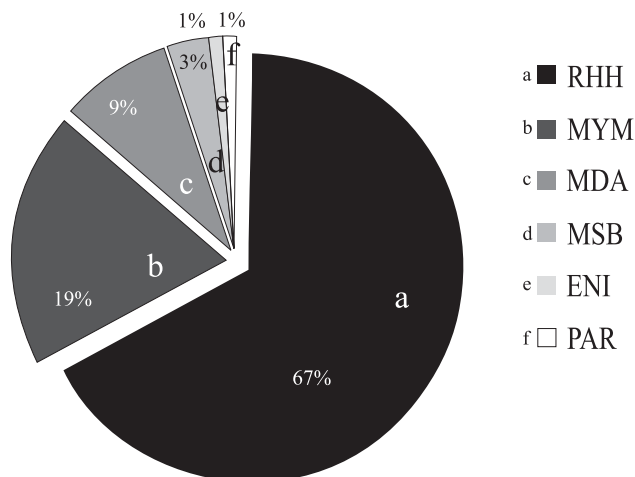


Fig. 1 - The share of the bat species from the total number of bats observed during the winter censuses within the period 2005 - 2009.

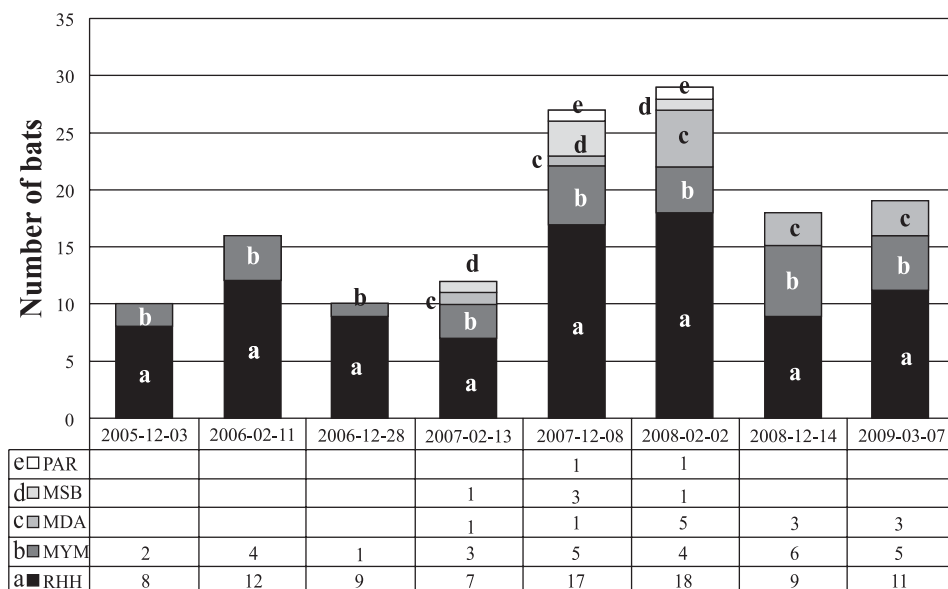


Fig. 2 - The abundance of the bat species observed during winter censuses within the period 2005 - 2009.

In Szczelina Naciekowa cave in Homole Ravine Natural Reserve one individual of northern bat *Eptesicus nilssonii* was recorded twice – this cave, with static cold microclimate, is considered to be a constant site of this species which is rarely seen in winter in undergrounds of Outer Carpathians (Sachanowicz et al., 2006). Two more species, *Rhinolophus ferrumequinum* and *Myotis emarginatus*, observed during winter in Slovak caves in Haligovskie Skaly (Danko et al., 2000, own data) can be found on Polish side.

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HIBERNAREA LILIECILOR ÎN ADĂPOSTURILE SUBTERANE DIN MUNȚII MAŁE PIENINY (MUNȚII CARPAȚI, SUDUL POLONIEI)

REZUMAT

În perioada inventarierii efectuate între 2005 și 2009, au fost observate șase specii de lilieci: liliacul mic cu potcoavă, liliacul comun, liliacul de apă, liliacul mustăcios, liliacul nordic și liliacul urecheat. *Rhinolophus hipposideros* a fost cel mai numeros (67% din toate semnalările). Cel mai mare hibernaculum din partea poloneză a arealului a fost mina Bania w Jarmucie, cu maximum 29 de lilieci în timpul unui singur control. De-a lungul anilor de cercetare numărul speciilor și al indivizilor a crescut. Observat mai rar în Carpații Exteriori, *Eptesicus nilssonii* a fost raportat în adăpostul pentru iernat din Rezervația Homole Ravine.

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THE POPULATION OF RED DEER (*CERVUS ELAPHUS* L., 1758) IN TULCEA COUNTY (ROMANIA)

SORIN GEACU

Abstract. The presence of the Red Deer in the North-western parts of Tulcea County is an example of the natural expansion of a species spreading area. In North Dobrogea, this mammal first occurred only forty years ago. The first specimens were spotted on Cocosul Hill (on the territory of Niculițel area) in 1970. Peak numbers (68 individuals) were registered in the spring of 1987. The deer population (67 specimens in 2007) of this county extended along 10 km from West to East and 20 km from North to South over a total of 23,000 ha (55% of which was forest land) in the East of the Măcin Mountains and in the West of the Niculițel Plateau.

Résumé. La présence du cerf rouge (*Cervus elaphus*) dans le nord-ouest du département Tulcea constitue un exemple d'extension naturelle de l'aire de distribution d'une espèce. Ce mammifère n'est apparu dans le nord de la Dobrogea que depuis 40 années. Les premiers exemplaires ont été observés en 1970 à Dealul Cocosului situé sur le territoire de la commune Niculițel. Le plus grand nombre en a été enregistré au cours du printemps de l'année 1987, quand on y a observé 68 exemplaires. En 2007 l'aire de la population de cerfs (67 exemplaires) du département de Tulcea s'étendait sur environ 10 km de l'ouest vers l'est et 20 km du nord vers le sud, en tout environ 23 000 ha (dont 55% de terrain forestier) à l'est des Monts Măcin et à l'ouest du Plateau Niculițel.

Key words: fauna, mammals, Red Deer, Tulcea County, Dobrogea Plateau, Romania.

Origin and presence

Some forty years ago, a new mammal, the Red Deer (*Cervus elaphus* L., 1758) was added to the North-Dobrogea Plateau fauna (Geacu, 2004).

Its presence in this area is a telling proof of the natural penetration of a species from one region to another. It appears that the first specimens have originated from the Vrancea Subcarpathians (the Curvature Carpathians area between the Slănic (Buzău) and the Trotuș valleys), a region closest to North Dobrogea (110 km distance in straight line). The North-Dobrogea deer population is of exceptional cynegetic value, being a typical Carpathian species (Almășan, 1990: 11), a view supporting our own opinion concerning its origin.

Both Barbu (1990) and Almășan (op. cit.) uphold the idea that the Tulcea-based deer originate from the Curvature Carpathians. Murariu (2008) explains their presence in this county by the species habit to migrate in autumn to the plain, which, in this case, is only 100 km away.

The specimens are supposed to have migrated alongside the Putna and/or Milcov rivers and farther on through the forests lining the Siret and the Danube rivers (across which they swam or traversed on ice when the water was frozen) in the North-West / South-East direction. This assertion is sustained by the presence of a female deer seen for a few months in Torcești Forest (600 ha) – Siret Floodplain, Galați County, in 1975 (it was for the first time that the species was reported in that county). Then again, a male appeared in 2000-2001, both specimens coming from the Măgura Odobești forests 40 km to the North-West.

In Tulcea County, the first animals were observed in 1970 on Niculițel hunting funds, close to Cocos Monastery (Barbu, 1971; Almășan, op. cit.), average altitude 200 m (Fig. 1). Later on, they were spotted in the neighbouring zones to the West and South where they actually settled.

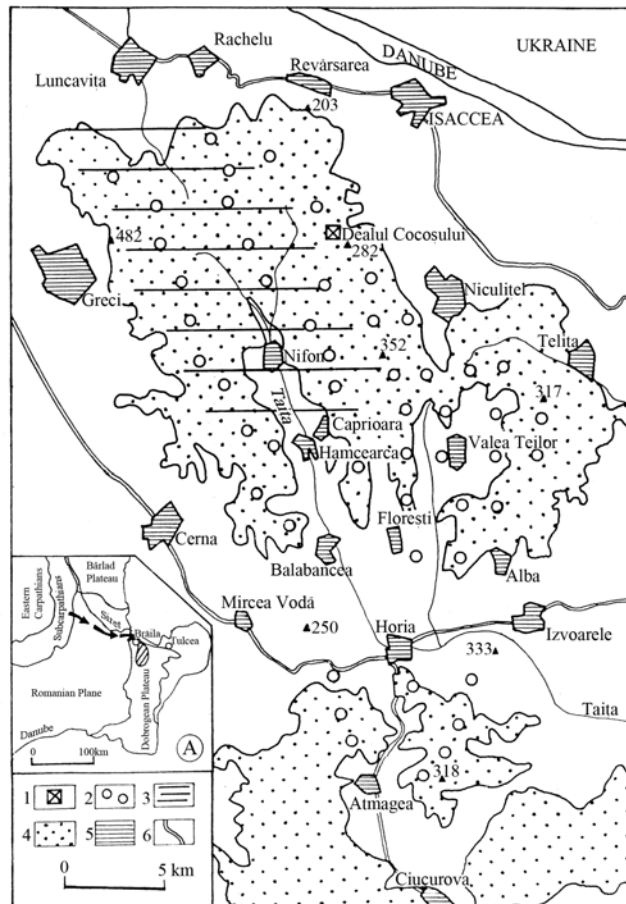


Fig. 1 - Red Deer specimens present in the North-western parts of Tulcea County. 1, Cocosul Hill, close to the homonymous monastery, where deer were first spotted in Tulcea County; 2, Maximum deer spreading area in North Dobrogea (1979-1991); 3, Current deer area; 4, Forests; 5, Settlements; 6, Upgraded road. In the box (A), probable deer migration route from the Curvature Carpathians to the North-western parts of Tulcea County.

In the vast forests that stretch out at the contact between the Niculițel Plateau and the Măcin Mountains (physical-geographical units separated by the Tăița Valley), the Red Deer found a good ecological niche for survival. It is the quiet forested areas crossed by running waters that are favoured by the Red Deer, and this is just what North-Dobrogea offered them from West to East (10 km) and from North to South (20 km) basically compact, little circulated woods with no upgraded road running through them and only one village, Nifon (formerly Țiganca) that lies inside the forested area. The absence of water and the grazing

grounds of neighbouring areas prove restrictive for this mammal. The North-Dobrogea forests consist of: *Quercus pedunculiflora*, *Q. pubescens*, *Q. dalechampii*, *Carpinus orientalis*, *C. betulus*, *Tilia tomentosa*, *Fraxinus excelsior*, *F. ornus*, *Pinus* sp., etc.

The presence of the Red Deer in the north-western part of Tulcea County constitutes an example of animal migration on the vertical, from 700-1000 m in the Subcarpathians to 80-450 m in the North-West of Dobrogea.

Population dynamics

The exact information dates from the spring of 1971, when 11 deer (5 males and 6 females) were observed on the Niculițel funds. Shortly after, they would move 20 km southwards Atmagea funds, where 4 males and 3 females were numbered in March 1973. A note in the Ciucurova Forest Range of 1974 reads: „7 deer, whose origin is not precisely known, have been living for the last few years on this range” (p. 194).

Subsequently, the population of the Atmagea hunting funds kept growing, so that in 1976 they had 18 deer (10 males and 8 females), a figure maintained over the next year, too. As a matter of fact, most North-Dobrogea deer lived on these funds until 1980.

In 1975, it was for the first time that 4 deer (one male and 3 females) had reached the forests South-East of Greci Village (the homonymous hunting funds). In March 1977, a pair from Atmagea would go back to Niculițel, and was spotted on the Alba-Celcic funds (lying in-between the above two); the next year they arrived in the forests South of Niculițel, where number of deer kept growing in the following years up to 18 specimens (6 males and 12 females), in 1982. The annual number of individuals on the Greci funds was no higher than 4-6 animals along 1975-1982 (Tab. 1).

The 1981 Game Assessment Report of the former Tulcea Forest Inspectorate mentioned the following: „definite mating sites could not be singled out, because foresters on the ground usually do not recognise the sounds which males use to emit at mating time”.

Table 1

Red Deer effectives in the hunting funds over 1971-2006 (specimens).

Year/Funds	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Niculițel	11	3	1	-	-	-	2	2	2	6	9
Atmagea	-	-	7	10	16	18	18	15	15	13	9
Țiganca	-	-	-	-	-	-	-	-	3	3	3
Greci					4	4	4	4	4	5	5
Total	11	3	8	10	20	22	24	21	24	27	26

Year/Funds	1982	1983	1984	1985	1986	1987	1988	1990	1992	1993
Niculițel	18	6	10	7	23	20	10	17	-	-
Atmagea	21	20	15	7	8	3	10	8	6	9
Țiganca	3	16	19	19	28	38	17	15	45	31
Greci	6	5	6	6	6	7	7	7	7	7
Total	48	47	50	39	65	68	44	47	58	47

Year/Funds	1994	1995	1996	1997	1998	1999	2000	2001	2003	2006
Atmagea	11	10	12	10	6	-	-	-	-	-
Țiganca	46	23	30	24	34	15	22	22	23	47
Greci	7	7	7	9	9	6	14	15	18	20
Total	64	40	49	43	49	21	36	37	41	67

In Tulcea County, from 11 deer in 1971, numbers rose to 27 in 1980, they becoming 2.4 times more numerous. Nearly half of them lived in the Atmagea area. While in 1971, deer used to be seen only on the Niculițel hunting funds, in 1980 they were spread out on 4 funds (Niculițel, Atmagea, Țiganca and Greci).

In the next decade (1981-1991) the deer populated the same 4 funds being 4.3 times more numerous in 1982 than in 1971. Here it is the distribution of the 48 specimens: Atmagea – 43.7%, Niculițel – 37.5%, Greci -12.5% and Țiganca – 6.3%.

The findings revealed the following:

- the growth rate was the highest: at Țiganca 3 individuals in 1982 and 38 in 1987 (12.6 times more);

- numbers fluctuated between 6 and 23 at Niculițel with a peak in 1986 (11 males and 12 females). The last year of their presence here was 1991 (some 20 individuals, afterwards they migrated to Țiganca);

- numbers fell down to 3 at Atmagea (2 males and one female) in 1987;

- there were between 5 and 7 specimens at Greci;

- the slight numerical decrease on Niculițel and Atmagea funds was due to the heavy winter of 1984/1985.

The maximum number of the North-Dobrogea deer population was registered in the spring of 1987: 68 specimens, 56% of which lived on the Țiganca hunting funds.

In 1990, Almășan mentioned having seen over 20 deer horns on the ground. In the Fântânică Brook Valley (Cerna Forest Range), the horns he found weighted more than 9 kg and were 110 cm long, which was a valuable trophée (235 points CIC). Those found close to Niculițel had 7.5 kg (215 CIC points). He put forward a proposal for „a forest-hunting complex in North-Dobrogea destined to the intensive management of the Red Deer as main species, with Roe Deer and Wild Boar as by-species”.

No more deer on the Niculițel and Atmagea hunting funds in 1992 and 1999, respectively. An exception made one male accompanied by three females seen in the forest located North of Atmagea in March 2005.

At Țiganca the population fluctuated between 22 (in 2000-2001) and 47 specimens (in 2006); at Greci, it would grow after 1997 up to 22 individuals in 2005 (6 males and 16 females).

In the spring of 2006, Tulcea County had 67 deer (14 males and 53 females), which represented a six-times increase compared to 1971 only on the Țiganca and Greci funds.

Murariu (2008) identified this mammal (by footprints, faeces and hair) in the Măcin Mountains National Park (in the Seaca Valley, in the maize fields East of Cerna, on the path linking the Călcata Peak to the Lupilor Hill, and in the Piatra Roșie and Fagilor valleys) approximating the number of deer roaming in the Park area to 20. In 2007, investigations conducted within the Park by Murariu and Geacu confirmed the presence of the species in the forests stretching out North-West of

Nifon Village (Forest Unit IV of the Cerna Forest Range), deer footprints and bones being found in parcel 27 and 53, respectively.

The population's sex-ratio was variable (Tab. 2).

Table 2

Sex-ratio values of the Red Deer population in Tulcea County (1971-2006).

Year	1971	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
M/F	1/1.2	1.6/1	1/1.5	1.2/1	1/1	1.1/1	1/2.1	1/2.1	1/1.9	1/2.3	1/2.5

Year	1983	1984	1985	1986	1987	1988	1990	1992	1993	1994	1995
M/F	1/2.6	1/2.5	1/2.3	1/2.4	1/2.8	1/2.4	1/2.4	1/1.1	1/1.7	1/1.2	1/1.8

Year	1996	1997	1998	1999	2000	2001	2006
M/F	1/1.4	1/1.8	1/3.1	1/2.5	1/1.2	1/1.3	1/3.7

There were years when males outnumbered females, e.g. in 1973 (5 males and 3 females) and 1975 (11 males and 9 females).

In 2006 the sex-ratio appeared to be completely unbalanced: 53 females and only 14 males.

Along time, few deer have been harvested from North Dobrogea. The first specimens were one female which came from Niculițel hunting funds and one male from Atmagea funds. In 1978, another male was harvested from the latter funds.

In 1982, 3 deer (one male and 2 females) were found dead at Atmagea. A female, presumably arrived from the Atmagea forests, was running over on the Măcin-Babadag highway (1988), not far from Căprioara tourist stopover (Horia Commune). On January 3, 1995, they found dead deer on parcel 27, Forest Unit IV of the Cerna Forest Range. In 1997, a 378 kg-deer was harvested not far from Hamcearca Village. Between 1992 and 2004, a number of 9 deer were hunted down in Țiganca hunting funds (one in each of the 1992, 1998 and 2002 years, and 2 in each of the years 2001, 2003 and 2004).

It should be remembered that until the early 1980s, the North-Dobrogea ecosystems had been inhabited by wolves, jackals appearing one decade later. It is highly probable that these two carnivorous species have, in time, contributed to some of the numerical fluctuations registered in the deer population. For example, in 2008, the remains of a female deer eaten by wolves were found at Țiganca.

Investigations on the ground revealed variously-sized groups of deer, e.g. 23 specimens on Țiganca hunting funds. Since the deer effectives were not very large, the damaged they caused was quite insignificant. Nevertheless, peeled off elm bark was frequently seen at Țiganca.

In 1992, a few deer, originating from the Măcin Mountain woods, were spotted eastwards as far as the Danube Floodplain in Brăila Coutny (at a distance of 12 km).

Conclusions

The presence of the Red Deer in the North-western parts of Tulcea County is an example of the natural expansion of a species spreading area. In North Dobrogea, this mammal first occurred only forty years ago.

In the beginning, the deer arrived from the Niculițel Plateau (1970) on the homonymous hunting funds; in 1973, they migrated to Atmagea funds (Babadag

Plateau), a place which registered the highest number of these animals throughout the county until 1980. From 1975, some specimens were seen also on the Greci funds, others returned to Niculițel (1978); from 1979 on, they were signalled at Țiganca as well. No deer occurred at Niculițel since 1992, nor at Atmagea, since 1999.

So, it is only at Țiganca and Greci funds, with a richly forested environment and the quiet needed by the species to survive, that deer have been living over the past decade.

Approximating the species spreading area in terms of the size of the hunting funds they had been recorded on, we could say that their area kept enlarging from ca 8,000 ha (out of which 5,300 ha (66%) forest land) in an early stage (1971, Niculițel funds) to 44,000 ha (out of which 23,500 ha (53%) forest land) over 1979-1991 (when 4 funds existed: Niculițel, Greci, Țiganca and Atmagea). Since 1992, the species area amounts to some 23,000 ha (out of which 12,500 ha (55%) forest land), representing only Țiganca and Greci funds. Thus, while the area extended by 5.5 times from 1971 to 1979, values remained rather constant over 1979-1991, only to shrink by 1.9 times beginning with 1992.

In 2007, the Tulcea County area of the deer micro-population (67 individuals) covered about 10 km from West to East and 20 km from North to South, extending in the eastern part of the Măcin Mountains and in the west of the Niculițel Plateau.

POPULAȚIA DE CERB COMUN (*CERVUS ELAPHUS* L., 1758) DIN JUDEȚUL TULCEA (ROMÂNIA)

REZUMAT

Prezența cerbului comun în nord-vestul județului Tulcea constituie un exemplu de extindere naturală a ariei de răspândire a unei specii. „Vechimea” acestui mamifer în nordul Dobrogei este de numai 40 de ani. Primele exemplare au fost observate în anul 1970 pe Dealul Cocoșului de pe teritoriul comunei Niculițel. Maximul populațional s-a înregistrat în primăvara anului 1987, când s-au constatat 68 de exemplare.

În anul 2007 arealul populației de cerb (67 exemplare) din județul Tulcea se extindea pe aproximativ 10 km de la vest către est și 20 km de la nord spre sud, în total circa 23000 ha (din care 55% păduri) în estul Munților Măcin și vestul Podișului Niculițel.

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TERRESTRIAL VERTEBRATES OF DOBROGEA – ROMANIA AND BULGARIA

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Abstract. The authors report the state of the terrestrial vertebrates of Romanian and Bulgarian Dobrogea. Five amphibian species, eight of reptiles, 159 of birds and 39 mammals species were inventoried. Some of them are characteristic to the steppe areas, in which Dobrogea is included, and others (as amphibians) have a limited distribution, around water flows, pools and lakes. Some of the observed or collected species have populations which can be compared in the two parts of Dobrogea, while the others (e.g. *Crocidura suaveolens*, *Mesocricetus newtoni*, *Microtus arvalis*) have populations more numerous in the Bulgarian Dobrogea, this thing indicating that there are several undamaged habitats and a low anthropic pressure than in the Romanian one.

Résumé. Dans le cadre du contrat de collaboration roumaino-bulgare des années 2008-2009, soutenu par les Ministères de la Recherche Scientifique des deux pays, on a étudié les vertébrés terrestres de la Dobrogea roumaine (départements de Tulcea et Constanța) et de la Dobrogea bulgare (départements de Silistra et Dobrich). Au cours des deux années on y a observé, prélevé ou inventorié (sur la base des informations de terrain) un nombre de 211 vertébrés terrestres: 5 espèces d'amphibiens, 8 de reptiles, 159 d'oiseaux et 39 de mammifères. Les amphibiens y sont les vertébrés avec la plus réduite biodiversité, le plus grand nombre d'espèces appartenant à la classe des oiseaux. Pour chaque espèce on a précisé le statut de protection, les amphibiens figurant dans les annexes des OUG 57/2007 de la législation roumaine concernant la conservation de la biodiversité et de la loi no. 77/2002 de la législation bulgare, tandis que sur le plan international – dans les annexes de la Directive 92/43 EEC sur la conservation des habitats naturels, de la faune et de la flore sauvage. Les autres espèces de vertébrés jouissent d'une protection légale similaire, sauf un petit nombre d'espèces sans statut actuel de protection. Sur la base des résultats des observations et des prélèvements, nous considérons que l'état des écosystèmes de la Dobrogea bulgare est plus proche de l'état naturel, que ceux de la Dobrogea roumaine. Cette situation se reflète dans les populations (plus nombreuses en Bulgarie) de certaines espèces de vertébrés, ce qui prouve la valeur de ces espèces en tant que bioindicateurs, dans le cas de la Dobrogea roumaine la pression anthropique étant plus forte sur les écosystèmes naturels. Dans les deux pays des aires protégées existent, mais leurs superficies peuvent croître, afin d'agrandir leurs chances de constituer des refuges, pour conserver le fond faunistique de quelques espèces rares ou menacées: *Mesocricetus newtoni*, *Spermophilus citellus*, *Mustela eversmanni*, *Vormela peregusna* etc.

Key words: amphibians, reptiles, birds, mammals, inventory, habitats, conservation.

INTRODUCTION

Between 2008 – 2009, a Romanian – Bulgarian co-operation project was carried on in order to study the vertebrates of both parts (Romanian and Bulgarian) of Dobrogea, financed by the Ministers of Scientific Research of both countries. The team of specialists were from „Grigore Antipa” National Museum of Natural History – București (Bucharest) and „Konstantin Prelavsky” University – Shumen and Museum of Natural Sciences from Varna.

Our main interest was focussed on birds and mammals, but in our field trips we also observed and gathered information on amphibians and reptiles from the local people.

English translation by Mihaela Barcan Achim.

If the largest part of the studied area (counties Tulcea and Constanța, in Romania, and Dobrich and Silistra, in Bulgaria) is considered a steppe area from the biogeographical point of view, from the same point of view we cannot avoid the Pontic area. Under these circumstances of a large diversity of the relief (Hercynic Mountains of northern Dobrogea, hills and channels in limy structures, and the cliffs of loess from the East of the studied area) we also deal with different climatic influences and, as a consequence, with a large diversity of ecosystems. Murariu et al. (2009) asserted:

„In the past, Dobrogea was characterized by a vegetal coat with xerophilous grasslands: *Stipa*, *Festuca*, *Diplachne*, *Agropyrum*, *Centaurea*, *Artemisia* etc. The area with grassy vegetation alternated here and there with bushes formed of xerophilous shrubs (*Prunus spinosa*, *Evonymus europaeus*, *Crataegus monogyna*, *Ligustrum vulgare*) with rare forest patches (*Quercus pedunculiflora*, *Q. pubescens*, *Ulmus foliaceus*, *U. procera*, *U. ambiguus*, *Acer tataricum*, *A. campestre*, *Pinus* sp. etc.). Today, most of the grasslands are fallowed, and the bushes and a part of the steppe forests are cut in order to create a proper land for agriculture, on larger and larger surfaces. The steppe begins right at the littoral level and stretches up to 50 – 100 m altitude. Here and there, an area with a transfer vegetation between lawns and forests can be identified, i.e. the so-called forest steppe area, between 200 – 300 m altitude.”

Important data about Dobrogean's vertebrates, especially on small mammals as well as on hunting species published many authors, starting with Hogguer (1879) and continuing in the 20th century with Simionescu (1922), Lepși (1929), Călinescu (1931, 1934), Oprescu (1936). But most articles about vertebrates from Dobrogea were published in the second half of the 20th century by: Ausländer et al. (1957 a, b), Dumitrescu et al. (1958), Hellwing et al. (1960), Suciș et al. (1962), Dumitrescu et al. (1962-1963), Hamar et al. (1963), Dumitrescu et al. (1965), Barbu et al. (1965), Băcescu et al. (1965), Popescu (1968, 1972), Popescu et al. (1968), Schnapp (1968, 1971), Solomon (1968), Vasiliu et al. (1968), Boguleanu (1969), Iana (1970, 1973), Marcheș (1970), Valenciuc et al. (1970, 1971), Valenciuc et al. (1973), Popescu et al. (1974), Atanasova (1987), Răduleț (1994, 1996, 2005), Răduleț et al. (1996).

In first decade of the 21st century we can mention the contributions of Murariu (2000, 2006, 2007, 2008), Angelescu (2003), Peshev et al. (2004), Atanasova et al. (2009), Gospodinova et al. (2009), Koshev (2009).

Besides the interest of the Romanian-Bulgarian mixed team of specialists in the observation and in the identification of vertebrates, we also estimated the effects of the anthropic pressure on them, knowing that there already are some protected areas on the Romanian and Bulgarian territories, necessary for protecting the plant and animal endemic species, rare or threatened.

MATERIAL AND METHODS

Besides the field trips and observation noting on vertebrates, we also collected, measured and weighed them, and then we released them, especially the birds and bats. We also studied their paths through grass and their tracks on sand and wet soil, the openings of the rodent galleries, the hills and droppings; some birds were studied using the field glasses, and others were identified by their song.

Studied areas (Fig. 1):

- from Romanian Dobrogea – Măcin, Greci, Cerna, Celic Dere, Isaccea, Niculițel, Babadag, Slava Cercheză and Sarichioi – from Tulcea County; - Hârșova,

Horia, Târgușor, Cernavodă, Peștera, Băneasa, Canaraua Feti and Hagieni – from Constanța County – with endemic or rare floral and faunal elements, of Ponto-Mediterranean, Ponto-Balkan, Ponto-Panonic origin, etc, which influenced the decisions of creating protected areas within the “Natura 2000” ecological network, as areas of special avifaunal protection (SPAs) or sites of community interest (SCIs).

- from Bulgarian Dobrogea – Dobrich, Dobrichka, General Toshevo, Kavarna, Krushari, Shabla and Tervel from Dobrich County, and Shrebarba lake, Dulovo, Tutrakan, Alfatar, Glavnitza and Malak Preslavetz from Silistra County where the forests account for 23 % of the whole territory of the county. Natural plantations of oak, cerris oak, hornbeam and the like are prevalent. Also, here there are some SCIs (Durankulak Lake, Shabla-Ezerets Lake and Kaliakra Complex, other surfaces from the same areas being SPAs, and have different codes in the Bulgarian legislation).

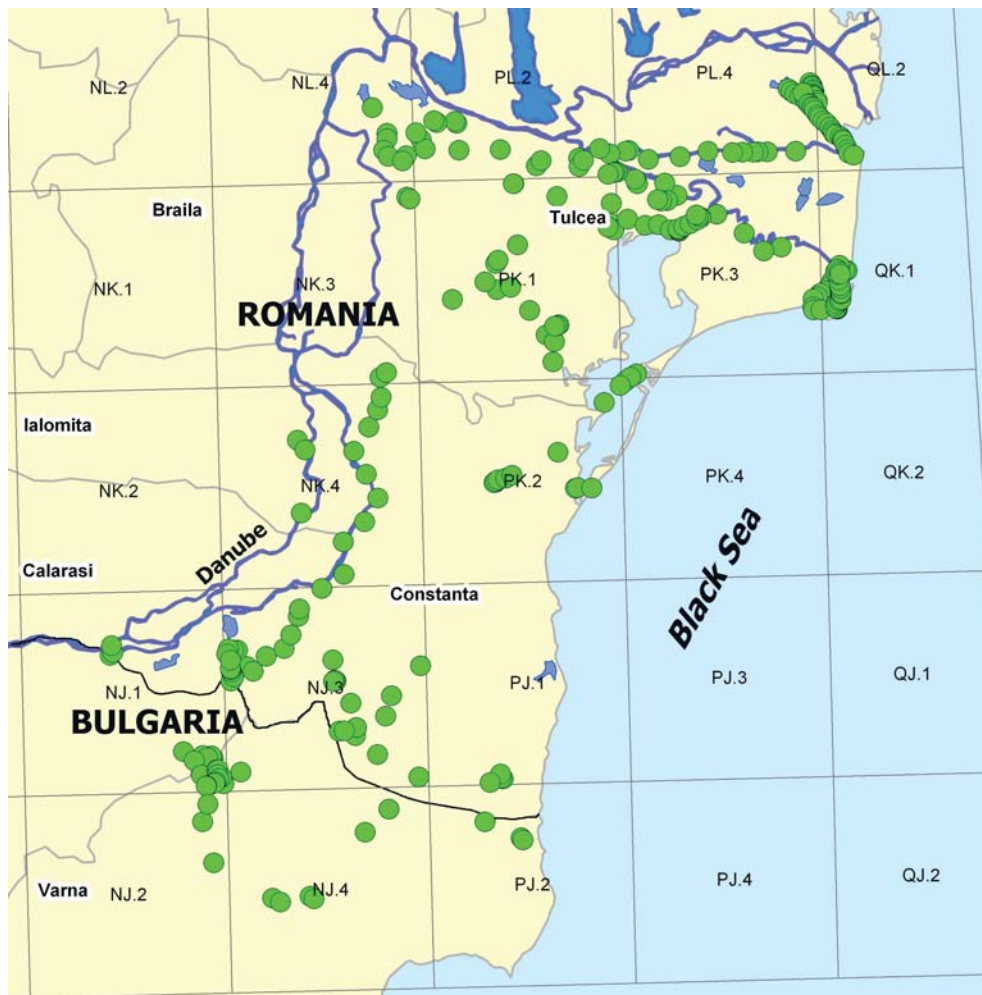


Fig. 1 - Survey points from Romanian and Bulgarian Dobrogea (U.T.M. quadrants 50x50 km).

RESULTS AND DISCUSSIONS

AMPHIBIANS (Class AMPHIBIA)

Although they are not completely adapted to the terrestrial life, being dependant on the water presence, at least for reproduction, the amphibians succeeded in adopting some strategies for surviving in steppe areas, thus colonizing the land since billion of years ago. Within the ecological conditions of Dobrogea, some amphibians withdraw in stone cracks, holes in the ground or in the mud of the few rivers, pools and lakes of the region, for hibernating. But, no matter where they spend winter, in spring they go to the water surfaces – even there are temporary pools appeared after the snow melting, where they lay eggs.

We do not expect to occur a large specific diversity of amphibian in Romanian and Bulgarian Dobrogea, because there are a few wet areas and rare and very rare water flows. Excepting the Danube in the western, northern and North-Eastern Romanian Dobrogea, there are rare water flows which often are dried in summer: Valea Jijila, Valea Sulucului, Taița River where there is a dam, near Horia locality, which accumulates a large quantity of water, then Telița, Valea Roștilor, Topolog, Ciucurova, Slava, Casimcea, Mahomencea, Hamangia, Ceamurlia, Urluia. The most important lakes are: Bugeacului, Oltina, Răzoarele, Corbu, then Nuntași, Babadag, Golovița, excluding Razelm-Sinoe lakes and the littoral ones (Tașaul, Siutghiol, Techirghiol).

In Bulgarian Dobrogea, the hydrographic network is more limited, water accumulations (e.g. on Suha Reka) and lakes (Srebarna, Shabla, Durankulak) are more important.

Thus, from the studied area we can name as representatives of the amphibian species:

Bombina bombina (L., 1761) occurs in the entire Romanian and Bulgarian Dobrogea, where the pools form, even they are temporary. The simple preservation of some wet areas, with unpolluted water may allow the numerical improvement of the populations, smaller and smaller along the last decades, because of the anthropic pressure.

Pelobates fuscus (Laurentus, 1768) has the hind legs short and strong, with a shovel-like widened inner metatarsal tubercle, for digging easier in the ground. Romanian name is “broasca de pământ” (“ground frog”), because, both in summer and in winter it hides in the ground; for hibernation it digs deeper. When the weather is warm, it can be seen only at night, when it goes out from shelter for foraging. Also, this species recorded important numerical decreases of its populations, and it is considered a species of community interest (Cogălniceanu [in Făgăraș et al.], 2008).

Pelobates syriacus balcanicus Karaman, 1928 has the biology and habits of the previous species, from which it differentiates by the much widened metatarsal tubercle (almost double), flattened frons and a vertical pupil in light. It is rarer than *P. fuscus*, and the northern limit of its distribution is the South of Romania.

Hyla arborea L., 1758 shelters on the leaves of the humid grassy and it even climb the trees, where it can be remarked only when it utters its well-known sounds. It is included in the list of the species of community interest.

Bufo viridis L., 1768 is less pretentious (among amphibians) to the water quality and it is not disturbed by the man's presence, but numerous individuals are victims, being crushed by cows, cars, and even by man, during the night.

Amphibian species, observed and reported by us, are included in the annexes of the Directives of the Habitats, with the plant and animal species of community interest and whose conservation needs the declaration of some special conservation areas.

REPTILIANS (Class REPTILIA)

There are species to whom the conditions from the Romanian and Bulgarian Dobrogea are optimum, just by the steppe regime, with less precipitations, with frequent sunny places and rocks.

Testudo graeca ibera Pallas, 1814 was occurred in fallow places, with spontaneous gramineae, but also in forests, and protection belts. They are hardly observed in the wild. They accidentally come out along the path. In spring and in autumn they can be observed during the breeding dances, because they hit each other the carapaces, giving the impression that somebody is breaking stones. It is a threatened species because the ornaments from the yellow carapace, bordered by black spots, is interesting for those who are very fond of "original" night lights, ash-trays etc. That is why, besides the statute of endangered species by the human, dog, cat and boar pressure, it is also protected by the interdiction of any kind of trade (CITES Convention to which Romania adhered in 1993).

Emys orbicularis (L., 1758) is strictly bound to the presence of the fresh waters (it rarely goes in the brackish ones) and that is why its populations are isolated in Dobrogea. As a matter of fact, the preferred food lives in water: earthworms, snails, tadpoles, fishes.

Cogălniceanu (2008) asserts that the common slider, *Trachemys scripta*, escaped from aquaria, is competitive in the wild, competing with the native one, occupying the same habitats and looking for the same food sources.

Lacerta agilis L., 1758 prefers the steppe areas, being observed in the edge of the roads and paths, at the limit between the agricultural cultures and the commons. It is not protected.

Lacerta viridis (Laurenti, 1768) was observed along the valleys, with a steppe vegetation and rarely in the woods and in agricultural lands. It is important in the trophic relations of the ecosystems of Dobrogea because it feeds on coleopterans, orthopterans, dipterans, hymenopterans, other smaller lizards. It is not protected but the anthropic pressure endangers its life.

Podarcis taurica Pallas, 1841 is considered a Balkan endemic species, preferring the humid areas and the forest skirts. It has an important role in the ecosystems' trophic relations of Dobrogea, feeding mainly on injurious insects, myriapods, araneae. It is included both in the Romanian and Bulgarian legislation of animal protection.

Coluber caspius Gmelin, 1789 is characteristic to the rocky grassy slopes, but it also has been seen and caught along the valley from the base of Dealul Consul, South-West of locality Izvoarele. It is subjected to the wrong beliefs on snakes, local people trying to do their best in killing them, especially because they feed on poultry. We consider that the statute of endangered species and the trying to convince people that it mainly feeds on rodents, probably it is a chance in preserving this species in the faunal fund of the Romanian and Bulgarian Dobrogea.

Natrix natrix (L., 1758) is frequently occurred, mainly around the households with cattle sheds and near waters, being an excellent swimmer. It is not protected, and in some areas it is captured for its skin, for morocco-leather tanning. This interest in this species might endanger it.

Vipera ammodytes montandoni Boulenger, 1904 was observed on the sunny slopes of the Măcin Mountains National Park, with a grassy vegetation, rare bushes of *Crataegus* and *Prunus*, but with a rocky substratum, for refuges when endangered and for protected places for hibernation. It is captured for its venom necessary in pharmacy. Over-exploitation of the individuals made it to be considered an endangered species (Iftime, 2005). It is protected in Bulgaria, by the Law no 77/2002 of implementing the Directives of the Habitats.

But we can assert that all reptiles have a protection statute and are included in the red lists of some protected areas (e.g. Red List of Măcin Mountains National Park), in OUG 57/2007 (Romanian Governmental Ordinance no 57/2007) on the protected natural areas to preserve wild flora and fauna's natural habitats) or in the annexes of some international conventions.

BIRDS (Class AVES)

The birds from the Romanian and Bulgarian Dobrogea are subjected to important anthropic influences, both by the industrial and agricultural activities and by the modifications of the habitats, but especially by the wind farms. In northern Dobrogea, there are some wind turbines, some of them functional, others mounted for the future necessities, but in the Bulgarian Dobrogea there are hundreds of wind turbines, forming real armies, reaching 60 m high, among whose propellers birds of all dimensions can fly. The risk is greater during migrations, Dobrogea being a very important line, both for reaching the Danube Delta and for their travel to North, to the Siret Valley, in spring, and backwards, in autumn. Therefore, from the perspective of enlarging the using of the equipments for generating unconventional electric power, monitoring programs on the birds' flight or on the impact of the wind farms on ornithofauna would be necessary. Even a negotiation with the managers of these wind farms is also necessary in order to stop them temporarily (1 h) when the bird flocks come around the wind turbines, during migration period. In the Bulgarian Dobrogea such kind of bird monitoring station already exists, with permanent records of the flight direction, especially around the wind turbines, for finding the eventual corps or injured birds. In addition, the Bulgarian ornithologists (Viktor Vasilev, in verbis) noticed that the migratory bird flocks observe from the distance the presence of the wind farms and then, they either change the fly direction or fly higher for avoiding the impact with the new constructions, at least during the day.

Table 1

List of the bird species observed in the Romanian and Bulgarian Dobrogea (in 2008 and 2009 and their protection status).

Species			INTERNATIONAL			ROMANIA		BULGARIA	
	Country	European Threat Status	EC Bird Directive	Bern Con.	Bonn Con.	RGO 57/2007	RBVRO	Biodiversity Act	Bulgarian Threat Status
1	2	3	4	5	6	7	8	9	10
<i>Tachybaptus ruficollis</i> (Pall., 1764)	Ro	S	-	II	-	4B	-	A3	V
<i>Podiceps cristatus</i> (L., 1758)	Ro	S	-	III	-	-	-	A3	V
<i>Podiceps grisegena</i> (Bodd., 1783)	Ro	S	-	II	-	-	-	A3	E
<i>Phalacrocorax pygmaeus</i> (Pall., 1773)	Ro	V	I	II	II	3	V	A2, 3	E
<i>Phalacrocorax carbo sinensis</i> (Blum., 1798)	Ro	S	-	III	-	-	-	-	-
<i>Pelecanus onocrotalus</i> L., 1758	Ro	R	I	II	I/II	3	V	-	-
<i>Pelecanus crispus</i> Bruch., 1832	Ro	V	I	II	I/II	-	cE	-	-
<i>Botaurus stellaris</i> (L., 1758)	Ro	(V)	I	II	II	3	-	A2, 3	E
<i>Isobrychus minutus</i> (L., 1766)	Ro Bg	(V)	I	II	II	3	V	A2, 3	E
<i>Nycticorax nycticorax</i> (L., 1758)	Ro	D	I	II	-	3	V	-	-
<i>Ardeola ralloides</i> (Scop., 1769)	Ro	V	I	II	-	3	-	-	-

Table 1 (continued)

Species			INTERNATIONAL			ROMANIA		BULGARIA	
	Country	European Threat Status	EC Bird Directive	Bern Con.	Bonn Con.	RGO 57/2007	RBVRO	Biodiversity Act	Bulgarian Threat Status
1	2	3	4	5	6	7	8	9	10
<i>Egretta alba</i> (L., 1758)	Ro	S	I	II	-	3	E	-	-
<i>Egretta garzetta</i> (L., 1758)	Ro	S	I	II	-	3	cE	-	-
<i>Ardea cinerea</i> (L., 1758)	Ro Bg	S	-	III	-	-	-	A3	V
<i>Ardea purpurea</i> (L., 1766)	Ro Bg	V	I	II	II	3	E	A2, 3	E
<i>Platalea leucorodia</i> L., 1758	Ro	E	I	II	II	3	-	-	-
<i>Plegadis falcinellus</i> L., 1766	Ro	D	I	II	II	3	E	-	-
<i>Ciconia nigra</i> (L., 1758)	Ro	R	I	II	II	3	V	-	-
<i>Ciconia ciconia</i> (L., 1758)	Ro Bg	V	I	II	II	3	V	A2,3	V
<i>Cygnus olor</i> (Gm., 1789)	Ro Bg	S	-	III	II	-	-	A2,3	V
<i>Anser anser</i> (Swinhoe, 1871)	Ro	S	-	III	II	5C	-	A3	E
<i>Anas strepera</i> L., 1758	Ro	V	II	III	II	5C	-	-	-
<i>Anas platyrhynchos</i> L., 1758	Ro	S	-	III	II	5D	-	A4	-
<i>Anas querquedula</i> L., 1758	Ro	V	-	III	II	5C	-	A4	V
<i>Tadorna tadorna</i> (L., 1758)	Ro	S	-	II	II	3	V	A2, 3	V
<i>Tadorna ferruginea</i> (Pall., 1764)	Ro	V	I	II	II	3	cE	A2, 3	cE
<i>Circaetus gallicus</i> (Gm., 1788)	Ro	R	I	II	II	3	V	A2, 3	V
<i>Circus aeruginosus</i> (L., 1758)	Ro Bg	S	-	II	II	3	-	A2, 3	E
<i>Accipiter gentilis</i> (L., 1758)	Ro	S	-	II	II	3	-	A3	E
<i>Accipiter nisus</i> (L., 1758)	Ro	S	-	II	II	-	-	A3	E
<i>Buteo buteo</i> L., 1758)	Ro Bg	S	-	II	II	-	-	A3	S
<i>Buteo rufinus</i> (Cretzschm., 1827)	Ro Bg	(E)	I	II	II	3	-	A2, 3	V
<i>Aquila pomarina</i> Brehm, 1831	Ro Bg	R	I	II	II	3	V	A2, 3	V
<i>Aquila clanga</i> Pall., 1811	Ro	E	I	II	II	3	cE	A2, 3	cE
<i>Aquila heliaca</i> Sav., 1809	Ro Bg	E	I	II	II	3	cE	A2, 3	R
<i>Hieraaetus pennatus</i> (Gmel., 1788)	Ro	R	I	II	II	3	cE	A2, 3	V
<i>Falco tinnunculus</i> L., 1758	Ro Bg	D	-	II	II	4B	-	A3	-
<i>Falco subbuteo</i> L., 1758	Ro Bg	S	-	II	II	4B	-	A3	V
<i>Falco vespertinus</i> (L., 1766)	Ro Bg	V	-	II	II	3	V	A2, 3	cE
<i>Falco cherrug danubialis</i> Kleinschm., 1939	Ro	E	-	II	II	3	cE	-	-
<i>Perdix perdix</i> (L., 1758)	Ro Bg	V	I/II/III	III	-	5C 5D	-	A4	-
<i>Coturnix coturnix</i> (L., 1758)	Ro Bg	V	-	III	II	5C	-	A4	-
<i>Phasianus colchicus</i> L., 1758	Ro Bg	S	-	III	-	5C 5D	-	A4	-
<i>Fulica atra</i> (L., 1758)	Ro Bg	S	-	III	-	5C 5D	-	A4	-
<i>Galinula chloropus</i> (L., 1758)	Ro Bg	S	-	III	-	5C	-	A3	-
<i>Haematopus ostralegus</i> L., 1758	Ro	S	-	III	II	3??	V	A3	cE
<i>Himantopus himantopus</i> (L., 1758)	Ro	S	I	II	II	3	E	A2, 3	E
<i>Recurvirostra avosetta</i> L., 1758	Ro	Lw	I	II	II	3	V	A2, 3	E
<i>Charadrius dubius curonicus</i> Gmel., 1789	Ro	(S)	-	II	II	-	-	A3	V
<i>Vanellus vanellus</i> (L., 1758)	Ro	(S)	-	III	II	-	-	A3	V
<i>Limosa limosa</i> (L., 1758)	Ro	V	II	III	II	-	-	A3	-
<i>Philomachus pugnax</i> (L., 1758)	Ro	(S)	I/II	III	II	-	-	A3	-
<i>Tringa totanus</i> (L., 1758)	Ro	D	II	III	II	-	-	A2, 3	cE
<i>Tringa ochropus</i> L., 1758	Ro	(S)	-	II	II	-	-	A3	E

Table 1 (continued)

Species			INTERNATIONAL			ROMANIA		BULGARIA	
	Country	European Threat Status	EC Bird Directive	Bern Con.	Bonn Con.	RGO 57/2007	RBVRO	Biodiversity Act	Bulgarian Threat Status
1	2	3	4	5	6	7	8	9	10
<i>Tringa glareola</i> L., 1758	Ro	D	I	II	II	3	-	A3	-
<i>Larus cachinnans</i> Pall., 1811	Ro	S	-	III	-	-	-	-	-
<i>Larus melanocephalus</i> Temm., 1820	Ro	S	I	II	II	3	E	A3	V
<i>Larus ridibundus</i> L., 1766	Ro Bg	S	-	III	-	-	-	A3	E
<i>Larus minutus</i> Pall., 1776	Ro	D	-	II	-	3	-	A3	-
<i>Larus ichthyaetus</i> Pall., 1773	Ro	S	-	III	-	-	-	-	-
<i>Sterna hirundo</i> (L., 1758)	Ro	S	I	II	-	3	-	A3	E
<i>Sterna sandvicensis</i> Lath., 1787	Ro	D	I	II	II	3	cE	A3	E
<i>Sterna albifrons</i> Pall., 1764	Ro	D	I	II	II	3	E	A3	E
<i>Chlydonias hybrida</i> (Pall., 1811)	Ro	D	I	II	II	3	-	A3	V
<i>Chlydonias niger</i> (L., 1758)	Ro	D	I	II	II	3	-	A3	cE
<i>Chlydonias leucopterus</i> Temm., 1815	Ro	S	-	II	-	-	-	A3	-
<i>Columba palumbus</i> L. 1758	Bg	S	I/II/III	III	-	5C 5D	V	A4	-
<i>Streptopelia decaocto</i> (Friv., 1838)	Ro Bg	(S)	-	III	-	5C	-	A4	-
<i>Streptopelia turtur</i> (L., 1758)	Ro Bg	D	II	III	-	5C	-	A4	-
<i>Cuculus canorus</i> L., 1758	Ro Bg	S	-	III	-	-	-	A3	-
<i>Ous scops</i> (L., 1758)	Ro Bg	(D)	-	II	-	4B	-	A3	-
<i>Athene noctua</i> (Scop., 1769)	Ro Bg	D	-	II	-	4B	-	A3	-
<i>Strix aluco</i> L., 1758	Ro Bg	S	-	II	-	-	V	A3	-
<i>Asio otus</i> (L., 1758)	Ro Bg	S	-	II	-	-	-	A3	-
<i>Caprimulgus europaeus</i> L., 1758	Ro	(D)	I	II	II	3	-	A2, 3	-
<i>Apus apus</i> (L., 1758)	Ro	S	-	III	-	-	-	A3	-
<i>Tachymarpis melba</i> L., 1758	Ro Bg	(S)	-	II	-	-	-	A3	-
<i>Alcedo atthis</i> (L. 1758)	Ro Bg	D	I	II	-	3	-	A2, 3	-
<i>Merops apiaster</i> L., 1758	Ro Bg	D	-	II	II	4B	-	A2, 3	-
<i>Coracias garrulus</i> L., 1758	Ro Bg	V	I	II	II	3	-	A2, 3	-
<i>Upupa epops</i> L., 1758	Ro Bg	D	-	II	-	4B	V	A3	-
<i>Jynx torquilla</i> L., 1758	Ro	D	-	II	-	4B	E	A3	-
<i>Dendrocopos syriacus</i> (Hemp. & Ehr., 1833)	Ro Bg	(S)	I	II	-	-	-	A2, 3	-
<i>Dendrocopos major</i> (L., 1758)	Ro Bg	S	-	II	-	-	-	A3	-
<i>Dendrocopos medius</i> (L., 1758)	Ro Bg	S	I	II	-	3	-	A2, 3	-
<i>Dendrocopos leucotos</i> (Shp. & Dress., 1871)	Ro	S	I	II	-	3	-	A2, 3	V
<i>Dendrocopos minor</i> (Brehm, 1831)	Ro	S	-	II	-	-	-	A3	-
<i>Dryocopus martius</i> (L., 1758)	Ro	S	I	II	-	3	-	A2, 3	V
<i>Picus viridis</i> L., 1758	Ro	D	-	II	-	4B	-	A3	-
<i>Picus canus</i> (Gm., 1788)	Ro	D	I	II	-	3	-	A2, 3	V
<i>Melanocorypha calandra</i> (L., 1758)	Ro	(D)	I	II	-	3	-	A2, 3	E
<i>Calandrella brachydactyla</i> (Leis., 1814)	Ro	V	I	II	-	3	-	A2, 3	V
<i>Galerida cristata</i> L., 1758	Ro Bg	(D)	-	III	-	-	-	A3	-
<i>Lullula arborea</i> (L., 1758)	Ro Bg	V	I	III	-	3	-	A2, 3	-
<i>Alauda arvensis</i> L., 1758	Ro Bg	V	II	III	-	5C	-	A3	-
<i>Riparia riparia</i> (L., 1758)	Ro	D	-	II	-	-	-	A2,3	-

Table 1 (continued)

Species			INTERNATIONAL			ROMANIA		BULGARIA	
	Country	European Threat Status	EC Bird Directive	Bern Con.	Bonn Con.	RGO 57/2007	RBVRO	Biodiversity Act	Bulgarian Threat Status
1	2	3	4	5	6	7	8	9	10
<i>Hirundo rustica</i> L., 1758	Ro Bg	D	-	II	-	-	-	A3	-
<i>Delichon urbica</i> (L., 1758)	Ro Bg	S	-	II	-	-	-	A3	-
<i>Cecropis daurica</i> (L., 1771)	Bg	S	-	II	-	-	-	A3	-
<i>Ptyonoprogne rupestres</i> Scop., 1769	Bg	S	-	II	-	-	-	A3	-
<i>Anthus campestris</i> (L. 1758)	Ro Bg	V	I	II	-	3	-	A2, 3	-
<i>Anthus trivialis</i> (L. 1758)	Ro Bg	S	-	II	-	-	-	A3	-
<i>Motacilla flava flava</i> L., 1758	Ro Bg	S	-	II	-	4B	-	A3	-
<i>Motacilla flava feldegg</i> (Mich. 1830)	Ro Bg	S	-	II	-	4B	-	A3	-
<i>Motacilla alba</i> L., 1758	Ro Bg	S	-	II	-	4B	-	A3	-
<i>Luscinia luscinia</i> (L., 1758)	Ro	S	-	II	II	-	-	A3	-
<i>Luscinia megarhynchos</i> Brehm, 1831	Ro	(S)	-	II	II	-	-	A3	-
<i>Saxicola rubetra</i> (L., 1758)	Ro Bg	S	-	II	II	-	-	A3	-
<i>Saxicola torquata rubicola</i> (L., 1766)	Ro	(D)	-	II	II	-	-	A3	-
<i>Erithacus rubecula</i> (L., 1758)	Ro Bg	S	-	II	II	4B	-	A3	-
<i>Phoenicurus phoenicurus</i> (L., 1758)	Ro Bg	V	-	II	II	4B	-	A3	V
<i>Phoenicurus ochr. gibraltariensis</i> (Gm., 1789)	Ro Bg	S	-	II	II	4B	-	A3	-
<i>Oenanthe oenanthe</i> (L., 1758)	Ro Bg	S	-	II	II	-	-	A3	-
<i>Oenanthe pleschanka</i> (Lepechin, 1770)	Ro	(S)	-	II	II	3	V	A2, 3	E
<i>Oenanthe hispanica</i> (L., 1758)	Ro	V	-	II	II	-	-	A2, 3	-
<i>Turdus merula</i> L., 1758	Ro Bg	S	II	III	II	-	-	A3	-
<i>Turdus philomelos ericetorum</i> Brehm, 1831	Ro Bg	S	II	III	II	5C	-	A3	-
<i>Acrocephalus schoenobaenus</i> (L., 1758)	Ro	(S)	-	II	II	-	-	A3	V
<i>Acrocephalus scirpaceus</i> (Herm., 1804)	Ro	S	-	II	II	-	-	A3	-
<i>Acrocephalus arundinaceus</i> (L., 1758)	Ro	(S)	-	II	II	-	-	A3	-
<i>Hippolais pallida elaeica</i> (Hemp.& Ehr., 1833)	Ro	(V)	-	II	II	-	-	A3	-
<i>Hippolais icterina</i> (Vieil., 1817)	Ro	S	-	II	II	-	-	A3	V
<i>Sylvia nisoria</i> (Bechst. 1795)	Ro Bg	(S)	I	II	II	-	-	A2, 3	-
<i>Sylvia communis</i> Lath. 1787	Ro Bg	S	-	II	II	-	-	A3	-
<i>Sylvia atricapilla</i> (L. 1758)	Ro Bg	S	-	II	II	-	-	A3	-
<i>Sylvia curruca</i> (L. 1758)	Ro Bg	S	-	II	II	-	-	A3	-
<i>Phylloscopus sibilatrix</i> (Bechst. 1793)	Ro	(S)	-	II	II	4B	-	A3	-
<i>Phylloscopus collybita</i> (Vieil., 1817)	Ro Bg	(S)	-	II	II	4B	-	A3	-
<i>Muscicapa striata</i> (Pall., 1746)	Ro Bg	D	-	II	II	-	-	A3	-
<i>Parus caeruleus</i> (L. 1758)	Ro Bg	S	-	II	-	-	-	A3	-
<i>Parus major</i> L., 1758	Ro Bg	S	-	II	-	-	-	A3	-
<i>Aegithalos caudatus</i> (L., 1758)	Ro Bg	S	-	III	-	-	-	A3	-
<i>Panurus biarmicus ruscicus</i> (Brehm, 1831)	Ro	(S)	-	II	-	4B	-	A3	-
<i>Sitta europaea</i> Wolf, 1810	Ro Bg	S	-	II	-	4B	-	A3	-
<i>Remiz pendulinus</i> L., 1758	Ro	(S)	-	III	-	4B	-	A3	V
<i>Oriolus oriolus</i> (L., 1758)	Ro Bg	S	-	II	-	4B	-	A3	-
<i>Lanius collurio</i> (L., 1758)	Ro Bg	(D)	I	II	-	3	-	A2, 3	-
<i>Lanius minor</i> (Gm., 1788)	Ro Bg	(D)	I	II	-	3	-	A2, 3	-

Table 1 (continued)

Species			INTERNATIONAL			ROMANIA		BULGARIA	
	Country	European Threat Status	EC Bird Directive	Bern Con.	Bonn Con.	RGO 57/2007	RBVRO	Biodiversity Act	Bulgarian Threat Status
1	2	3	4	5	6	7	8	9	10
<i>Lanius senator</i> L., 1758	Ro	D	-	II	-	-	-	A3	-
<i>Garrulus glandarius</i> (L., 1758)	Ro Bg	(S)	-	III	-	5C	-	A5	-
<i>Pica pica</i> (L., 1758)	Ro Bg	S	-	III	-	5C	-	A4	-
<i>Corvus frugilegus</i> L., 1758	Ro Bg	S	-	III	-	5C	-	A4	-
<i>Corvus monedula</i> (Vieil. 1817)	Ro Bg	(S)	-	III	-	-	-	A4	-
<i>Corvus corone</i> L., 1758	Ro Bg	S	-	III	-	5C	-	A4	-
<i>Corvus corax</i> L., 1758	Ro Bg	(S)	-	III	-	4B	E	A3	-
<i>Sturnus vulgaris</i> L., 1758	Ro Bg	S	-	III	-	5C	-	A4	-
<i>Passer domesticus</i> (L., 1758)	Ro Bg	S	-	III	-	-	-	A5	-
<i>Passer montanus</i> (L., 1758)	Ro Bg	(S)	-	III	-	-	-	A3	-
<i>Passer hispaniolensis</i> (Temm., 1820)	Ro Bg	(S)	-	III	-	4B	-	A3	-
<i>Fringilla coelebs</i> (L., 1758)	Ro Bg	S	I 9	III	-	-	-	A3	-
<i>Carduelis carduelis</i> (L., 1758)	Ro Bg	(S)	-	II	-	4B	-	A3	-
<i>Carduelis chloris</i> (L., 1758)	Ro Bg	S	-	II	-	4B	-	A3	-
<i>Carduelis cannabina</i> L. 1758	Ro Bg	S	-	II	-	4B	-	A3	-
<i>Coccothraustes coccothraustes</i> (L., 1758)	Ro Bg	S	-	II	-	4B	-	A3	-
<i>Emberiza calandra</i> (L., 1758)	Ro Bg	(S)	-	III	-	4B	-	A3	-
<i>Emberiza citrinella</i> (L., 1758)	Ro Bg	(S)	-	II	-	-	-	A2, 3	-
<i>Emberiza melanocephala</i> Scop., 1769	Ro	(V)	-	II	-	4B	-	A3	-
<i>Emberiza schoeniclus</i> (L., 1758)	Ro	S	-	II	-	-	-	A3	-
<i>Emberiza hortulana</i> L., 1758	Ro	(V)	I	III	-	3	-	A2, 3	-

Abbreviations: European Threat Status: E - Endangered, V - Vulnerable, R - Rare, D - Declining, L - Localized, Ins. - Insufficiently Known, S - Secure, (S) - Status provisional, W - Category relates to winter population;

EC Bird Directive Annex I, Annex II, Annex III; Bern Convention Appendix I, Appendix II; Bonn Convention Appendix I, Appendix II

Protection statute: (RGO, with annexes) = Romanian Government Ordinance No. 57/2007, on the regime of the protected areas, conservation of the natural habitats, of wild flora and fauna:

A3-RGO 57/2007 = bird species whose conservation needs the establishing of the areas of special avifaunal protection; A4B-RGO No. 57/2007 = bird species which need strict protection; A5C-RGO No. 57/2007 = bird species of community interest whose hunting is allowed; A5D-RGO No. 57/2007 = bird species of community interest whose commercialization is allowed; A5E-RGO No. 57/2007 = bird species of community interest whose commercialization is allowed in special conditions.

RBVRO - Red Book of Vertebrates of Romania; Ro-Romania; Bg-Bulgaria;

From a total of 159 observed bird species, only 57 are protected by the international legislation (included in the annexes of the Bird Directives - 79/409/EEC (*European Economic Community*) or in national legislation. In Romania, 32 bird species are protected by the Red Book of Vertebrates and 99 species by the Romanian Government Ordinance No. 57/2007, on the regime of the protected areas, conservation of the natural habitats, of wild flora and fauna with annexes. In Bulgaria, 145 bird species observed in the field are protected by the Biodiversity Act (Tab. 1).

From the list above, most of the species are included in the annexes of the Bird Directive 79/409/EEC for the conservation of wild birds and in the national legislations (Romanian and Bulgarian) for the biodiversity conservation.

MAMMALS (Class MAMMALIA)

As regards the mammals, Murariu et al. (2009) reported 39 species of the orders Insectivora (5), Chiroptera (8), Lagomorpha (1), Rodentia (15), Carnivora (8) and Artiodactyla (2), discussing the evolution tendencies of each population, threatening category and protection statute in the international and national legislation. Our studies focused on collecting small mammals and on observations on those ones middle- and large sized. We returned in the same place several times for observing the birds and mammals, as in Suha Reka (Fig. 2 and fig. 3, left). In the same area, we found hills and galleries of *Spalax leucodon*, without results in catching one specimen (Fig. 3, right).

However, setting about 50 snap traps in Romanian and Bulgarian Dobrogea several small mammal species were caught as it was presented in



Fig. 2 - Suha Reka Valley. Left: The bridge under which bats roosted and the passage of Passeriformes passed (2008). Right: The same bridge with the net, to inventory birds and bats (2009). (Photos: D. Murariu)



Fig. 3 - Left: Underbridge roost for bats and birds in Suha Reka Valley. Right: A gallery of *Spalax leucodon* and a snap trap set at the entrance; also in Suha Reka Valley (2009). (Photos: D. Murariu)

figures 4 and 5. From the first station, 4 species were caught (Fig. 4) and among them, the most common species seemed to be *Apodemus sylvaticus*. *Apodemus agrarius* is also important because it usually prefers humid places, a rare habitat in Dobrogea, excepting few creeks and rivers (e.g. Telița). *Dryomys nitedula* lives mostly in afforested areas and it is the only door mouse species occurred in Dobrogea.

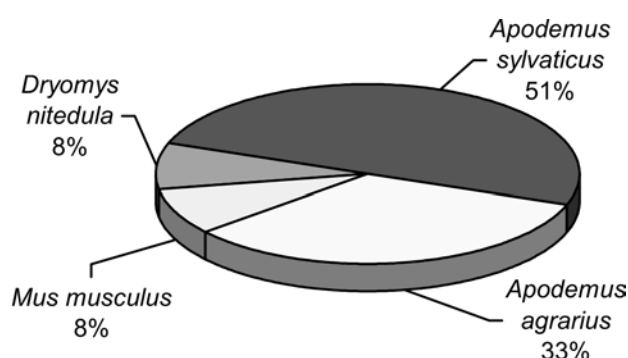


Fig. 4 - Four small mammal species collected from Celic Dere – Tulcea county (Romania, 2008).

In the Bulgarian stations (Bejanovo and Durankulak, figs 6 and 7) specimens of eight small mammal species were caught, only *Apodemus sylvaticus* (11) and *Apodemus agrarius* (10) being common with the Romanian part, also with a large number of individuals (Fig. 5). But *Crocidura suaveolens* was the dominant species. *Microtus arvalis* (6) and *M. subterraneus* (1) were less represented. *Mesocricetus newtoni* (1) is in its preferred steppe habitat (Fig. 7, right)

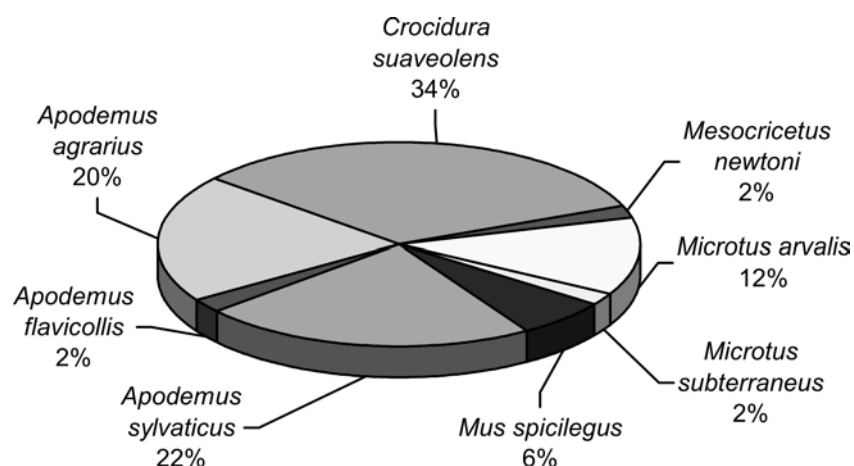


Fig. 5 - Eight small mammal species collected from Bejanovo and Durankulak (Bulgaria, 2009).



Fig. 6 - Reserve food for winter gathered by *Mus spicilegus*, close to Bejanovo (2009). (Photo: D. Murariu)



Fig. 7 - Two steppe habitats of collecting small mammal species from Bejanovo (left) and Durankulak (right) – Bulgaria (2009). (Photo: D. Murariu)

*List of the mammals reported from the Romanian and Bulgarian Dobrogea
(2008 and 2009)*

Order INSECTIVORA Bowdich, 1821

Family Erinaceidae Bonaparte, 1838

Erinaceus concolor Martin, 1838

Family Talpidae Gray, 1825

Talpa europaea Linnaeus, 1758

Family Soricidae (Gray, 1821)

Sorex araneus Linnaeus, 1758*Neomys fodiens* (Pennant, 1771)*Crocidura suaveolens* (Pallas, 1811)

Order CHIROPTERA Blumenbach, 1779

Family Rhinolophidae Bell, 1836

Rhinolophus ferrumequinum (Schreber, 1774)*Rhinolophus mehelyi* Matschie, 1901

Family Vespertilionidae (Gray, 1821)

Myotis myotis (Borkhausen, 1779)*Plecotus auritus* (Linnaeus, 1758).*Miniopterus schreibersii* (Kuhl, 1819)*Pipistrellus pipistrellus* (Schreber, 1774)*Hypsugo savii* (Bonaparte, 1837)*Nyctalus noctula* (Schreber, 1774)

Order LAGOMORPHA Brandt, 1855

Family Leporidae Gray, 1821

Lepus europaeus Pallas, 1778

Order RODENTIA Bowdich, 1821

Family Sciuridae Gray, 1821

Spermophilus citellus (Linnaeus, 1766)

Family Myoxidae Gray, 1821

Dryomys nitedula (Pallas, 1779)

Family Cricetidae Rochebrune, 1883

Mesocricetus newtoni (Nehring, 1898)

Family Arvicolidae Gray, 1821

Arvicola terrestris (Linnaeus, 1758)*Microtus* (= *Pitymys* Mc Murtrie, 1831) *subterraneus* (de Selys-Longschamps, 1836)*Microtus arvalis* (Pallas, 1779)*Ondatra zibethicus* (Linnaeus, 1766)

Family Muridae Gray, 1821

Apodemus sylvaticus (Linnaeus, 1758)*Apodemus flavicollis* (Melchior, 1834)*Apodemus agrarius* (Pallas, 1771)*Rattus norvegicus* (Berkenhout, 1769)*Mus musculus* Linnaeus, 1766*Mus spicilegus* Petényi, 1882

Family Spalacidae Gray, 1821

Spalax leucodon Nordmann, 1840

Family Zapodidae Coues, 1875

Sicista subtilis (Pallas, 1773)

Order CARNIVORA Bowdich, 1821

Family Canidae Gray, 1821

Canis aureus Linnaeus, 1758*Vulpes vulpes* (Linnaeus, 1758)

Family Mustelidae Swainson, 1835

Meles meles (Linnaeus, 1758)*Martes foina* (Erxleben, 1777)*Mustela putorius* (Linnaeus, 1758)*Mustela eversmanni* Lesson, 1827*Vormela peregusna* Gldenstaedt, 1770

Family Felidae Gray, 1821

Felis silvestris Schreber, 1777

Order ARTIODACTYLA Owen, 1848

Family Suidae Gray, 1821

Sus scrofa Linnaeus, 1758

Family Cervidae Gray, 1821.

Capreolus capreolus (Linnaeus, 1758)

Among the 39 mammal species, some of them have a protection statute, mentioned in the Red Book of the Vertebrates of Romania, others in OUG 57/2007 on the regime of the protected natural areas, conservation of the natural habitats, of wild flora and fauna, in the annexes of the Law no 103/1996 (completed and modified) of the hunting fund and game protection in Romania, or in the annexes of the international conventions (ex., Habitat Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora).

Conclusions

1. The terrestrial vertebrate fauna from Romanian and Bulgarian Dobrogea is an important part of biodiversity with 5 species of amphibians, 8 of reptiles, 159 of birds and 39 of mammals.

2. We consider that the amphibian fauna has reduced species diversity, mainly because Dobrogea is inhospitable by its steppe regime, without a rich hydrographic network, and the species reported by us (some of them terrestrial) are present along a few rivers, pools and lakes, where they can lay eggs.

3. From the 8 reptile species, some of them (e.g. *Emys orbicularis*) depend on the water presence, while others (*Testudo graeca*, *Lacerta agilis*, *Coluber caspius*, *Vipera ammodytes montandoni*) prefer the steppe habitats, with sunny slopes and xerophilous vegetation.

4. Ornithofauna of Romanian and Bulgarian Dobrogea includes species characteristic to the steppe areas (*Coturnix coturnix*, *Merops apiaster*, *Galerida cristata*), but also some aquatic species (*Cygnus olor*, *Anas platyrhynchos* etc.), to

which water accumulations and lakes of the studied area are refuges, foraging and nestling places.

5. From mammals, the following species are characteristics to the Dobrogea steppe: *Spermophilus citellus*, *Mesocricetus newtoni*, *Sicista subtilis*, *Spalax leucodon*, *Mustela eversmanni*, *Vormela peregusna*, which seem to have optimum populations for considering them elements of the biodiversity of the area, according to our observations and results.

6. For each reported species we mentioned the present protection statute in the national legislation (Romanian and Bulgarian), in the annexes of the international conventions on the conservation of the natural habitats, of the flora and fauna, or in the annexes of the special directive for birds.

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VERTEBRATELE TERESTRE DIN DOBROGEA ROMÂNEASCĂ ȘI BULGĂREASCĂ

REZUMAT

În cadrul contractului de colaborare româno-bulgară pe anii 2008 – 2009, finanțat de Ministeriele Cercetării Științifice din ambele țări, s-a desfășurat studiul vertebratelor terestre din Dobrogea românească (județele Tulcea și Constanța) și din Dobrogea bulgărească (județele Silistra și Dobrich). În cei doi ani, au fost observate, colectate sau inventariate pe seama informațiilor din teren, un număr de 211 specii de vertebrate terestre, după cum urmează: 5 specii de amfibieni, 8 de reptile, 159 de păsări și 39 specii de mamifere. Amfibienii sunt vertebratele cu cea mai redusă biodiversitate în zona cercetată, cele mai multe specii fiind din clasa păsărilor. Pentru fiecare specie este pecizat statutul de ocrotire, amfibienii figurând în anexele OUG 57/2007 din legislația românească de conservare a biodiversității și ale Legii nr. 77/2002 din legislația bulgărească, iar la nivel internațional – în anexele Directivei 92/43/EEC asupra conservării habitatelor naturale, a faunei și florei sălbatice. De aceeași legislație se bucură și celelalte vertebrate, doar câteva fiind fără statut actual de ocrotire. Pe seama rezultatelor observațiilor și a colectărilor apreciem că starea ecosistemelor din Dobrogea bulgărească este mai apropiată de aceea naturală, decât în Dobrogea românească. Această stare se reflectă în mărimea diferită a populațiilor (mai mari în Bulgaria), aceluiași specii de vertebrate, probându-se și valoarea acestor specii ca bioindicatori, în cazul Dobrogei românești fiind o mai mare presiune antropică asupra ecosistemelor naturale. În ambele țări există arii protejate, dar suprafețele lor pot fi extinse, pentru creșterea șanselor de refugii și păstrare în fondul faunistic al unor specii rare sau periclitate: *Mesocricetus newtoni*, *Spermophilus citellus*, *Mustela eversmanni*, *Vormela peregusna* etc.

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SYSTEMATIC LIST OF THE ROMANIAN VERTEBRATE FAUNA

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Abstract. Compiling different bibliographical sources, a total of 732 taxa of specific and subspecific order remained. It is about the six large vertebrate classes of Romanian fauna. The first class (Cyclostomata) is represented by only four species, and Pisces (here considered super-class) – by 184 taxa. The rest of 544 taxa belong to Tetrapoda super-class which includes the other four vertebrate classes: Amphibia (20 taxa); Reptilia (31); Aves (382) and Mammalia (110 taxa).

Résumé. Cette contribution à la systématique des vertébrés de Roumanie s'adresse à tous ceux qui sont intéressés par la zoologie en général et par la classification de ce groupe en spécial. Elle représente le début d'une thème de confrontation des opinions des spécialistes du domaine, ayant pour but final d'offrir aux élèves, aux étudiants, aux professeurs de biologie ainsi qu'à tous ceux intéressés, une synthèse actualisée de la classification des vertébrés de Roumanie. En compilant différentes sources bibliographiques, on a retenu un total de plus de 732 taxons d'ordre spécifique et sous-spécifique. Il s'agit des six grandes classes de vertébrés. La première classe (Cyclostomata) est représentée dans la faune de Roumanie par quatre espèces, tandis que Pisces (considérée ici au niveau de surclasse) l'est par 184 taxons. Le reste de 544 taxons font partie d'une autre surclasse (Tetrapoda) qui réunit les autres quatre classes de vertébrés: Amphibia (20 taxons); Reptilia (31); Aves (382) et Mammalia (110 taxons).

Key words: vertebrates, lampreys, fish, amphibians, reptiles, birds, mammals, kingdoms, phylums, classes.

INTRODUCTION

The name of the vertebrate group originates in Latin: *vertebratus* = animals with articulations, word related to the noun *vertebra* which refer to any bone or segment of the spine – its presence being the main and defining feature of these creatures.

Since antiquity, vertebrate classification based on the anatomical comparisons, and later, on the physiological ones, the results of the palaeontological and zoogeographical studies. Modern classifications included the results of the biochemical and genetic studies, and later the studies basing on the Nuclear DNA sequency.

Linnaeus (1735) recognized two kingdoms of creatures (plants and animals), the third being assigned to minerals. After Darwin's paper and theory appeared (1859), the idea that a classification should reflect the base principle of the evolutionary theory strongly imposed – in the case of the creatures' origin in common ancestors we deal with a genealogical classification.

After 1960, the cladistic taxonomy imposed, i.e. that of the classification representation by the trees of life. According to it, we talk about a *monophyletic* taxon if it includes all descendents (from a common ancestor), and, on the contrary, about a *polyphyletic* or *paraphyletic* taxon if there are several ancestors.

Stanier et al. (1962) rehabilitated Chatton's outlook (1925, 1937) – the first biologists who remarked and invented the terms of procaryotes and eukaryotes.

English translation by Mihaela Barcan Achim.

Whittaker (1969) recognized fungi as a separated kingdom, and thus five kingdoms resulted, differentiated mainly by the feeding way: pluricellular plants – *autotrophs*; pluricellular animals – *heterotrophs*; fungi – *saprophyte* living organisms. The other two kingdoms (Protista/Protoctista and Monera/Procariota) include the unicellular organisms and cellular colonies, with autotroph and heterotroph nutrition, respectively with absorbent nutrition and a metabolism of a photosynthetic or chimiosynthetic type. Monera were taken into consideration since Haeckel (1866), but later, classification system of the creatures was divided into five kingdoms, including the prokaryote monera (common bacteria or eubacteria) and the archaeobacteria. Some authors consider the last ones as the sixth kingdom, because they have some features of eucaryotes (not occurred in prokaryotes) and are over 3 billion years old.

Finally, other authors (Copeland, 1956; Whittaker, 1969; Woese et al., 1977, 1990) invented the term of Superkingdom or Field, three in number: Archaea; Bacteria; Eukarya – in this last superkingdom being included the kingdoms: Protista or Protoctista, Fungi, Plantae and Animalia. Also, Woese & Fox (1977) wrote on the main kingdoms of the living world.

In its turn, kingdom Animalia includes two sub-kingdoms (Protozoa and Metazoa), with a total of 25 phyla. In their turn, Metazoans include two rami (Protostomia and Deuterostomia), the second ramus being divided in seven phyla, the last one being Chordata with the sub-phylum Vertebrata, in which the infra-phyla Agnatha and Gnatostomata are included.

ROMANIAN VERTEBRATE FAUNA

In Romania there are representatives of both infra-phyla, with the following general features: the presence of the backbone; the presence of the skull, the presence of some specialized sense organs, the presence of some well-defined organs.

Mentioning that the divisions in sub-phyla and infra-phyla are conventional, that within them super-classes and infra-classes can exist, the Class Cyclostomata of the first infraphylum (Agnatha), with present representatives in the Romanian fauna, has young (ammocoete larvae) which usually live in fresh waters, in mud, being microphagous, and adults which can migrate in the sea and feed on dead or ill fish. The specialists consider the representatives of the order Petromyzontiformes adapted to the life in fresh waters, and those of the order Mixini – in the marine ones.

In its turn, the infra-phylum Gnatostomata includes fish (Superclass Pisces), a distinguished category (after Lagler et al., 1962; Bănărescu, 1964; Benton, 2004 and Nelson, 2006) being the cartilaginous ones (Class Chondrichthyes). According to several authors, bony fishes are raised at the Super-class level (Osteichthyes) with two classes: Actinopterygii and Sarcopterygii. The other vertebrates are included (according to Fuhn, 1961; Fuhn & Vancea, 1961; Vasiliu & Șova, 1968) in Super-class Tetrapoda, with the classes: Amphibia; Reptilia; Aves; Mammalia.

Because this classification will be accessed by the students, biology teachers, specialists or persons very fond of biology of Romania, on the one hand, and on the other one, because it refers to the vertebrates of the Romanian fauna, the first vernacular name of the taxon is in Romanian and the second one in English.

This synthesis is the first form (in preparation) suggesting the specialists' implication, who deal with different groups of vertebrates, as well as the zoologists, in general, for completing with their newest ideas on the systematics of this sub-

phylum and for offering to those who are interested in a study mean; any concrete, constructive proposal will be appreciated as an effort and interest in updating the systematic of the Romanian vertebrates.

SYNTHESIS OF SYSTEMATIC LIST OF THE ROMANIAN VERTEBRATE FAUNA

Kingdom ANIMALIA (Linnaeus, 1758) = Animale/Animals

Sub-kingdom BILATERIA/BILATERALIA (Hatschek, 1888) =
Bilaterale/Bilaterals

Infra-kingdom CHORDONIA (Haeckel, 1888) Cavalier/ Smith, 1998 =
Cordate/Chordates

Phylum CHORDATA (Bateson, 1885) = Cordate/Chordates

Sub-phylum VERTEBRATA Lamarck, 1802 = Vertebrate/Vertebrates

Infra-phylum AGNATHA Linnaeus, 1758 = Agnate/Lawless vertebrates

Class CYCLOSTOMATA Linnaeus, 1758 = Ciclostomi/Cyclostomes
(grec. „round mouth”)

Order Petromyzontiformes Berg, 1940 = Chișcari/Lampreys

Family Petromyzontidae Berg, 1940 = Chișcari/Lampreys

1. *Eudontomyzon danfordi* (Regan, 1911) = Chișcar/Carpathian lamprey
2. *Eudontomyzon vladykowi* Oliva et Zanandrea, 1959 = Chișcar/Lamprey
3. *Eudontomyzon mariae* (Berg, 1931) = Chișcar/Lamprey
4. *Lampetra planeri* (Bloch, 1784) = Hadină-de-râu/Brook lamprey

Infra-phylum GNATHOSTOMATA Zittel, 1879 = Veretbrate cu fălci/Jawed vertebrates

Super-class PISCES Linnaneus, 1758 = Pești/Fish

Class CHONDRICHTHYES Huxley, 1880 = Pești cartilaginoși/Cartilaginous fish

Sub-class ELASMOBRANCHII Bonaparte, 1838 = Rechini/Sharks

Super-order Euselachii (Hay, 1902) = Rechini/Shraks

Order Galeiformes Lozano et Ray, 1928 = Pești rechiniiformi/Sharky fish

Family Sphyrnidae Gill, 1872 = Rechini-ciocan/Hammerhead sharks

5. *Sphyrna zygaena* (L., 1758) = Rechin-ciocan, Pește-ciocan/Smooth hammerhead

Sub-order Squaloidei Müller et Henle, 1838 = Subordinul rechinelor/Shark sub-order

Family Squalidae Blainville, 1816 = Rechini/Sharks

6. *Squalus acanthias* L., 1758 = Câine-de-mare/Spiny dogfish or Spurdog or Mud shark

Order Rajiformes Berg, 1940 = Pești cartilaginoși turtiți/Flattened cartilaginous fishes

Family Rajidae Balinville, 1816 = Vulpi de mare/Skates

7. *Raja clavata* L., 1758 = Vatos, Vulpe-de-mare/Thornback ray

Family Dasyatidae Jordan, 1888 = Pisici de mare/Stingrays

8. *Dasyatis pastinaca* (L., 1758) = Pisică-de-mare/Common stingray

Class OSTEICHTHYES (Huxley, 1880) = Pești osoși/Bony fish

Sub-class ACTINOPTERYGII Cope, 1871 = Pești cu radiile osoase și tari/Ray-finned fish, or spiny-rayed fish

Super-order Chondrostei J. Müller, 1844 = Sturioni și pești ganoizi sau pești parțial osoși/Sturgeons and paddlefishes

Order Acipenseriformes Berg, 1940 = Sturioni/Sturgeons

Family Acipenseridae Bonaparte, 1832 = Sturioni/Sturgeons

9. *Huso huso* (L., 1758) = Morun/The beluga or European sturgeon

10. *Acipenser nudiventris* Lovetzky, 1828 = Viza/ship sturgeon

11. *Acipenser ruthenus ruthenus* (L., 1758) = Cegă/Sterlet

12. *Acipenser güldenstaedti colchicus* Berg, 1948 = Nisetru/Black Sea sturgeon

13. *Acipenser sturio*, L., 1758 = Șip/European sea sturgeon

14. *Acipenser stellatus stellatus* Pallas, 1771 = Păstrugă/Starry sturgeon

Super-order Teleostei (Bonaparte, 1836) = Pești osoși/Bony fish

Order Anguilliformes Goodrich, 1909 = Anghile/True eels

Family Anguillidae Jordan et Evermann, 1896 = Anghile/True eels

15. *Anguilla anguilla* (L., 1758) = Anghila/European eel

Order Clupeiformes Berg, 1940 = Pești cu radii moi/Ray-finned fish

Sub-order Clupeoidei Bertin et Arambourg, 1958 = Pești cu radii moi/Ray-finned fish

Family Clupeidae Berg, 1940 = Pești cu radii moi/Ray-finned fish

16. *Sprattus sprattus phalericus* (Risso, 1826) = Sprot/Sprat

17. *Clupeonella cultiventris cultiventris* (Nordmann, 1840) = Gingirica/Tyulka sprat

18. *Sardina pilchardus sardina* (Risso, 1826) = Sardea/European pilchard

19. *Sardinella aurita* (Valenciennes, 1847) = Sardeluță/Round sardinelle

20. *Alosa pontica pontica* (Eichw., 1838) = Scrumbie-de-Dunăre/Black Sea Herring

21. *Alosa maeotica maeotica* (Grimm., 1901) = Scrumbie-de-mare/Black Sea Shad

22. *Alosa caspia nordmanni* Antipa, 1906 = Rizeafcă/Danube shad

Family Engraulidae Jordan et Eversmann, 1896 = Hamsii/Anchovies

23. *Engraulis encrasicolus ponticus* Alexandrov, 1927 = Hamsie/Black Sea anchovy

Sub-order Salmonoidei Berg, 1940 = Păstrăvi/Salmons

Family Salmonidae Regan, 1914 = Păstrăvi/Salmons

24. *Salmo trutta fario* L., 1758 = Păstrăv, Păstrăv-de-munte/Brown trout
25. *Salmo trutta labrax* Pallas, 1811 = Păstrăv-de-mare/Black Sea trout
26. *Salmo trutta lacustris* L., 1758 = Păstrăv-de-lac/European lake trout
27. *Salmo gairdneri irideus* Gibbons, 1855 = Păstrăv-curcubeu/Rainbow trout
28. *Salvelinus fontinalis* (Mitchill, 1815) = Păstrăv-fântânel/Brook trout
29. *Hucho hucho* (L., 1758) = Lostrită/Huchen or Danube salmon
30. *Coregonus lavaretus maraenoides* Poljakow, 1874 = Coregon/Lake chud whitefish
31. *Coregonus albula ladogensis* Pravolm, 1938 = Coregon-mic/Ladogan whitefish

Sub-family Thymalinae Gill, 1894 = Salmonide de Atlanitc/Graylings

32. *Thymallus thymallus* (L., 1758) = Lipan/The grayling

Sub-order Esocoidei Berg, 1936 = Știuci/Pikes, pickerels and muskellunges

Family Esocidae Günther, 1866 = Știuci/Pikes

33. *Esox lucius* L., 1758 = Știucă/Europaeischer Hecht

Family Umbridae Günther, 1866 = Țigănuși/Mudminnows

34. *Umbra krameri* Walbaum, 1792 = Țigănuș/The European mudminnow

Order Cypriniformes Goodrich, 1909 = Cipriniforme/Minnows and suckers

Sub-order Cyprinoidei Berg, 1940 = Ciprinoidei/Minnows and suckers

Family Cyprinidae Jordan et Eversmann, 1896 = Ciprinide/Minnows and suckers

35. *Rutilus rutilus carpathorossicus* Vladikov, 1930 = Babușcă/Carpathian roach
36. *Rutilus rutilus heckeli* (Nordmann, 1840) = Tarancă/Black Sea roach
37. *Rutilus frisii frisii* (Nordmann, 1840) = Virezub/Caspian roach
38. *Rutilus pigus virgo* (Lacépède, 1804) = Babușcă-de-Tur/Danubian roach
39. *Leuciscus souffia agassizi* Valenciennes, 1844 = Clean-dungat/Soufie
40. *Leuciscus leuciscus leuciscus* (L., 1758) = Clean-mic/Common Dace
41. *Leuciscus cephalus cephalus* (L., 1758) = Clean/Chub or Chevaine
42. *Leuciscus borysthemicus borysthemicus* (Kessler, 1859) = Babușcă-mică/Black Sea Chub
43. *Leuciscus idus idus* (L., 1758) = Văduviță/Ide
44. *Phoxinus phoxinus phoxinus* (L., 1758) = Boiștean/Minnow
45. *Tinca tinca* (L., 1758) = Lin/Tench or Doctor fish
46. *Scardinius erythrophthalmus erythrophthalmus* (L., 1758) = Roșioară/Common rudd
47. *Scardinius erythrophthalmus racovitzae* Müller, 1958 = Roșioară-de-Pețea/Racovitza's rudd
48. *Aspius aspius aspius* (L., 1758) = Avat/Asp
49. *Leucaspis delineatus delineatus* (Heckel, 1843) = Plevușcă/Belica or Moderlieschen
50. *Chalcalburnus chalcoides mento* (Agassiz, 1832) = Obleț-mare/Danube bleak
51. *Alburnus alburnus alburnus* (L., 1758) = Obleț/Common bleak
52. *Alburnoides bipunctatus bipunctatus* (Bloch, 1782) = Latiță/Spirlin
53. *Blicca björkna björkna* (L., 1758) = Batcă/Silver bream

54. *Abramis braman* Danubius (Pavlov, 1956) = Plătică/Danubian bream
55. *Abramis sapa sapa* (Pallas, 1811) = Cosac/White-eye bream
56. *Abramis ballerus* (L., 1758) = Cosac-cu-bot-turtit/Zope or blue bream
57. *Vimba vimba carinata* (Pallas, 1811) = Morunaș/Vimba
58. *Pelecus cultratus* (L., 1758) = Sabiță/Ziege or Sabre carp
59. *Chondrostoma nasus nasus* (L., 1758) = Scobar/Nase
60. *Rhodeus sericeus amarus* (Pallas, 1776) = Boartă/Bitterling
61. *Gobio gobio obtusirostris* Valenciennes, 1844 = Porcușor/Common gudgeon
62. *Gobio uranoscopus frici* Vladykov, 1925 = Porcușor-de-vad/Longbarbel gudgeon
63. *Gobio albipinnatus* Fang, 1943 = Porcușor-de-șes/Romanogobio
64. *Gobio kessleri kessleri* Dybowski, 1862 = Porcușor-de-nisip/Kessler's gudgeon
65. *Gobio kessleri banaticus* Bănărescu, 1953 = Porcușor-bănățean/Banat gudgeon
66. *Gobio kessleri antipai* Bănărescu, 1953 = Porcușorul-lui-Antipa/Antipa's sand gudgeon
67. *Pseudorasbora parva* (Schlegel, 1842) = Murgoi-bălțat/Topmouth gudgeon
68. *Barbus barbus barbus* (L., 1758) = Mreană/Barbel or Bottled ales
69. *Barbus meridionalis petenyi* Heckel, 1847 = Mreană vânătă/Mediterranean Barbel
70. *Cyprinus carpio carpio* L., 1758 = Crap/Common carp
71. *Carassius carassius* (L., 1758) = Caracudă/Crucian carp
72. *Carassius auratus gibelio* (Bloch, 1783) = Caras/Gibel carp
73. *Carassius auratus auratus* (L., 1758) = Caras-roșu/Goldfish
74. *Hypophthalmichthys molitrix* (Valenciennes, 1844) = Crap-argintiu/Silver carp
75. *Aristichthys nobilis* Rich., 1845 = Crap argintiu-nobil/Bighead carp

Family Cobitidae Regan, 1911 = Țipari/Loaches

76. *Orthrias barbatulus barbatulus* (L., 1758) = Molan/Stone loach
77. *Misgurnus fossilis* (L., 1758) = Țipar/European weatherfish or European weather loach
78. *Cobitis taenia taenia* L., 1758 = Zvârlugă/Spined loach
79. *Cobitis elongata elongata* Heckel et Kner, 1868 = Fâsă-mare/Balkan loach
80. *Sabanejewia romanica* Băcescu, 1943 = Nisiparniță/Romanian loach
81. *Sabanejewia aurata balcanica* Karaman, 1932 = Câră răsăriteană/Eastern golden loach
82. *Sabanejewia aurata vallachica* Nalbant, 1957 = Câră/Eastern Carpathian golden loach
83. *Sabanejewia aurata radnehsis* Jaszfi., 1951 = Sfârlează/Radna's golden loach
84. *Sabanejewia aurata bulgarica* Drensky, 1928 = Dunăriță/Bulgariannuoliainen or Gold-Steinbeißer.

Sub-order Siluroidei Berg, 1940 = Somni/Catfish

Family Siluridae Regan, 1911 = Somn/Wels catfish

85. *Silurus glanis* L., 1758 = Somn/Wels catfish

Family Ictaluridae Taylor, 1954 = Somni americani/North American catfish

86. *Ictalurus melas melas* Le Sueur, 1819 = Somn-pitic, Somn-american/Black bullhead

Order Gadiformes Berg, 1940 = Cod și merlucius/Cods and hakes

Family Gadidae Svetovidov, 1937 = Pești gadizi/Cods, codfishes, true cods

87. *Gaidropsarus mediterraneus* (L., 1758) = Galea/Shore rockling or Three-bearded rockling

88. *Lota lota lota* (L., 1758) = Mihalt/Burbot

89. *Odontogadus merlangus euxinus* (Nordmann, 1840) = Bacaliar/Whiting

Order Beloniformes Berg, 1940 = Pești argintii/Old World silversides fish

Family Belonidae Regan, 1911 = Zărgani/Garfish

90. *Belone belone euxini* Günther, 1866 = Zărgan/Garfish

Order Mugiliformes Berg, 1940 = Chefali, aterine/Mulletts

Family Atherinidae Günther, 1861 = Aterine/Neostethid priapriumfishes

91. *Atherina boyeri* (Risso, 1810) = Aterină/Big-scale sand smelt

92. *Atherina hepsetus* L., 1758 = Aterină-mare/Mediterranean sand smelt

Order Cyprinodontiformes Berg, 1940 = Ciprinodontiformi/Killifishes and live-bearers

Family Poeciliidae Berg, 1940 = Gambusii/Gambusies

93. *Gambusia affinis holbrooki* (Agassiz, 1854) = Gambusie/Eastern mosquitofish

Order Zeiformes Berg, 1940 = Pești dulgheri/Boarfishes and dories

Family Zeidae Kordan et Eversmann, 1898 = Pești dulgheri/Boarfishes and dories

94. *Zeus pungio* Valenncienes, 1835 = Dulgher/Atlantic John dory

95. *Zeus faber* L., 1758 = Dulgher-mare/Mediterranean John dory

Order Gasterosteiformes Berg, 1940 = Ghidrini/Stickleback fish

Family Gasterosteidae Günther, 1859 = Ghidrini/Stickleback fish

96. *Pungitius platygaster platygaster* (Kessler, 1859) = Osar/Nine or ten-spined stickleback

97. *Gasterosteus aculeatus aculeatus* L., 1758 = Ghidrin/Three-spined stickleback

98. *Gasterosteus aculeatus crenobiontus* Băcescu et Mayer, 1956 = Ghidrin-de-izvor/Spring-spined stickleback

Order Syngnathiformes Berg, 1940 = Ace, căluți de mare/Pipe-fish

Family Syngnathidae Günther, 1870 = Ace, căluți de mare/Pipe-fish

99. *Syngnathus typhle argentatus* Pallas, 1811 = Ac-de-mare/Broad-nosed pipefish

100. *Syngnathus tenuirostris* Rathke, 1837 = Ac-de-mare-cenușiu/Narrow-snouted pipefish

101. *Syngnathus variegatus* Pallas, 1811 = Ac-de-mare-vărgat-cu-alb/White striped pipefish

102. *Syngnathus nigrolineatus nigrolineatus* Eichwald, 1831 = Undrea/Black striped pipefish

103. *Syngnathus schmidtii* Popov, 1928 = Ac-de-mare-ghimpat/Spined pipefish

104. *Nerophis ophidion terres* (Rathke, 1837) = Ață-de-mare/Straight-nosed pipe-fish

105. *Hippocampus ramulosus* Leach, 1814 = Căluț-de-mare/Sea Horse

Order Scorpaeniformes Bloch, 1789 = Scorpii de mare/Scleroparei fish

Sub-order Scorpaenoidei Klein, 1885 = Scorpii de mare/Scleroparei fish

Family Scorpaenidae Jordan et Eversmann, 1898 =
Scorpii de mare/Scleroparei fish

106. *Scorpaena porcus* L., 1758 = Scorpie-de-mare/Black scorpionfish

Family Triglidae Jordan et Eversmann, 1898 = Rândunele de mare/Sea robins

107. *Trigla lucerna* L., 1758 = Rândunică-de-mare/Tub gurnard or Yellow gurnard

Sub-order Cottoidei Berg, 1940 = Zglăvoace/Mail-cheeked fishes

Family Cottidae Berg, 1940 = Zglăvoace/Mail-cheeked fishes

108. *Cotus gobio gobio* L., 1758 = Zglăvoacă/Bullhead

109. *Cottus poecilopus poecilopus* Heckel, 1836 = Zglăvoacă-răsăriteană/Alpine bullhead

Order Perciformes Bertin et Arambourg, 1958 = Bibani/Perch-like fish

Sub-order Percoidei Bertin et Arambourg, 1958 = Bibani/Perch-like fish

Family Serranidae Regan, 1913 = Bibani/Perch-like fish

110. *Morone labrax* (L., 1758) = Lavrac, Lup-de-mare/ European bass or Sea bass or White salmon

111. *Serranus cabrilla* (L., 1758) = Biban-de-mare/Comber

Family Centrarchidae Regan, 1913 = Pești soare/Sunfish

112. *Lepomis gibbosus* (L., 1758) = Biban-soare/Pumpkinseed

Family Percidae Jordan et Eversmann, 1896 = Percide/Perch

113. *Perca fluviatilis fluviatilis* L., 1758 = Biban/European perch

114. *Gymnocephalus cernuus* (L., 1758) = Ghiborț/Eurasian ruffe

115. *Gymnocephalus schraetser* (L., 1758) = Răspăr/Donauhork (in Danish)

116. *Stizostedion lucioperca* (L., 1758) = Șalău/Zander

117. *Stizostedion volgense* (Gmelin, 1758) = Șalău-vărgat/Wolga-zander

118. *Aspro streber* Siebold, 1863 = Fusar/Asper

119. *Aspro zingel* (L., 1758) = Fusar-mare/Large European asper

120. *Romanichthys valsanicola* Dumitrescu, Bănărescu, Stoica, 1957 = Asprete/Asprete

Family Sparidae Jordan et Eversmann, 1898 = Dorade/Breams and porgies

121. *Dentex dentex* (L., 1758) = Dințat/Common dentex

122. *Boops boops* (L., 1758) = Gupă/Bogue

123. *Boops salpa* (L., 1758) = Gupă/Goldstrieme or Cow bream

124. *Diplodus annularis* (L., 1758) = Sparos/Annular sea bream
125. *Charax puntazzo* (L., 1758) = Carax/Pici
126. *Sparus auratus* L., 1758 = Doradă/Gilthead sea bream
127. *Pagellus erythrops* (L., 1758) = Pagel/Red pandora

Family Maenidae Jordan et Eversmann, 1898 = Smarizi litorali/Picarels

128. *Spicara smaris* (L., 1758) = Smarid/Picarel

Family Sciaenidae Günther, 1860 = Pești sonori/Drums or croakers

129. *Sciaena cirrosa* L., 1758 = Milacop/Bearded umbrine or Maigre
130. *Corvina umbra* (L., 1758) = Corb-de-mare/Brown maigre

Family Mullidae Günther, 1859 = Pești-capră/Goatfishes

131. *Mullus barbatus ponticus* Essipov, 1927 = Barbun/Black-Sea goat fish

Family Pomatomidae Jordan et Eversmann, 1896 = Lufari/Bluefish

132. *Pomatomus saltatrix* (L., 1758) = Lufar/Bluefish

Family Carangidae Jordan et Eversmann, 1896 = Stavrizi/Jacks, pompanos, jack mackerels, scads

133. *Trachurus mediterraneus* Steindachner, 1868 = Stavrid-mare/Mediterranean horse mackerel
134. *Trachurus trachurus* (L., 1758) = Stavrid-negru/Atlantic horse mackerel

Sub-order Labroidei Bertin et Arambourg, 1958 = Pești labroidei/Wrasses, cichlids and parrotfish

Family Pomacentridae Günther, 1862 = Pești perciformi/Damselfishes

135. *Heliaspes chromis* (L., 1758) = Cromos/Damselfish

Family Labridae Jordan et Eversmann, 1898 = Pești lapini/Wrasses

136. *Labrus viridis prasocites* Pallas, 1811 = Lapină-mare/Green wrasse
137. *Crenilabrus ocellatus* (Forsk., 1775) = Lapină/European wrasse
138. *Crenilabrus griseus* (L., 1758) = Lapină-comună/Grey wrasse
139. *Crenilabrus quinque-maculatus* (Bloch, 1792) = Lapin-cu-cinci-pete/Five-spotted wrasse
140. *Crenilabrus tinca* (L., 1758) = Lapină-brună/Peacock wrasse
141. *Symphodus scina* (Forsk., 1775) = Lapină-cu-bot-mare/Big-snout wrasse
142. *Ctenolabrus rupestris* (L., 1758) = Lapină/Goldsinny-wrasse
143. *Coris julis* (L., 1758) = Pește-păun/Mediterranean rainbow wrasse

Sub-order Trachinoidei Bertin et Arambourg, 1958 = Pești dragoni/Weeverfish, stargazers, torrent fish

Family Trachinidae Jordan et Eversmann, 1898 = Pești dragoni/Weeverfish

144. *Trachinus draco* L., 1758 = Dragon/Greater weever

Family Uranoscopidae Jordan et Eversmann, 1898 = Pești cu ochii pe cap/Stargazers

145. *Uranoscopus scaber* L., 1758 = Bou-de-mare/Stargazer

Sub-order Blennioidei Berg, 1940 = Pești veninoși dungați/Striped poison-fang lenny

Family Blenniidae Regan, 1912 = Pești veninoși dungați/Striped poison-fang lenny

146. *Blennius sanguinolentus* Pallas, 1811 = Corosbină, Cățel-de-mare/Red-speckled blenny

147. *Blennius sphynx* Valenncienes, 1830 = Iepuraș-de-mare/Hen-like blenny

148. *Blennius pavo* Risso, 1810 = Corosbină-cu-creastă/Salaria slizoun

149. *Blennius zvonimiri ponticus* Slast., 1929 = Cocoș-de-mare/Zoanimir's blenny

150. *Blennius tentacularis* Brünici, 1768 = Cocoșel-de-mare/Fringehead blenny

151. *Coryphoblennius galerita* (L., 1758) = Cocoșel/Montagu's blenny

Family Clinidae Regan, 1912 = Pești clinizi marini/Clinids, kelpfishes, klipfishes, and scaled blennies

152. *Tripterygion tripteronotus* (Risso, 1810) = Corosbină-cu-trei-înotătoare/Blackfaced blenny

Sub-order Ophidioidei Berg, 1940 = Pești-perlă/Pearlfishes

Family Ophidiidae Jordan et Eversmann, 1898 = Pești cordea/Brotulas and cusk eels

153. *Ophidion rochei* Müller, 1845 = Cordea, pește-de-noapte/Cuskeel

Sub-order Ammodytoidei Berg, 1940 = Pești lance/Sand lances

Family Ammodytidae Boulenger, 1910 = Pești lance/Sand eels or sandeels

154. *Ammodytes cicerellus* Rafinesque, 1910 = Uva/Smooth sandeel

Sub-order Callionymoidei Berg, 1940 = Pești splendizi/Dragonets

Family Callionymidae Regan, 1913 = Pești splendizi/Dragonets and scotter blennies

155. *Callionymus festivus* Pallas, 1811 = Calionim/Dragonet

156. *Callionymus belenus* Risso, 1826 = Calionim-mic/Smal dragonet

Sub-order Gobioidae Berg, 1940 = Guvizi/Gobies or fire gobies or marble gobies

Family Gobiidae Regan, 1911 = Guvizi/Gobios or gobies

157. *Pomatoschistus microps leopardinus* (Nordmann, 1840) = Guvid-de-nisip/Sand goby

158. *Pomatoschistus minutus elongatus* (Canestrini, 1862) = Guvid-de-mâl/Mud goby

159. *Pomatoschistus caucasicus* (Kawrejsky, 1899) = Guvid-mic/Goby „bubyr“

160. *Pomatoschistus longicaudatus* (Kessler, 1877) = Guvid-cu-coadă-lungă/Ponto-Caspian goby

161. *Gobius niger* L., 1758 = Guvid-negru/Black goby

162. *Gobius ophioccephalus* Pallas, 1811 = Guvid-de-iarbă/Zostera's goby
 163. *Gobius melanostomus melanostomus* Pallas, 1811 = Guvid, Stronghil/Round goby
 164. *Gobius fluviatilis fluviatilis* Pallas, 1811 = Zimbraș/Babka goby or Monkey goby
 165. *Gobius syrman syrman* Nordmann, 1840 = Guvid-de-Razelm/Syrman goby
 166. *Gobius cephalarges cephalarges* Pallas, 1811 = Guvid-de-mare/Sea goby
 167. *Gobius ratan ratan* Nordmann, 1840 = Guvid-ratan/Ratan goby
 168. *Gobius kessleri* Günther, 1861 = Guvid-de-baltă, Mitroace/Kessler's goby
 169. *Gobius gymnotrachelus gymnotrachelus* Kessler, 1857 = Zglăvoacă/Gobie coureur
 170. *Gobius batrachocephalus* Pallas, 1811 = Hanos/Black Sea goby
 171. *Proterorhinus marmoratus* (Pallas, 1811) = Moacă-de-brădiș/Tubenose goby
 172. *Benthophiloides brauneri* Beling-Iljin, 1927 = Guvid-de-Dunăre/Bottom goby
 173. *Benthophilus stellatus stellatus* (Sauvage, 1874) = Umflătură/Stellate tadpole-goby
 174. *Aphyia minuta* (Risso, 1810) = Guvid-de-sticlă/Delicasy goby

Sub-order Scombroidei Bertin et Arambourg, 1958 = Baracude, toni, pești spadă/
 Barracuda, tuna, mackerel and swordfish

Family Scombridae Berg, 1940 = Scrumbii/Mackerels, tunas, bonitos

175. *Scomber scomber* L., 1758 = Scrumbie-albastră/Blue mackerel
 176. *Pneumatophorus colias* (Gmelin, 1738) = Colios/Chub mackerel

Family Cybiidae Berg, 1940 = Pălămidă/Spanish mackerel, bonito

177. *Sarda sarda* (Bloch, 1793) = Pălămidă/Atlantic bonito

Family Thunnidae Regan, 1903 = Pești ton/Tuna

178. *Thunnus thynnus* (L., 1758) = Ton/Atlantic bluefin tuna

Family Xiphiidae Jordan et Eversmann, 1896 = Pești spadă/Swordfishes

179. *Xiphias gladius* L., 1758 = Pește-spadă/Swordfish

Sub-order Gobiosocoidei Bertin et Arambourg, 1958 = Pești ventuză/Blennies, sand
 stargazers, kelpfishes

Family Gobiesocidae Günther, 1861 = Pești ventuză/Clingfishes and singleslits

Sub-family Lepadogastrinae Jordan et Fowler, 1902 = Pești ventuză/Shore
 clingfish

180. *Diplogaster bimaculata bimaculata* (Bonnaterre, 1788) = Pește-ventuză/Two-spotted clingfish
 181. *Diplogaster bimaculata euxinica* Murgoci, 1964 = Pește-ventuză/Black Sea clingfish
 182. *Apletodon microcephalus bacescui* Murgoci, 1940 = Pește-ventuză/Mediterranean clingfish
 183. *Lepadogaster lepadogaster* (Bonnaterre, 1788) = Pește-ventuză/Shore clingfish
 184. *Lepadogaster candollei* Risso, 1810 = Pește-ventuză/Connemara sucker or Connemara clingfish

Order Pleuronectiformes Berg, 1940 = Pești turtiți/Flatfishes

Family Bothidae Norman, 1934 = Calcani/ Turbots

185. *Scophthalmus maeoticus* (Pallas, 1811) = Calcan/Black Sea turbot

186. *Scophthalmus rhombus* (L., 1758) = Calcan-mic/Small turbot

Family Pleuronectidae Norman, 1934 = Cambule/Flounders

187. *Platichthys flesus luscus* Pallas, 1811 = Cambulă/Flounder

Family Soleidae Gilbert, 1905 = Pești marini turtiți/Soles

188. *Solea nasuta* (Risso, 1810) = Limbă-de-mare/Snouted sole

Superclass TETRAPODA (Goodrich, 1930) =

Animale cu patru picioare/Four leg animals

Class AMPHIBIA Linnaeus, 1758 = Amfibieni/Amphibians

Sub-class ANUROMORPHA Kuhn, 1960 = Amfibieni fără coadă/Anuromorphs

Super-order Salinetia Laurentus, 1768 = Broaște/Frogs and toads

Order Anura Dumeril, 1801 = Broaște/Frogs and toads

Sub-order Discoglossoidei Sokol, 1977 = Broaște/Frogs

Family Discoglossidae Guenther, 1859 = Broaște cu disc pe limbă/

Disc-tongued frogs

1. *Bombina bombina* (L., 1761) = Buhai-de-baltă-cu-burta-roșie/Fire-bellied toad

2. *Bombina variegata variegata* (L., 1758) = Buhai-de-baltă-cu-burtă-galbenă/ Yellow-bellied toad

Sub-order Anomocoela Noble, 1922 = Broaște de pământ/Spade foot toads

Family Pelobatidae Boulenger, 1882 = Broaște de pământ/Spade foot toads

3. *Pelobates fuscus fuscus* (Laurentus, 1768) = Broască-de-pământ-brună/European spadefoot toad

4. *Pelobates syriacus balcanicus* Karaman, 1928 = Broască-de-pământ-siriacă/Turkish spadefoot toad

Sub-order Diplasiocoela Noble, 1922 = Broaște cu vertebre biconcave/Diplasiocels

Family Ranidae Gray, 1825 = Broaștele adevărate/True frogs

Sub-family Raninae Gray, 1825 = Broaște ranine/Ranins

5. *Rana ridibunda ridibunda* Pallas, 1771 = Broască-mare-de-lac/Marsh frog

6. *Rana esculenta* L., 1758 = Broască-mică-de-lac/Edible frog

7. *Rana dalmatina* Bonaparte, 1839 = Broască-roșie-de-pădure/Agile frog

8. *Rana temporaria temporaria* Bonaparte, 1839 = Broască-roșie-de-pădure/ Common frog

9. *Rana arvalis arvalis* Nilsson, 1842 = Broască-de-mlaștină/Frog of the fields

10. *Rana arvalis wolterstorffi* Főjerváry, 1919 = Broască-de-mlaştină-Wolterstorffi/
Balkan moor frog

Sub-order Procoela Nichols et Noble, 1922 = Broaşte cu vertebre procele/Procoels
Family Bufonidae Hogg, 1841 = Broaşte râioase/Toads

11. *Bufo bufo bufo* (L., 1758) = Broască-râioasă-brună/European toad or Common toad
12. *Bufo viridis viridis* Laurentus, 1768 = Broască-râioasă-verde/European green toad

Family Hylidae Günther, 1858 = Broaşte arboricole/Treefrogs

Sub-family Hyalinae Rafinesque, 1815 = Broaşte arboricole/Treefrogs

13. *Hyla arborea arborea* (L., 1758) = Broţăcel/European tree frog

Sub-class URODELOMORPHA (Cope, 1890) = Urodelomorfe/Urodelomorphs

Order Caudata Scopoli, 1777 = Broaşte cu coadă/Tailed amphibians

Sub-order Salamandroidea Noble, 1931 = Salamandre/Salamanders

Family Salamandridae Gray, 1825 = Salamandre/Salamanders

14. *Salamandra salamandra salamandra* (L., 1758) = Sălămâzdră-de-uscat/Fire salamander
15. *Triturus alpestris alpestris* (Laur., 1768) = Sălămâzdră-de-munte/Alpine newt
16. *Triturus montandoni* (Boulenger, 1880) = Sălămâzdră-carpatică/Montandon's newt
17. *Triturus cristatus cristatus* (Laur., 1768) = Sălămâzdră-cu-creastă/Northern crested newt
18. *Triturus cristatus dobrogeticus* (Kir., 1903) = Sălămâzdră dobrogeană/Great crested newt
19. *Triturus vulgaris vulgaris* (L., 1758) = Sălămâzdră-comună/Smooth newt
20. *Triturus alpestris ampelensis* Fuhn, 1951 = Sălămâzdră-de-apă-mică-transilvană/ Alpine newt

Class REPTILIA Laurenti, 1768 = Reptile/Reptiles

Sub-class ANAPSIDA Osborn, 1903 = Reptile anapside/Anapsids

Order Testudines Batsch, 1788 = Țestoase/Turtles and tortoises

Sub-order (= Cryptodira) Lee, 1995 = Țestoase/Tortoises and turtles

Superfamily Testudinoidea Fitzinger, 1826 = Țestoasele de apă dulce/Pond turtles

Family Emydidae Siebenrock, 1909 = Țestoasele de apă dulce/Pond turtles

1. *Emys orbicularis* (L., 1758) = Țestoasă-de-apă/European pond turtle

Family Testudinidae Gray, 1825 = Țestoasele terestre/Tortoises or Land turtles

2. *Testudo graeca ibera ibera* Pallas, 1814 = Țestoasă-de-uscat/Greek tortoise
3. *Testudo hermanni hermanni* Gmelin, 1789 = Țestoasă-de-uscat/Hermann's tortoise

Superfamily Chelonioidea Bauer, 1893 = Țestoasele marine/Sea turtles

Family Cheloniidae Oppel, 1811 = Țestoasele marine/Sea turtles

4. *Caretta caretta caretta* (L., 1758) = Țestoasă-de-mare/Loggerhead sea turtle
 Infra-class LEPIDOSAUROMORPHA Benton, 1923 = Șerpi, șopârle/Lizards and snakes

Order Squamata Oppel, 181 = Reptile cu solzi/Scaled reptiles

Sub-order Sauria Mac Cartney, 1802 = Diapsidele actuale/Living diapsids

Infra-order Scincomorpha Camp, 1923 = Șopârle/Lizards, skinks, whiptails

Family Scincidae Oppel, 1811 = Șopârle cu coada prehensilă/
 Prehensile-tailed skink

Sub-family Scincinae (Greer, 1970) = Șopârlite/Skinks

5. *Ablepharus kitaibelli stepanekii* Fuhn, 1970 = Șopârliță-de-frunzar/Budak's snake-eyed skink

Family Lacertidae Oppel, 1811 = Șopârlele adevărate sau șopârlele de zid/Wall lizards or true lizards

6. *Lacerta agilis agilis* L., 1758 = Șopârlă-de-câmp/Sand lizard
7. *Lacerta agilis euxinica* Fuhn et Vancea, 1961 = Șopârlă-de-grind/Euxinic sand lizard
8. *Lacerta agilis chersoniensis* Andr., 1832 = Șopârlă-de-stepă/Eastern green lizard
9. *Lacerta trilineata dobrogica* Fuhn et Mertens, 1959 = Gușter-vărgat/Balkan green lizard
10. *Lacerta viridis viridis* (Laurenti, 1768) = Gușter/European green lizard
11. *Lacerta viridis meridionalis* Cyren, 1933 = Gușter-sudic/Southern green lizard
12. *Lacerta muralis muralis* (Laurenti, 1768) = Șopârlă-de-ziduri/Common wall lizard
13. *Lacerta taurica taurica* Pallas, 1811 = Șopârlă-de-stepă/Steppe lizard
14. *Lacerta vivipara* Jacquin, 1787 = Șopârlă-de-munte/Viviparous lizard
15. *Lacerta praticola pontica* Lantz et Cyrén, 1919 = Șopârlă-de-pădure/Forest lizard
16. *Eremias arguta deserti* (Gml., 1789) = Șopârlă-de-nisip/Steppe runner

Infra-order Anguimorpha Fürbringer, 1900 = Șopârle anguide/Anguids lizards or legless lizards

Family Anguidae Oppel, 1811 = Șopârle anguide/Anguids lizards or legless lizards

17. *Anguis fragilis colchicus* (Nordmann, 1840) = Șarpe-de-rouă sau năpârca/Slow worm

Sub-order Serpentes Linnaneus, 1758 = Șerpini actuali/Modern snakes

Infra-order Henophidia (Gray, 1825) = Șerpi/Snakes

Family Boidae Gray, 1825 = Boide/Boids

Sub-family Boinae Gray, 1825 = Boine/Boins

18. *Eryx jaculus turcicus* (Olivier, 1801) = Șarpe-de-nisip/Sand boa

Infra-order Xenophidia (Oppel, 1811) = Cobre, vipere, șerpi de mare/Cobras, vipers, sea snakes

Family Colubridae Oppel, 1811 = Șerpi colubrizi/Colubrid snakes
 Sub-family Natricinae Bonaparte, 1838 = Șerpi obișnuiți (de casă și de apă)/Common and water snakes

19. *Natrix natrix natrix* (L., 1758) = Șarpe-de-casă/Grass snake
20. *Natrix tessellata* (Laurenti, 1768) = Șarpe-de-apă/ Dice snake
- Sub-family Colubrinae Oppel, 1811 = Șerpi colubri/Colubrids
21. *Coluber jugularis caspius* Gmelin, 1789 = Șarpe-râu/Caspian whipsnake
22. *Elaphe quatuorlineata sauromates* (Pallas, 1814) = Balaur/Blotched snake or Four-lined snake
23. *Elaphe longissima longissima* (Laurenti, 1768) = Șarpele-lui Esculap/ Aesculapian snake
24. *Coronella austriaca austriaca* Laurenti, 1768 = Șarpe-de-alun/Smooth snake

Family Viperidae Oppel, 1811 = Vipere/Vipers

25. *Vipera ammodytes ammodytes* (L., 1758) = Viperă-cu-corn/Nose-horned viper
26. *Vipera ammodytes montandoni* Boul., 1904 = Viperă-cu-corn-dobrogeană/ European nose-horned viper
27. *Vipera berus berus* (L., 1758) = Viperă/Adder
28. *Vipera berus bosniensis* Boettger, 1889 = Viperă bosniacă/Balkan cross adder or Bosnian viper
29. *Vipera ursinii* (Bonap., 1835) = Viperă-de-stepă/Meadow viper or Orsini's viper
30. *Vipera ursinii renardi* (Cristoph, 1861) = Viperă-de-stepă-Rena/Renard's viper
31. *Vipera ursinii rákosiensis* Méhely, 1894 = Viperă-de-fâneță/ Hungarian meadow viper

Class AVES Linnaeus, 1758 = Păsări/Birds

Order Gaviiformes Wetmore et Miller, 1926 = Cufundari/Divers

Family Gaviidae Coues, 1903 = Cufundari/Divers

1. *Gavia arctica arctica* (L., 1758) = Fundac-mijlociu/Black-throated loon
2. *Gavia immer* (Brünn., 1764) = Fundac-mare/Great Northern loon or Great Northern diver or Common loon
3. *Gavia stellata stellata* (Pont., 1763) = Fundac-cu-gușa-roșie/Red-throated diver

Order Podicipediformes Fürbringer, 1888 = Corcodei/Grebes

Family Podicipedidae Bonaparte, 1831 = Corcodei/Grebes

4. *Podiceps cristatus cristatus* (L., 1758) = Corcodel-mare/Great crested grebe
5. *Podiceps griseigena griseigena* (Bodd., 1783) = Corcodel-cu-gât-roșu/Red-necked grebe
6. *Podiceps auritus auritus* (L., 1758) = Corcodel-de-iarnă/Horned grebe or Slavonian grebe
7. *Podiceps nigricollis* Ch. L. Brehm, 1831 = Corcodel-cu-gât-negru/Black-necked grebe
8. *Podiceps ruficollis ruficollis* (Pallas, 1764) = Corcodel-pitic/Little grebe

Order Procellariiformes Fürbringer, 1888 = Furtunari/Albatrosses and petrels

Family Procellariidae Leach, 1820 = Petreli/Petrels

9. *Puffinus puffinus yelkouan* (Acerbi, 1827) = Furtunar/Yelkouan shearwater or
Levantine shearwater or Mediterranean shearwater

Order Pelecaniformes Sharpe, 1891 = Pelicani, cormorani/Pelicans and cormorants

Family Phalacrocoracidae Reichenbach, 1850 = Cormorani/Cormorants

10. *Phalacrocorax carbo sinensis* (Shaw et Nodder, 1801) = Cormoran-mic/Black
cormorant
11. *Phalacrocorax aristotelis aristotelis* L., 1758 = Cormoran-moțat/European shag
or Common shag
12. *Phalacrocorax pygmeus* (Pallas, 1773) = Cormoran-mic/Pygmy cormorant

Family Pelecanidae Rafinesque, 1815 = Pelicani/Pelicans

13. *Pelecanus onocrotalus* L., 1758 = Pelican/Great white pelican
14. *Pelecanus crispus* Bruch, 1832 = Pelican-creț/Dalmatian pelican

Order Ciconiiformes Bonaparte, 1854 = Berze și stârci/Storks and herons

Family Ardeidae Leach, 1820 = Stârci/Herons

15. *Ardea cinerea cinerea* L., 1758 = Stârc-cenușiu/Grey heron
16. *Ardea purpurea purpurea* L., 1758 = Stârc-roșu/Purple heron
17. *Egretta alba alba* (L., 1758) = Egretă-mare/Great egret
18. *Egretta garzetta garzetta* (L., 1758) = Egretă-mică/Little egret
19. *Ardeola ralloides* (Sop., 1769) = Stârc-galben/Squacco heron
20. *Bubulcus ibis ibis* (L., 1758) = Stârc-de-cireadă/Cattle egret
21. *Nycticorax nycticorax nycticorax* (L., 1758) = Stârc-de-noapte/Black-crowned
night heron
22. *Ixobrychus minutus minutus* (L., 1758) = Stârc-pitic/Little bittern
23. *Botaurus stellaris stellaris* (L., 1758) = Buhai-de-baltă/Great bittern

Family Ciconiidae Gray, 1840 = Berze/Storks

24. *Ciconia ciconia ciconia* (L., 1758) = Barză-albă/White stork
25. *Ciconia nigra* (L., 1758) = Barză-neagră/Black stork

Family Threskiornithidae Richmond, 1917 = Țigănuși, lopătari/Ibises, Spoonbills

26. *Plegadis falcinellus falcinellus* (L., 1758) = Țigănuș/Glossy ibis
27. *Platalea leucorodia leucorodia* L., 1758 = Lopătar/Eurasian spoonbill or
Common spoonbill

Order Phoenicopteriformes Fürbringer, 1888 = Flamingi/Flamingos

Family Phoenicopteridae Bonaparte, 1831 = Flamingi/Flamingos

28. *Phoenicopus ruber roseus* Pallas, 1811 = Flaming/Flamingo

Order Anseriformes Wagler, 1831 = Lebede, găște, călifari/Swans, geese, ducks

Family Anatidae Vigors, 1825 = Lebede, găște, călifari/Swans, geese, ducks

Sub-family Anserinae Vigors, 1825 = Lebede, găște/ Swans and geese

29. *Cygnus olor* (Gmel., 1789) = Lebădă-de-vară/Mute swan

30. *Cygnus cygnus* (L., 1758) = Lebădă-de-iarnă/Whooper swan
31. *Anser fabalis fabalis* (Lath., 1787) = Gâscă-de-semănătură/Taiga bean goose
32. *Anser fabalis albifrons* (Scop., 1769) = Gârliță/White-fronted goose
33. *Anser erythropus* (L., 1758) = Gârliță-mică/Lesser white-fronted goose
34. *Anser anser rubirostris* Swinhoe, 1871 = Gâscă-de-vară/Eastern greylag goose
35. *Anser caerulescens caerulescens* (L., 1758) = Gâscă-polară/Lesser snow goose
36. *Anser indicus* (Lath., 1790) = Gâscă-de-India/Bar-headed goose
37. *Branta leucopsis* (Bechst., 1803) = Gâscă-călugăriță/Barnacle goose
38. *Branta bernicla bernicla* (L., 1758) = Gâscă-neagră/Brant goose
39. *Branta ruficollis* (Pallas, 1769) = Gâscă-gât-roșu/Red-breasted goose

Sub-family Anatinae Leach, 1820 = Rațe, călifari/Ducks, Shelducks

40. *Tadorna ferruginea* (Pallas, 1764) = Călifar-roșu/Ruddy shelduck
41. *Tadorna tadorna* (L., 1758) = Călifar-alb/Common shelduck
42. *Anas penelope* L., 1758 = Rață-fluierătoare/Wigeon or Eurasian wigeon
43. *Anas strepera* L., 1758 = Rață-pestriță/Gadwall
44. *Anas crecca* L., 1758 = Rață-pitică/Common teal or Eurasian teal
45. *Anas platyrhynchos platyrhynchos* L., 1758 = Rață-mare/Mallard
46. *Anas acuta acuta* L., 1758 = Rață-sulițar/Pintail or Northern pintail
47. *Anas querquedula* L., 1758 = Rață-cârâitoare/Garganey
48. *Anas clypeata* L., 1758 = Rață-lingurar/Northern shoveler
49. *Anas angustirostris* (Menètriès, 1832) = Rață-porumbacă/Marbled duck
50. *Netta rufina* (Pallas, 1773) = Rață-cu-ciuf/Red-crested pochard
51. *Aythya ferina* (L., 1758) = Rață-cap-castaniu/Common pochard
52. *Aythya nyroca* (Güld., 1769) = Rață-roșie/Ferruginous duck
53. *Aythya fuligula* (L., 1758) = Rață-moțată/Tufted duck
54. *Aythya marila marila* (L., 1758) = Rață-cap-negru/Greater scaup
55. *Somateria mollissima* (L., 1758) = Eider/Common eider
56. *Clangula hyemalis* (L., 1758) = Rață-de-gheturi/Long-tailed duck
57. *Melanitta nigra nigra* (L., 1758) = Rață-neagră/Common scoter or Black scoter
58. *Melanitta fusca fusca* (L., 1758) = Rață-catifelată/White-winged scoter
59. *Bucephala clangula* (L., 1758) = Rață-sunătoare/Common goldeneye
60. *Mergus albellus* L., 1758 = Ferestraș-mic/Smew
61. *Mergus serrator serrator* L., 1758 = Ferestraș-mijlociu/Red-breasted merganser
62. *Mergus merganser merganser* L., 1758 = Ferestraș-mare/Common merganser
63. *Oxyura leucocephala* (Scop., 1769) = Rață-arămie/White-headed duck

Order Falconiformes Sharpe, 1874 = Răpitoare de zi/Day prey birds

Family Accipitridae Viellot, 1816 = Vulturi, acvile, șorecari, ulii/Vultures, eagles, buzzards, hawks

64. *Gyps fulvus fulvus* (Habl., 1783) = Vultur-sur/Griffon vulture or Eurasian griffon vulture
65. *Aegypius monachus* (L., 1758) = Vultur-negru/Cinereous vulture or Black vulture, or Monk vulture, or Eurasian black vulture
66. *Neophron percnopterus* (L., 1758) = Vultur-alb/Egyptian vulture
67. *Gypaetus barbatus aureus* (Habl., 1783) = Zăgan/Lammergeier or Bearded vulture

68. *Aquila chrysaetos chrysaetos* (L., 1758) = Acvilă-de-munte/Golden eagle
69. *Aquila heliaca heliaca* Savigny, 1809 = Acvilă-de-câmp/Imperial eagle or Eastern imperial eagle
70. *Aquila nipalensis orientalis* Cab., 1854 = Acvilă-de-stepă/Steppe eagle
71. *Aquila clanga pallas*, 1811 = Acvilă-țipătoare-mare/Greater spotted eagle
72. *Aquila pomarina* Ch. L. Brehm, 1831 = Acvilă-țipătoare-mică/Lesser spotted eagle
73. *Hieraaetus pennatus* (Gmel., 1788) = Acvilă-porumbacă-mică/Booted eagle
74. *Hieraaetus fasciatus fasciatus* (Vieill., 1822) = Acvilă-porumbacă-mare/Bonelli's eagle
75. *Buteo buteo buteo* (L., 1758) = Șorecar-de-deal/Common buzzard
76. *Buteo buteo vulpinus* (Glog., 1833) = Șorecar-roșcat/Western steppe buzzard
77. *Buteo lagopus lagopus* (Pont., 1763) = Șorecar-încălțat/Rough-legged hawk
78. *Buteo rufinus rufinus* (Cretzm., 1829) = Șorecar-mare/Long-legged buzzard
79. *Buteo hemilasius* Temm. et Schlegel, 1844 = Șorecar-asiatic/Upland buzzard
80. *Accipiter nisus nisus* (L., 1758) = Uliu-pășărar/Eurasian sparrowhawk
81. *Accipiter gentilis gallinarum* (Ch. L. Brehm, 1831) = Uliu-porumbă/ Northern goshawk
82. *Accipiter brevipes* (Seur, 1850) = Uliu-scund/Levant sparrowhawk
83. *Milvus milvus milvus* (L., 1758) = Gaie-roșie/Red kite
84. *Milvus migrans migrans* (Bodd., 1783) = Gaie-neagră/Black kite
85. *Haliaeetus albicilla* (L., 1758) = Codalb/White-tailed eagle
86. *Pernis apivorus apivorus* (L., 1758) = Viespar/Honey buzzard
87. *Circus aeruginosus aeruginosus* (L., 1758) = Erete-de-stuf/Marsh harrier
88. *Circus cyaneus cyaneus* (L., 1758) = Erete-vânător/Northern harrier
89. *Circus macrourus* (Gmel., 1770) = Erete-alb/Pallid harrier
90. *Circus pygargus* (L., 1758) = Erete-cenușiu/Montagu's harrier
91. *Circaetus gallicus gallicus* (Gmel., 1788) = Șerpar/Short-toed eagle

Family Pandionidae Sclater et Salvin, 1873 = Uligani/Ospreies

92. *Pandion haliaetus haliaetus* (L., 1758) = Uligan-pescar/Osprey

Family Falconidae Vigors, 1824 = Șoimi/Falcons

93. *Falco subbuteo subbuteo* L., 1758 = Șoimul-rândunelelor/Eurasian hobby
94. *Falco peregrinus peregrinus* Tunst., 1771 = Șoim-călător/Peregrine falcon
95. *Falco peregrinus leucogenys* Ch. L. Brehm, 1854 = Șoim-călător-roșcat/Brehm's falcon
96. *Falco biarmicus feldeggii* Scleg., 1843 = Șoim-sudic/Lanner falcon
97. *Falco cherrug danubialis* Kleinschm., 1939 = Șoim-dunărean/European saker falcon
98. *Falco columbarius regulus* Pallas, 1773 = Șoimuleț-de-iarnă/Merlin
99. *Falco vespertinus vespertinus* L., 1758 = Șoim-vânturel-de-seară/Red-footed falcon
100. *Falco naumanni naumanni* Fleischer, 1808 = Șoim-viderel-mic/Baumann's greenbul
101. *Falco tinnunculus tinnunculus* L., 1758 = Șoim-vinderel-roșu/Common kestrel

Order Galliformes Temminck, 1820 = Coccoși sălbatici, fazani/Wild cocks, pheasants

Family Tetraonidae Vigors, 1825 = Coccoși sălbatici/Wild cocks

Sub-family Tetraoninae Vigors, 1825 = Coccoși sălbatici/Wild cocks

102. *Lyrurus tetrax tetrax* (L., 1758) = Coccoș-de-mesteacăn/Little bustard

103. *Tetrao urogallus urogallus* L., 1758 = Coccoș-de-munte/Northern capercaillie

104. *Tetrastes bonasia bonasia* (L., 1758) = Ieruncă/Hazel grouse

Family Phasianidae Horsfield, 1821 = Fazani, coccoși sălbatici,
potârnicchi/Pheasants, wild cocks, partridges

Sub-family Phasianinae (Horsfield, 1821) = Fazani, potârnicchi/Pheasants,
partridges

105. *Alectoris graeca graeca* (Meisn., 1804) = Potârniche-de-stâncă/Rock partridge

106. *Perdix perdix perdix* (L., 1758) = Potârniche/Grey partridge

107. *Coturnix coturnix coturnix* (L., 1758) = Prepeliță/Common quail

108. *Phasianus colchicus* L., 1758 = Fazan/Common pheasant

Order Gruiformes Bonaparte, 1854 = Cocori/Cranes

Family Gruidae Vigors, 1825 = Cocori/Cranes

109. *Grus grus grus* (L., 1758) = Cocor/Common crane

110. *Anthropoides virgo* (L., 1758) = Cocor-mic/Demoiselle crane

Family Rallidae Vigors, 1825 = Cârstei, lișițe/Rails, coots

111. *Rallus aquaticus aquaticus* L., 1758 = Cristel-de-baltă/Water rail

112. *Porzana porzana* (L., 1758) = Cresteț-pestriț/Spotted crane

113. *Porzana pusilla intermedia* (Herm., 1804) = Cresteț-pitic/Baillon's crane

114. *Porzana parva parva* (Scop., 1769) = Cresteț-mic/Little crane

115. *Crex crex* (L., 1758) = Cristel-de-câmp/Corn crane

116. *Gallinula chloropus chloropus* (L., 1758) = Găinușă-de-baltă/Common moorhen

117. *Fulica atra atra* L., 1758 = Lișiță/Eurasian coot

Family Otidae Rafinesque, 1815 = Dropii/Bustards

118. *Otis tarda tarda* L., 1758 = Dropie/Great bustard

119. *Otis tetrax orientalis* Hart., 1916 = Spurcaci/Eastern little bustard

120. *Chlamydotis undulata maqueniei* (Gray, 1832) = Dropie-gulerată/Houbara bustard

Order Charadriiformes Huxley, 1867 = Nagâți, ploieri/Lapwings, plovers

Family Haematopodidae Bonaparte, 1838 = Scoicari/Oystercatchers

121. *Haematopus ostralegus longipes* But., 1910 = Scoicar/Eurasian oystercatcher

Family Charadriidae Vigors, 1825 = Nagâți, ploieri/Lapwings, plovers

122. *Vanellus vanellus* (L., 1758) = Nagât/Northern lapwing

123. *Vanellus spinosus* (L., 1758) = Nagât-sudic/Spur-winged lapwing

124. *Vanellus leucurus* (L., 1758) = Nagât-cu-picioare-galbene/White tailed lapwing

125. *Charadrius hiaticula* L., 1758 = Ploier-gulerat-mare/Ringed plover

126. *Charadrius dubius curonicus* Gmel., 1789 = Ploier-gulerat-mic/Little ringed plover
 127. *Charadrius alexandrinus alexandrinus* L., 1758 = Ploier-de-mare/Kentish plover
 128. *Charadrius asiaticus* L., 1758 = Ploier-asiatic/Caspian plover
 129. *Eudromias morinellus* (L., 1758) = Ploier-de-munte/Eurasian dotterel
 130. *Pluvialis squatarola* (L., 1758) = Ploier-argintiu/Grey plover
 131. *Pluvialis apricaria altifrons* (Ch. L. Brehm, 1811) = Ploier-mare/Golden plover
 132. *Arenaria interpres interpres* (L., 1758) = Pietruş/Ruddy turnstone

Family Scolopacidae Vigors, 1825 = Becaşine, sitari, fluierari/Snipes, godwits, sandpipers

133. *Gallinago gallinago gallinago* (L., 1758) = Becaşină/Common snipe
 134. *Gallinago media* (Lath., 1787) = Becaşină-mare/Great snipe
 135. *Limnocryptes minimus* (Brünn., 1764) = Becaşină-mică/Jack snipe
 136. *Scolopax rusticola rusticola* L., 1758 = Sitar/Eurasian woodcock
 137. *Numenius arquata arquata* (L., 1758) = Culic-mare/Eurasian curlew
 138. *Numenius tenuirostris* Vieill., 1817 = Culic-cu-cioc-subţire/Slender-billed curlew
 139. *Numenius phaeopus phaeopus* (L., 1758) = Culic-mic/Whimbrel
 140. *Limosa limosa limosa* (L., 1758) = Sitar-de-mal/Black-tailed godwit
 141. *Limosa lapponica lapponica* (L., 1758) = Sitar-de-mal-nordic/Bar-tailed godwit
 142. *Tringa erythropus* (Pallas, 1764) = Fluierar-negru/Spotted redshank
 143. *Tringa totanus totanus* (L., 1758) = Fluierar-picior-roşu/Common redshank
 144. *Tringa nebularia* (Gumm., 1767) = Fluierar-picior-verde/Greenshank
 145. *Tringa ochropus* L., 1758 = Fluierar-de-zăvoi/Green sandpiper
 146. *Tringa glareola* L., 1758 = Fluierar-de-mlaştină/Wood sandpiper
 147. *Tringa stagnatilis* (Bechst., 1803) = Fluierar-de-lac/Marsh sandpiper
 148. *Tringa hypoleucos* L., 1758 = Fluierar-de-munte/Common sandpiper
 149. *Calidris minuta* (Leisl., 1812) = Prundaş-mic/Little stint
 150. *Calidris temminckii* (Leisl., 1812) = Prundaş-pitic/Temminck's stint
 151. *Calidris alpina alpina* (L., 1758) = Prundaş-de-liman/Dunlin
 152. *Calidris ferruginea* (Pont., 1763) = Prundaş-roşcat/Curlew sandpiper
 153. *Calidris alba* (Pallas, 1764) = Prundaş-nisipar/Sanderling
 154. *Limicola falcinellus falcinellus* (Pont., 1763) = Prundaş-de-nămol/Broad-billed sandpiper
 155. *Philomachus pugnax* (L., 1758) = Bătăuş/Ruff

Family Recurvirostridae Bonaparte, 1854 = Ciocîntors, cătălige/Avocets, stilts

156. *Recurvirostra avosetta* L., 1758 = Ciocîntors/Pied avocet
 157. *Himantopus himantopus himantopus* (L., 1758) = Cătăligă/Black-winged stilt

Family Phalaropidae (Peters, 1934) = Notatiţe/Phalaropes

158. *Phalaropus fulicarius* (L., 1758) = Notatiţa-cioc-lat/Red phalarope
 159. *Phalaropus lobatus* (L., 1758) = Notatiţa/Red-necked phalarope

Family Burhinidae Mathews, 1912 = Păsări ale ogorului/Stone curlews

160. *Burhinus oediconemus oediconemus* (L., 1758) = Pasărea ogorului/Stone curlew

Family Glareolidae C.L. Brehm, 1831 = Ciovlici/Pratincoles

161. *Glareola pratincola pratincola* (L., 1758) = Ciovlică-de-mare/Collared pratincole or Common pratincole

162. *Glareola nordmanni* Fisch., 1842 = Ciovlică-de-mare-negrie/Black-winged pratincole

Sub-order Lari Sharpe, 1891 = Pescăruși, chirighițe/Gulls, terns

Family Stercorariidae Gray, 1871 = Lupi de mare/Skuas

163. *Stercorarius pomarinus* (Temm., 1815) = Lup-de-mare/Pomarine skua
 164. *Stercorarius parasiticus* (L., 1758) = Lup-de-mare-parazit/Parasitic jaeger or Arctic skua
 165. *Stercorarius longicaudus* Vieill., 1819 = Lup-de-mare-coadă-lungă/Long-tailed skua

Family Laridae Vigors, 1825 = Pescăruși/Gulls

166. *Larus marinus* L., 1758 = Pescăruș-negru/Great black-backed gull
 167. *Larus fuscus fuscus* L., 1758 = Pescăruș-negricios/Lesser black-backed gull
 168. *Larus argentatus ponticus* Stegm., 1934 = Pescăruș-argintiu/Pontic gull
 169. *Larus hyperboreus* Gunn., 1767 = Pescăruș-de-gheturi, Pescăruș nordic/Glaucous gull
 170. *Larus canus canus* L., 1758 = Pescăruș-sur/Common gull, Mew gull or Sea mew
 171. *Larus melanocephalus* Temm., 1820 = Martin-cu-cap-negru/Mediterranean gull
 172. *Larus ichthyaetus* Pallas, 1773 = Pescăruș-asiatic/Great black-headed gull
 173. *Larus ridibundus* L., 1758 = Pescăruș-râzător/Black-headed gull
 174. *Larus genei* Brême, 1839 = Pescăruș-roz-alb/Slender-billed gull
 175. *Larus sabini* L., 1758 = Pescăruș-cu-coadă-scobită/Sabine's gull
 176. *Larus glaucoides* Meyer, 1822 = Pescăruș-polar/Iceland gull
 177. *Rissa tridactyla* (L., 1758) = Pescăruș-polar/Black-legged kittiwake

Family Sternidae Bonaparte, 1838 = Chirighițe/Terns

178. *Chlidonias niger* (L., 1758) = Chirighiță-neagră/Black tern
 179. *Chlidonias leucopterus* (Temm., 1815) = Chirighiță-aripi-albe/White-winged tern
 180. *Gelochelidon nilotica* (Gmel., 1789) = Pescăriță-râzătoare/Gull-billed tern
 181. *Chlidonias hybrida hybrida* (Pallas, 1811) = Chirighiță-obraz-alb/Whiskered tern
 182. *Hydroprogne caspia caspia* (Pallas, 1770) = Pescar-mare/Caspian tern
 183. *Sterna hirundo hirundo* L., 1758 = Pescăruș-de-baltă, Chiră-de-baltă/Common tern
 184. *Sterna albifrons albifrons* Palass, 1764 = Pescăruș-pitic, Chiră mică/Little tern
 185. *Sterna sandvicensis sandvicensis* Lath., 1787 = Pescăruș-de-mare, Chiră-de-mare/Sandwich tern

Order Columbiformes Latham, 1790 = Proumbei, turturele/Pigeons, doves

Family Pteroclididae Bonaparte, 1831 = Hulubi de stepă/Sand grouse

186. *Syrnhaptes paradoxus* (Pallas, 1773) = Hulub-de-stepă/Pallas's sand grouse

Family Columbidae Illiger, 1811 = Proumbei, turturele/Pigeons, doves

187. *Columba oenas oenas* L., 1758 = Porumbel-de-scorbură/Stock dove
 188. *Columba palumbus* L., 1758 = Porumbel-gulerat/Common wood pigeon
 189. *Streptopelia turtur turtur* (L., 1758) = Turturică/Turtle dove
 190. *Streptopelia decaocto decaocto* (Friv., 1838) = Guguștiuc/Eurasian collared dove

Order Cuculiformes Wagler, 1830 = Cuci/Cuckoos

Family Cuculidae Vigors, 1825 = Cuci/Cuckoos

191. *Cuculus canorus canorus* L., 1758 = Cuc/Common cuckoo

Order Strigiformes Wagler, 1830 = Răpitoare de noapte/Night prey birds

Family Strigidae Vigors, 1825 = Bufnițe, huhurezi/Owls,

Sub-family Striginae Vigors, 1825 = Bufnițe, strigi, huhurezi/Owls

192. *Otus scops scops* (L., 1758) = Ciuf-pitic/Eurasian scops owl
 193. *Bubo bubo bubo* (L., 1758) = Buhă/Eurasian eagle-owl
 194. *Surnia ulula ulula* (L., 1758) = Ciuhurez-porumbac/Northern hawk owl
 195. *Glaucidium passerinum passerinum* (L., 1758) = Ciuvică/Eurasian pygmy-owl
 196. *Athene noctua noctua* (Scop., 1769) = Cucuvaie/Little owl
 197. *Athene noctua indigena* Ch. L. Brehm, 1868 = Cucuvaie-balcanică/Brown little owl
 198. *Strix aluco aluco* L., 1758 = Huhurez-mic/Tawny owl
 199. *Strix aluco uralensis* Dcun., 1940 = Huhurez-mare/Ural owl
 200. *Asio otus otus* (L., 1758) = Ciuf-de-pădure/Long-eared owl
 201. *Asio flammeus flammeus* (Pont., 1763) = Ciuf-de-baltă/Short-eared owl
 202. *Aegolius funereus funereus* (L., 1758) = Minuniță/Boreal owl or Tengmalm's owl

Sub-family Tytoninae Ridgway, 1914 = Strigi/Barn owls

203. *Tyto alba guttata* (Ch. L. Brehm, 1831) = Strigă/Barn owl

Order Caprimulgiformes Ridgway, 1881 = Caprimulgi/Nightjars

Family Caprimulgidae Vigors, 1825 = Caprimulgi/Nightjars

204. *Caprimulgus europaeus europaeus* L., 1758 = Caprimulg/European nightjar

Order Apodiformes Peters, 1940 = Drepnele/Swifts

Family Apodidae Hartert, 1897 = Drepnele/Swifts

205. *Apus apus apus* (L., 1758) = Drepnea/Common swift
 206. *Apus melba melba* (L., 1758) = Drepnea-mare/Alpine swift

Order Coraciiformes Forbes, 1884 = Pescărei, prigorii, pupeze/Kingfishers, bee-eaters, hoopoes

Family Alcedinidae Rafinesque, 1815 = Pescărași/Kingfishers

207. *Alcedo atthis atthis* (L., 1758) = Pescăraș-albastru-mic/Eurasian kingfisher or River kingfisher
 208. *Alcedo atthis ispida* L., 1758 = Pescăraș-albastru-mare/Common kingfisher

Family Meropidae Rafinesque = Prigorii/Bee-eaters

209. *Merops apiaster* L., 1758 = Prigoare, Albinărel/European bee-eater

Family Coraciidae Rafinesque, 1815 = Dumbrăvenci/Rollers

210. *Coracias garrulus garrulus* L., 1758 = Dumbrăveancă/European roller

Family Upupidae Leach, 1820 = Pupeze/Hoopoes

211. *Upupa epops epops* L., 1758 = Pupăză/Common hoopoe

Order Piciformes Meyer et Wolf, 1810 = Ciocănitari/Woodpeckers

Family Picidae Vigors, 1825 = Ciocănitari/Woodpeckers

Sub-family Picinae Vigors, 1825 = Ciocănitari/Woodpeckers

212. *Picus viridis viridis* L., 1758 = Ciocănitare-verde, Ghionoaie verde/Green woodpecker
 213. *Picus viridis romaniae* Stresemann, 1919 = Ciocănitare-verdoaie/Romanian green woodpecker
 214. *Picus canus canus* Gmel., 1788 = Ciocănitare-verzuie/Grey-faced woodpecker
 215. *Dryocopus martius pinetorum* (Ch. L. Brehm, 1811) = Ciocănitare-neagră/Black woodpecker
 216. *Dendrocopos major major* (L., 1758) = Ciocănitare-pestriță-mare-răsăriteană/ Great spotted woodpecker
 217. *Dendrocopos major pinetorum* (Ch. L. Brehm, 1831) = Ciocănitare-mare/Forest great spotted woodpecker
 218. *Dendrocopos major candidus* Stress., 1919 = Ciocănitare-mare-sudică/Southern great spotted woodpecker
 219. *Dendrocopos syriacus* (Hempr. et Ehr., 1833) = Ciocănitare-de-grădină/Syrian woodpecker
 220. *Dendrocopos medius medius* (L., 1758) = Ciocănitare-pestriță-mijlocie/ Middle spotted woodpecker
 221. *Dendrocopos leucotos leucotos* (Bechst., 1803) = Ciocănitare-dos-alb/White-backed woodpecker
 222. *Dendrocopos lilfordi lilfordi* Sharpeet Dress, 1871 = Ciocănitare-dos-alb-dobrogeană/Lilford's white-backed woodpecker
 223. *Dendrocopos minor hortorum* (Ch. L. Brehm, 1831) = Ciocănitare-pestriță-mică/Lesser spotted woodpecker
 224. *Picoides tridactylus* (L., 1758) = Ciocănitare-cu-trei-degete/Three-toed woodpecker
 225. *Jinx torquilla torquilla* L., 1758 = Capîntortură/Eurasian wryneck

Order Passeriformes Linnaneus, 1758 = Păsărele cântătoare/Singing birds

Family Alaudidae Vigors, 1825 = Ciocârlii/Larks

226. *Calandrella brachydactyla brachydactyla* (Leisl., 1814) = Ciocârlie-cu-degete-scurte/Greater short-toed lark
 227. *Melanocorypha calandra calandra* (L., 1758) = Ciocârlie-de-Bărăgan/Calandra lark
 228. *Melanocorypha leucoptera* (Pallas, 1811) = Ciocârlie-cu-aripi-albe/White-winged lark
 229. *Melanocorypha yeltonensis* (Forster, 1768) = Ciocârlie-neagră/Black lark
 230. *Eremophila alpestris flava* (Gml., 1789) = Ciocârlie-urechiată/Shore lark
 231. *Lullula arborea arborea* (L., 1758) = Ciocârlie-de-pădure/Woodlark
 232. *Galerida cristata tenuirostris* Ch. L. Brehm, 1858 = Ciocârlan/Crested lark
 233. *Alauda arvensis arvensis* L., 1758 = Ciocârlie-de-câmp/Skylark

234. *Alauda arvensis lunata* Ch. L. Brehm, 1845 = Ciocârlie-de-câmp-cenușie/Eurasian skylark
235. *Alauda alauda cinerascens* Hart., 1940 = Ciocârlie-răsăriteană/Ash-throated skylark

Family Hirundinidae Vigors, 1825 = Rândunele, lăstuni/ Swallows, martins

236. *Riparia riparia riparia* (L., 1758) = Lăstun-de-mal/Sand martin
237. *Hirundo rustica rustica* L., 1758 = Rândunică/Barn swallow
238. *Delichon urbica urbica* (L., 1758) = Lăstun-de-casă/House martin

Family Motacillidae Horsfield, 1821 = Codobature, fâse/Wagtails, pipits

239. *Motacilla flava flava* L., 1758 = Codobatură-galbenă/Blue-headed wagtail
240. *Motacilla flava dombrowski* (Tscusi, 1903) = Codobatură-galbenă-răsăriteană/
Eastern yellow wagtail
241. *Motacilla flava feldegg* Michach., 1830 = Codobatură-cap-negru/Black-headed
wagtail
242. *Motacilla flava beema* (Sykes, 1832) = Codobatură-răsăriteană/Sykes' yellow
wagtail
243. *Motacilla flava taivanus* (Swinhoe, 1863) = Codobatură-asiatică/Asian yellow
wagtail
244. *Motacilla cinerea cinerea* (Gml., 1774) = Codobatură-de-munte/Grey wagtail
245. *Motacilla alba alba* L., 1756 = Codobatură-albă/White wagtail
246. *Anthus campestris campestris* (L., 1758) = Fâsă-de-câmp/Tawny pipit
247. *Anthus trivialis trivialis* (L., 1758) = Fâsă-de-pădure/Tree pipit
248. *Anthus pratensis* (L., 1758) = Fâsă-de-luncă/Meadow pipit or Titlark
249. *Anthus cervinus* (Pallas, 1811) = Fâsă-cu-gât-roșu/Red-throated pipit
250. *Anthus spinoletta spinoletta* (L., 1758) = Fâsă-de-munte/Water pipit

Family Laniidae Rafinesque, 1815 = Sfrâncioci/Shrikes

251. *Lanius collurio collurio* L., 1758 = Sfrâncioc-roșu/Red-backed shrike
252. *Lanius minor minor* (Gm., 1788) = Sfrâncioc-cu-fruntea-neagră/Lesser grey
shrike
253. *Lanius excubitor excubitor* L., 1758 = Sfrâncioc-mare/Great grey shrike
254. *Lanius excubitor homeyeri* Cab., 1873 = Sfrâncioc-răsăritean/Great grey shrike
255. *Lanius senator senator* L., 1758 = Sfrâncioc-cu-cap-roșu/Woodchat shrike

Family Bombycillidae Swainson, 1831 = Mătășari/Waxwings

256. *Bombycilla garrulus garrulus* (L., 1758) = Mătăsar/Bohemian waxwing

Family Cinclidae Sundevall, 1797 = Pescărei/Dippers

257. *Cinclus cinclus cinclus* (L., 1758) = Mierlă-neagră-nordică/White-throated dipper
258. *Cinclus cinclus aquaticus* Bechst., 1803 = Mierlă-de-apă/White-throated dipper
259. *Cinclus cinclus meridionalis* Ch. L. Brehm, 1856 = Mierlă-neagră-sudică/Souther
white-throated dipper

Family Troglodytidae Swainson, 1832 = Ochiul-boului/Wrens

260. *Troglodytes troglodytes troglodytes* (L., 1758) = Ochiul-boului/Winter wren

Family Prunellidae Richmond, 1908 = Brumărițe/Accentors

261. *Prunella collaris collaris* (Scop., 1768) = Brumăriță-de-stâncă/Rock accentor
 262. *Prunella collaris subalpina* (Ch. L. Brehm, 1831) = Brumăriță-de-gol/Alpine accentor
 263. *Prunella modularis modularis* (L., 1758) = Brumăriță-de-pădure/Hedge accentor

Family Sylviidae Vigors, 1825 = Lăcari, silvii, pitulici/Warbblers, chiffchaffs

264. *Cettia cetti cetti* (Temm., 1820) = Stufărică/Cetti's warbler
 265. *Locustella locustella luscinioides* (Savi, 1824) = Grelușel-de-stuf/Savi's warbler
 266. *Locustella fluviatilis fluviatilis* (Wolf, 1810) = Grelușel-de-zăvoi/River warbler
 267. *Locustella naevia naevia* (Bodd., 1783) = Grelușel-de-tufiș/Grasshopper warbler
 268. *Acrocephalus melanopogon melanopogon* (Temm., 1823) = Privighetoare-de-baltă/Moustached warbler
 269. *Acrocephalus schoenobaenus* (L., 1758) = Lăcar-de-rogoz/Sedge warbler
 270. *Acrocephalus paludicola* (Vieill., 1817) = Lăcar-de-pipirig/Aquatic warbler
 271. *Acrocephalus palustris* (Bechst., 1798) = Lăcar-de-mlaștină/Marsh warbler
 272. *Acrocephalus scirpaceus scirpaceus* (Herm., 1804) = Lăcar-de-lac/Eurasian reed warbler
 273. *Acrocephalus arundinaceus arundinaceus* (L., 1718) = Lăcar-mare/Great Reed Warbler
 274. *Acrocephalus agricola brevipennis* (Svertzov, 1872) = Lăcar-de-câmp/Cape Verde warbler
 275. *Hippolais icterina* (Vieill., 1817) = Frunzăriță/Icterine warbler
 276. *Hippolais pallida elaiica* (Linderm., 1843) = Frunzăriță-cenușie/Balkan olivaceous warbler
 277. *Sylvia borin borin* (Bodd., 1783) = Silvie-de-zăvoi/Garden warbler
 278. *Sylvia atricapilla atricapilla* (L., 1758) = Silvie-cu-cap-negru/Blackcap warbler
 279. *Sylvia curruca* (L., 1758) = Silvie-mică/Lesser whitethroat warbler
 280. *Sylvia communis communis* Lath., 1787 = Silvie-de-câmpie/Common whitethroat warbler
 281. *Sylvia nisoria nisoria* (Bechst., 1795) = Silvie-porumbacă/Barred warbler
 282. *Sylvia cantillans* (Pall., 1764) = Silvie-cu-barbă-albă/Subalpine warbler
 283. *Sylvia ruppelli* Blyth, 1851 = Silvie-cu-bărbie-neagră/Rüppell's warbler
 284. *Phylloscopus trochilus trochilus* (L., 1758) = Pitulicea-fluierătoare/Willow warbler
 285. *Phylloscopus trochilus acredula* (L., 1758) = Pitulice-nordică/Leaf warblers
 286. *Phylloscopus collybita collybita* (Vieill., 1817) = Pitulice-mică/Common chiffchaff
 287. *Phylloscopus collybita abietinus* (Nils., 1819) = Pitulice-răsăriteană/Eastern chiffchaff
 288. *Phylloscopus bonelli orientalis* (Ch. L. Brehm, 1855) = Pitulice-de-munte/Eastern Bonelli's warbler
 289. *Phylloscopus sibilatrix* (Bechst., 1793) = Pitulice-sfârâitoare/Wood warbler

Family Regulidae Cuvier, 1800 = Aușei/Crests

290. *Regulus regulus regulus* (L., 1758) = Aușel-de-iarnă/Goldcrest
 291. *Regulus ignicapillus ignicapillus* (Temm., 1820) = Aușel sprâncenat/Common firecrest

Family Muscicapidae Vigors, 1825 = Muscari/Flycatchers

292. *Muscicapa striata striata* (Pallas, 1764) = Muscar-sur/Spotted flycatcher
 293. *Ficedula hypoleuca hypoleuca* (Pallas, 1764) = Muscar-negru/Pied flycatcher
 294. *Ficedula albicollis albicollis* (Temm., 1815) = Muscar-gulerat/Collared flycatcher
 295. *Ficedula parva parva* (Becht., 1794) = Muscar-mic/Red-breasted flycatcher

Family Turdidae Rafinesque, 1815 = Privighetori, sturzi, mierle/Nightingales, thrushs

296. *Saxicola torquata rubicola* (L., 1758) = Mărăcinar-mare/European stonechat
 297. *Saxicola torquata maura* (Pallas, 1773) = Mărăcinar-răsăritean/Siberian stonechat
 298. *Saxicola rubetra* (L., 1758) = Mărăcinar-mic/Whinchat
 299. *Phoenicurus phoenicurus phoenicurus* (L., 1758) = Codroș/Common redstart
 300. *Phoenicurus phoenicurus samamisticus* (Habl., 1783) = Codroș-răsăritean/Ehrenberg's redstart
 301. *Phoenicurus ochruros gibraltariensis* (Gmel., 1789) = Codroș-de-munte/European black redstart
 302. *Luscinia megarhynchos megarhynchos* Ch.L.Brehm, 1831 = Privighetoare-mică/Nightingale
 303. *Luscinia luscinia* (L., 1758) = Privighetoare-mare/Thrush nightingale
 304. *Luscinia svecica cyanecula* (Meisn., 1804) = Privighetoare-pitică/White-spotted bluethroat nightingale
 305. *Luscinia svecica volgae* (Kleinschm., 1907) = Privighetoare-răsăriteană/Bluethroat nightingale
 306. *Erithacus rubecula rubecula* (L., 1758) = Măcăleandru/European robin
 307. *Oenanthe isabellina* (Cretzschm., 1826) = Pietrar-răsăritean/Isabelline wheatear
 308. *Oenanthe oenanthe oenanthe* (L., 1758) = Pietrar-sur/Northern wheatear
 309. *Oenanthe hispanica melanoleuca* (Güld., 1775) = Pietrar-mediterranean/Black-eared wheatear
 310. *Oenanthe pleschanka pleschanka* (Lepeșin, 1770) = Pietrar-negru/Pied wheatear
 311. *Monticola saxatilis* (L., 1758) = Mierlă-de-piatră/Rufous-tailed rock thrush or Rock thrush
 312. *Turdus viscivorus viscivorus* L., 1758 = Sturz-de-vâsc/Mistle thrush
 313. *Turdus pilaris* L., 1758 = Strurz-de-iarnă/Fieldfare
 314. *Turdus philomelos philomelos* Ch.L.Brehm, 1831 = Sturz-cântător/Song thrush
 315. *Turdus iliacus iliacus* (L., 1758) = Sturz-mic/Redwing
 316. *Turdus torquatus alpestris* (Ch.L.Brehm, 1831) = Mierlă-gulerată/Ring ouzel
 317. *Turdus merula merula* L., 1758 = Mierlă-neagră/Blackbird

Family Paradoxornithidae David, 1871 = Pițigoi de stuf/Bearded tits

318. *Panurus biarmicus russicus* (C.L. Brehm, 1831) = Pițigoi-de-stuf/Bearded tits

Family Paridae Vigors, 1825 = Pițigoi/Tits

319. *Aegithalos caudatus caudatus* L., 1758 = Pițigoi-codat/Long-tailed tit
 320. *Remiz pendulinus pendulinus* (L., 1758) = Boicuș/European penduline tit
 321. *Remiz pendulinus caspius* (Poelzam, 1870) = Boicuș-răsăritean/Caspian penduline-tit
 322. *Parus cristatus cristatus* L., 1758 = Pițigoi-moțat/Crested tit
 323. *Parus lugubris lugubris* Temm., 1820 = Pițigoi-de-livadă/Sombre tit

324. *Parus palustris communis* Baldenstein, 1827 = Pițigoi-sur/Marsh tit
 325. *Parus palustris stagnatilis* Ch.L.Brehm, 1855 = Pițigoi-sur-răsăritean/Marsh tit
 326. *Parus palustris congrevei* Kinnear, 1928 = Pițigoi-sur-de-munte/Mountain tit
 327. *Parus montanus borealis* Selys-Longch., 1843 = Pițigoi-de-munte/Willow tit
 328. *Parus caeruleus caeruleus* L., 1758 = Pițigoi-albastru/Blue tit
 329. *Parus cyanus cyanus* Pallas, 1770 = Pițigoi-azuriu/Azure tit
 330. *Parus major major* L., 1758 = Pițigoi-mare/Great tit
 331. *Parus ater ater* L., 1758 = Pițigoi-de-brădet/Gould coal tit

Family Sittidae Lesson, 1828 = Țicleni/Nuthatches

332. *Sitta europaea caesia* Wolf, 1810 = Țiclean/Eurasian nuthatch
 333. *Tichodroma muraria muraria* (L., 1758) = Fluturaș-de-piatră/Wallcreeper

Family Certhiidae Leach, 1820 = Cojoaice/Treecreepers

334. *Certhia familiaris familiaris* L., 1758 = Cojoaică/Eurasian treecreeper or Common treecreeper
 335. *Certhia brachydactyla brachydactyla* Ch.L.Brehm, 1820 = Cojoaică-de-grădină/Hort-toed treecreeper

Family Emberizidae Vigors, 1831 = Presure/Buntings

336. *Emberiza calandra calandra* L., 1758 = Presură-sură/Corn bunting
 337. *Emberiza citrinella citrinella* L., 1758 = Presură-galbenă/Yellowhammer
 338. *Emberiza cirrus cirrus* L., 1758 = Presură-bărboasă/Cirl bunting
 339. *Emberiza hortulana* L., 1758 = Presură-de-grădină/Ortolan or Ortolan bunting
 340. *Emberiza cia cia* L., 1758 = Presură-de-munte/Rock bunting
 341. *Emberiza schoeniclus schoeniclus* L., 1758 = Presură-de-stuf/Reed bunting
 342. *Emberiza schoeniclus intermedia* Degl., 1849 = Presură-de-trestie/Mediterranean reed bunting
 343. *Emberiza schoeniclus tschussii* Reiser, 1898 = Presură-de-stuf-dobrogeană/Tschüss' reed bunting
 344. *Emberiza melanocephala melanocephala* Scop., 1769 = Presură-cu-cap-negru/Black-headed bunting
 345. *Calcarius lapponicus* (L., 1758) = Presură-de-tundră/Lapland longspur
 346. *Plectrophenax nivalis nivalis* (L., 1758) = Presură-de-iarnă/Snow bunting

Family Fringillidae Vigors, 1825 = Sticleți, forfecuțe, căldărași/Goldfinches, crossbills, bullfinches

347. *Fringilla coelebs coelebs* L., 1758 = Cintează/Common chaffinch
 348. *Fringilla montifringilla* L., 1758 = Cintează-de-iarnă/Brambling
 349. *Serinus serinus* (L., 1766) = Căănăraș/European serin
 350. *Carduelis chloris chloris* (L., 1758) = Florinte/European greenfinch
 351. *Carduelis chloris mühle* Parrot, 1905 = Florințel/Greenfinch
 352. *Carduelis carduelis carduelis* (L., 1758) = Sticlete-trecător/Goldfinch or European goldfinch
 353. *Carduelis carduelis balcanica* Sachtleben, 1919 = Sticlete/Balkan goldfinch
 354. *Carduelis spinus* (L., 1758) = Scatiu/Eurasian siskin
 355. *Carduelis flammea flammea* (L., 1758) = Inăriță/Common redpoll
 356. *Carduelis flammea cabaret* (Müll., 1776) = Inăriță-roșie-mică/Lesser redpoll
 357. *Carduelis cannabina cannabina* (L., 1758) = Cânepar/Linnet

358. *Loxia pytyopsittacus* Borkh., 1793 = Forfecar/Parrot crossbill
 359. *Loxia curvirostra curvirostra* L., 1758 = Forfecuță/Common crossbill
 360. *Loxia leucoptera bifascinata* (Ch.L.Brehm 1827) = Forfecel/Two-barred crossbill
 361. *Coccothraustes coccothraustes coccothraustes* (L., 1758) = Botgros/Bullfinch (grosbeak)
 362. *Pyrrhula pyrrhula pyrrhula* (L., 1758) = Căldăraș-mare/Common bullfinch or Eurasian bullfinch
 363. *Pyrrhula pyrrhula germanica* (Ch.L.Brehm, 1831) = Căldăraș-mic/Gimpel

Family Ploceidae Sundevall, 1836 = Vrăbii/Sparrows

364. *Montifringilla nivalis nivalis* (L., 1758) = Cintează-de-munte/White-winged snowfinch
 365. *Passer domesticus domesticus* (L., 1758) = Vrabie-de-casă/House sparrow
 366. *Passer hispaniolensis hispaniolensis* (Temm., 1820) = Vrabie-spaniolă/Spanish sparrow
 367. *Passer montanus montanus* (L., 1758) = Vrabie-de-câmp/Tree sparrow

Family Sturnidae Rafinesque, 1815 = Grauri/Starlings

368. *Sturnus roseus* (L., 1758) = Lăcustar/Rosy starling
 369. *Sturnus vulgaris* L., 1758 = Graur/European starling

Family Oriolidae Vigors, 1825 = Granguri/Orioles

370. *Oriolus oriolus* (L., 1758) = Grangur/Eurasian golden oriole

Family Corvidae Vigors, 1825 = Ciori, gaițe, corbi/Crows, jays, ravens

371. *Garrulus glandarius glandarius* (L., 1758) = Gaiță/Eurasian jay
 372. *Pica pica pica* (L., 1758) = Coțofană/European magpie or common magpie
 373. *Nucifraga caryocatactes caryocatactes* (L., 1758) = Alunar/Spotted nutcracker
 374. *Nucifraga caryocatactes macrorhynchos* (Brehm., 1823) = Alunar-răsăritean/Long bill spotted nutcracker
 375. *Colaeus monedula turrium* (Ch.L.Brehm, 1831) = Stăncuță-transilvană/Western jackdaw
 376. *Colaeus monedula soemmeringi* (Fisch., 1811) = Stăncuță/Common jackdaw Eurasian jackdaw
 377. *Colaeus monedula spermolegus* Vieill., 1817 = Stăncuță/Eurasian jackdaw
 378. *Corvus frugilegus frugilegus* L., 1758 = Cioară-de-semănătură/Rook
 379. *Corvus corone corone* L., 1758 = Cioară-neagră/Rabenkrähe
 380. *Corvus corone cornix* L., 1758 = Cioară-grivă-ardeleană/Hooded crow
 381. *Corvus corone sardonius* Kleinschm., 1903 = Cioară-grivă/Hooded crow
 382. *Corvus corax corax* L., 1758 = Corb/Common raven

Class MAMMALIA Linnaeus, 1758 = Mamifere/ Mammals

Sub-class Eutheria Gill, 1872 = Mamifere placentare/Placental mammals

Order Insectivora Bowdich, 1712 = Insectivore/Insectivorous

Sub-order Dilambdodonta Gill, 1884 = Insectivore cu molari „W”/Insectivorous with „W” molars

Family Erinaceidae Fischer, 1814 = Arici/Hedgehogs

1. *Erinaceus concolor* (= *Erinaceus roumanicus roumanicus*) (Barett-Hamilton, 1900) = Arici-cu-piept-alb/ Eastern European hedgehog

Family Soricidae Fishcher, 1814 = Chițcani/Shrews

2. *Sorex araneus tetragonurus* Hermann, 1780 = Chițcan-de-pădure/Common shrew
3. *Sorex alpinus alpinus* Schinz, 1887 = Chițcan-de-munte/Alpine shrew
4. *Sorex minutus minutus* L., 1766 = Chițcan-pitic/Pygmy shrew
5. *Neomys fodiens fodiens* (Pennant, 1771) = Chițcan-de-apă/Water shrew
6. *Neomys anomalus milleri* Mottasz, 1907 = Chițcan-de-munte-apusean/Southern water shrew
7. *Crocidura leucodon leucodon* (Hermann, 1780) = Chițcan-de-câmp/White-toothed shrew
8. *Crocidura suaveolens suaveolens* (Pallas, 1811) = Chițcanul de grădină/Garden shrew or Lesser white toothed shrew

Family Talpidae Fischer, 1814 = Cârțițe/Moles

9. *Talpa europea* L., 1758 = Cârțiță/Eurasian mole or common mole

Order Chiroptera Blumenbach, 1779 = Lilioci/Bats

Sub-order Microchiroptera Dobson, 1875 = Lilioci mici/Small bats

Family Rhinolophidae Gray, 1825 = Lilioci cu pliuri nazale/Leaf-nosed bats

10. *Rhinolophus ferrumequinum ferrumequinum* Schreber, 1744 = Liliac-mare-cu-potcoavă/Greater horseshoe bat
11. *Rhinolophus hipposideros hipposideros* Bechstein, 1800 = Liliac-mic-cu-potcoavă/Lesser horseshoe bat
12. *Rhinolophus euryale euryale* Blasius, 1853 = Liliac-sudic/Mediterranean horseshoe bat
13. *Rhinolophus blasii* Peters, 1866 = Liliacul-lui-Blasius/Blasius' horseshoe bat
14. *Rhinolophus mehelyi* Matschie, 1901 = Liliac-românesc/Mehely's horseshoe bat

Family Vespertilionidae Gray, 1821 = Lilioci cu tragus/Tragus bats

15. *Myotis alcathoe* Helversen et Heller, 2001 = Liliacul mustăcios pitic/Alcathoe myotie
16. *Myotis mystacinus mystacinus* Kuhl, 1819 = Liliac-cu-mustăți/Whiskered bat
17. *Myotis emarginatus emarginatus* Geoffroy, 1806 = Liliac-cu-gene-lungi/Notched-eared bat
18. *Myotis nattereri nattereri* Kuhl, 1819 = Liliacul-lui-Natterer/Natterer's bat or Reddish-gray bat
19. *Myotis bechsteini* Leisler, 1819 = Liliacul-lui-Bechstein/Bechstein's bat
20. *Myotis brandtii* (Eversmann, 1845) = Liliacul mare mustăcios/Large-whiskered bat
21. *Myotis myotis myotis* Borkhausen, 1797 = Liliac-mare/Large mouse-eared bat
22. *Myotis daubentonii daubentonii* (Leisler, 1819) = Liliac-de-apă/Water bat or Daubenton's bat

23. *Myotis capaccinii capaccinii* (Bonaparte, 1837) = Liliac-cu-picioare-lungi/Long-fingered bat
24. *Myotis dasycneme dasycneme* (Boie, 1825) = Liliac-de-baltă/Pond bat
25. *Vespertilio murinus murinus* L., 1758 = Liliac-bicolor/Praticolou red bat
26. *Eptesicus nilsoni nilsoni* Keyserling et Blasius, 1807 = Liliac-nordic/Northern bat
27. *Eptesicus serotinus serotinus* (Schreber, 1874) = Liliac-cu-aripi-late/Serotine bat
28. *Nyctalus leisleri leisleri* (Kuhl., 1818) = Liliac-mic-de-amurg/Lesser noctule
29. *Nyctalus noctula noctula* (Schreber, 1874) = Liliac-mare-de-amurg/Great noctule or Common noctule
30. *Nyctalus lasiopterus lasiopterus* Schreber, 1780 = Liliacul mare de amurg/Giant noctule
31. *Pipistrellus pipistrellus pipistrellus* Schreber, 1744 = Liliac-pitic/Common bat or Lesser pipistrelle
32. *Pipistrellus nathusii* Kays. et Blasius, 1839 = Liliac-cu-pielea-aspră/Nathusius' pipistrelle
33. *Pipistrellus pygmaeus* Leach, 1825 = Liliacul-pitic mediteranean/Mediterranean Lesser pipistrelle
34. *Pipistrellus kuhli* Kuhl, 1817 = Liliacul cu dungă albă/White stripe bat
35. *Barbastella barbastellus* Schreber, 1774 = Liliac-cârn/Western barbastelle
36. *Plecotus auritus auritus* L., 1758 = Liliac urechiat brun/Brown long-eared bat
37. *Plecotus austriacus* (Fischer, 1829) = Liliacul urechiat cenușiu/Gray long-eared bat
38. *Miniopterus schreibersii schreibersii* Kuhl, 1819 = Liliac-cu-aripi-lungi/Long-winged bat or Schreiber's long-fingered bat

Order Lagomorpha Brandt, 1855 = Iepuri/Hares, rabbits, pikas

Family Leporidae Fischer, 1817 = Iepuri/Hares, rabbits

39. *Lepus europaeus europaeus* Pallas, 1778 = Iepure/European brown hare
40. *Oryctolagus cuniculus cuniculus* L., 1758 = Iepure-de-vizuină/European gray rabbit

Order Rodentia (Simplicidentata) Bowdich, 1821 = Rozătoare/Rodents

Sub-order Sciuromorpha Brandt, 1855 = Veverițe/Squirrels

Family Sciuridae Fischer, 1817 = Veverițe/Squirrels

41. *Sciurus vulgaris fuscoater* Altum, 1876 = Veveriță/Eurasian squirrel or Red squirrel

Sub-family Marmotinae Pocock, 1923

42. *Marmota marmota marmota* L., 1758 = Marmotă/Alpine marmot
43. *Citellus citellus* (L., 1758) = Popândău/European souslik or Ground squirrel

Family Castoridae Hemprich, 1820 = Castori/Beavers

44. *Castor fiber* L., 1758 = Castorul/Eurasian beaver

Sub-order Myomorpha Brandt, 1855 = Șoareci, șobolani, hamsteri etc./Mice, rats, hamsters, etc.

Family Cricetidae Fischer, 1817 = Hârciog/Hamsters

Sub-family Cricetinae Fischer, 1817 = Hârciog/Hamsters

45. *Cricetulus migratorius migratorius* Pallas, 1773 = Grivan-cenușiu-pitic/Grey hamster or Migratory hamster
46. *Cricetus cricetus cricetus* (L., 1758) = Hârciog/Common hamster or Black-bellied hamster
47. *Mesocricetus newtoni* Nehring, 1898 = Grivan românesc sau dobrogean/ Romanian hamster

Sub-family Microtidae Cope, 1891 = Șoareci cu coada scurtă/Short tailed mice

48. *Clethrionomys glareolus isticus* Miller, 1909 = Șoarece-scurmător/Bank vole or Common red-backed vole
49. *Arvicola terrestris terrestris* L., 1758 = Șobolan-de-apă/European water vole or Water rat
50. *Arvicola terrestris amphibius* L., 1758 = Șobolan-de-apă/Lesser water rat
51. *Ondatra zibethica* (L.,) 1758 = Bizam/Muskrat
52. *Pitymys subterraneus subterraneus* de Selys-Longch., 1836 = Șoarece-subpământean-mic/European pine vole
53. *Pitymys subterraneus dacius* Miller, 1908 = Șoarece-subpământean/European pine vole
54. *Pitymys subterraneus transylvanicus* Ehik, 1924 = Șoarece-subpământean-de-Făgăraș /Transylvanian pine vole
55. *Pitymys subterraneus nyirensis* Ehik, 1930 = Șoarece-subpământean/Pine vole
56. *Pitymys subterraneus klözelii* Ehik, 1924 = Șoarecele-subpământean-al-lui Klözel/Klözel's pine vole
57. *Chionomys nivalis* (Martins, 1842) = Șoarece-de-zăpadă/European snow vole
58. *Microtus levis* Miller, 1908 = Șoarece-sudic-de-câmp/Southern vole
59. *Microtus arvalis* (Pallas, 1778) = Șoarece-de-câmp/Common vole
60. *Microtus agrestis* L., 1758 = Șoarece-de-câmp-cu-păr-lung/Short tailed vole or Common field vole

Family Spalacidae Gray, 1821 = Orbeți/Mole rats

61. *Spalax leucodon* Nordmann, 1840 = Orbete/Lesser mole rat
62. *Spalax microphthalmus antiquus* Méhely, 1909 = Orbete-mare/Greater mole rat
63. *Spalax microphthalmus isticus* Méhely, 1909 = Orbete-dunărean/Danubian mole rat

Family Muridae Illiger, 1811 = Șoareci, șobolani/Mice, rats

64. *Rattus rattus rattus* L., 1758 = Șobolan-negru/Black rat or Roof rat
65. *Rattus rattus alexandrinus* Desmarest, 1819 = Șobolan-de-Alexandria/Alexandrian black rat
66. *Rattus norvegicus norvegicus* Berkenhout, 1769 = Șobolan-comun/Common rat or Brown rat
67. *Mus musculus musculus* L., 1758 = Șoarece-de-casă/House mouse
68. *Mus musculus spicilegus* Petenyi, 1882 = Șoarece-de-mișună/ Steppe mouse or Mound-building mouse
69. *Apodemus flavicollis flavicollis* Melchior, 1834 = Șoarece-cu-gât-galben/Yellow-necked mouse
70. *Apodemus sylvaticus sylvaticus* L., 175 = Șoarece-de-pădure/Wood mouse or European wood mouse

71. *Apodemus agrarius agrarius* Pallas, 1771 = Șobolan-de-câmp/Striped field mouse

72. *Micromys minutus pratensis* Ocskay, 1831 = Șoarece-pitic/Harvevst mouse

Sub-order Glirimorpha Wood, 1974 = Pârși/Dormice

Family Gliridae Thomas, 1897 = Pârși/Dormice

73. *Glis glis glis* L., 1766 = Pârș-mare/Common dormouse or Edible dormouse

74. *Muscardinus avellanarius avellanarius* L., 1758 = Pârș-de-alun/Hazel dormouse

75. *Eliomys quercinus* L., 1758 = Pârș-de-ghindă/Garden dormouse or Orchard dormouse

76. *Dryomys nitedula nitedula* Pallas, 1779 = Pârș-cu-coadă-stufoasă/Forest dormouse

Sub-order Myomorpha Brandt, 1855 = Șoareci săritori/Jumping mice

Family Zapodidae Coues, 1875 = Șoareci săritori de stepă/Steppe jumping mice

Sub-family Sicistinae Allen, 1901 = Șoareci săritori de stepă/Steppe jumping mice

77. *Sicista subtilis nordmanni* Keys. et Blasius, 1840 = Șoarece-săltător-de-stepă/Southern birch mouse

78. *Sicista subtilis trizona* Petenyi, 1882 = Șoarece-săltător-vărgat-de-pădure/Forest birch mouse

79. *Sicista betulina* Pallas, 1779 = Șoarece-vărgat/Northern birch mouse

Sub-order Caviomorpha Wood, 1955 = Nutrii/Coypus

Family Myocastoridae Smith, 1842 = Nutrii/Coypus

80. *Myocastor coypus* Molinia, 1782 = Nutrie/Coypus or Swamp beaver or Nutria

Order Cetacea Brisson, 1762 = Delfini/Dolphins

Sub-order Odontoceti Flower, 1867 = Delfini cu dinți/Teethed dolphins

Family Phocoridae Gray, 1825 = Marsuini/Porpoises

81. *Phocoena phocoena* L., 1758 = Porc-de-mare/Common porpoise or Harbor porpoise

Family Delphinidae Gray, 1821 = Delfini/Dolphins

82. *Delphinus delphis ponticus* Barabasch, 1935 = Delfin comun/Common dolphin or White belied porpoise

83. *Tursiops truncatus ponticus* Bobrinski, 1944 = Delfin-jucăuș-mare sau delfin-mare/Bottle-nosed dolphin or Coastal porpoise

Order Carnivora Bowdich, 1821 = Carnivore/Carnivores

Sub-order Fissipedia Blumenbach, 1791 = Câini, pisici,urși/Dogs, cats, bears

Superfamily Arctoidea Flower, 1869 = Urși, nevăstuici/Bears, Weasels

Family Mustelidae Fischer, 1817 = Dihori, jderi/Polectas, Martens

84. *Mustela erminea aestiva* Kerr, 1792 = Hermelină/Common stoat or Ermine

85. *Mustela minuta* (Pamel) = Nevăstuică-pitică/Lesser weasel

86. *Mustela nivalis nivalis* L., 1766 = Nevăstuică/Weasel

87. *Mustela nivalis boccamela* Becht., 1800 = Nevăstuică/Weasel
 88. *Mustela lutreola lutreola* L., 1761 = Nurcă, noriță/European mink or Marshotter
 89. *Mustela lutreola transsylvanica* Ehik, 1931 = Nurcă-de-Transilvania/Transylvanian mink
 90. *Mustela putorius putorius* L., 1758 = Dihor-de-casă/European polecat
 91. *Mustela putorius rothschildi* Pockock, 1932 = Dihor-de-stepă/Fitchew
 92. *Vormela peregusna euxinia* Bockock, 1936 = Dihor-pestriț, Dihor pătat/Marbled polecat
 93. *Martes martes martes* L., 1758 = Jder-de-copac/Pine marten or Common marten
 94. *Martes foina foina* Erxleben, 1777 = Jder-de-piatră/Beech marten or Rock marten
 95. *Meles meles meles* L., 1758 = Viezure/Eurasian badger
 96. *Lutra lutra lutra* L., 1758 = Vidră/Common otter or Eurasian otter

Family Ursidae Fischer, 1817 = Urși/bears

97. *Ursus arctos arctos* L., 1758 = Urs/Brown bear
 Superfamily Cynofeloidea Lesson, 1842 = Câini, pisici/Dogs, cats

Family Canidae Fischer, 1817 = Lupi, vulpi/Wolfs, foxes

Sub-family Caninae Linnaeus, 1758 = Lupi, vulpi/Wolfs, foxes

98. *Canis lupus lupus* L., 1758 = Lup/Common wolf or Grey wolf
 99. *Canis aureus moreoticus* Geoffroy, 1835 = Șacal/Common jackal or Golden jackal
 100. *Vulpes vulpes crucigera* Bechstein, 1789 = Vulpe/Common fox or Red fox
 101. *Nyctereutes procyonoides procyonoides* Gray, 1834 = Câine enot/Racoon-like dog

Family Felidae Fischer, 1817 = Pisici/Cats

Sub-family Felinae Fischer, 1817 = Pisici, râși/Cats, lynx

102. *Felis silvestris silvestris* Schreber, 1777 = Pisică-sălbatică/European wild cat
 103. *Lynx lynx lynx* L., 1758 = Râs/European lynx or Northern lynx

Sub-order Pinnipedia Illiger, 1811 = Pinipede/Pinnipeds or fin-footed carnivores

Family Phocidae Gray, 1821 = Focile fără urechi/Earless seals

Sub-family Monachinae Gray, 1869 = Monk seals

104. *Monachus monachus* Hermann, 1779 = Focă-cu-burtă-albă/Mediterranean seal or monk seal

Order Artiodactyla Owen, 1848 = Artiodactile/Even-toed mammals

Sub-order Suiformes Jaekel, 1911 = Porci/Hogs

Family Suidae Gray, 1821 = Porci/Hogs

105. *Sus scrofa attila* Thomas, 1912 = Porc-mistreț/Wild boar or Wild hog or Wild pig

Sub-order Ruminantia Scopoli, 1777 = Rumegetoare/Ruminants

Family Cervidae Goldfuss, 1820 = Cerbi/Antlered ruminants

Sub-family Cervinae Goldfuss, 1820 = Cerbi/Antlered ruminants

106. *Dama dama dama* (L., 1758) = Cerb-lopătar/Fallow deer

107. *Cervus elaphus hippelaphus* Erxleben, 1777 = Cerb/Red deer or European deer

Family Capreolidae Brookes, 1828 = Căprioare/Roe deers

108. *Capreolus capreolus capreolus* (L., 1758) = Căprioară/Roe deer

Family Bovidae Gray, 1821 = Bovide sau cavicornide/Hollow-hored ruminants

Sub-family Bovinae Gray, 1821 = Bovide sau cavicornide/Hollow-hored ruminants

109. *Bison bonasus bonasus* L., 1758 = Zimbru/Wisent or European bison

Sub-family Caprinae Gray, 1821 = Capre/Goats

110. *Rupicapra rupicapra carpatica* Couturier, 1939 = Capră-neagră/Alpine chamois

111. *Ovis ammon* L., 1758 = Muflon/Wild sheep or Mufflon

LISTA SISTEMATICĂ A VERTEBRATELOR DIN FAUNA ROMÂNIEI

REZUMAT

Sinteza din lista sistematică a vertebratelor din România se adresează tuturor celor interesați de zoologie în general și de clasificarea grupului în mod special. Ea reprezintă deschiderea temei confruntărilor de opinii ale specialiștilor în acest domeniu, cu scopul final de a oferi elevilor, studenților, profesorilor de biologie și oricui este interesat, fie și ocazional, o sinteză actualizată a clasificării vertebratelor din România. Compilând diferite surse bibliografice au fost reținuți în total 732 taxoni de ordin specific și subspecific. Este vorba despre cele șase mari clase de vertebrate. Prima clasă (Cyclostomata) este reprezentată în fauna României prin doar patru specii, iar Pisces (considerată aici la nivel de supraclasă) - prin 184 taxoni. Restul de 544 taxoni fac parte din altă supraclasă (Tetrapoda) care întrunește celelalte patru clase de vertebrate: Amphibia (20 taxoni); Reptilia (31); Aves (382) și Mammalia (110 taxoni).

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MICROEVOLUTIONARY TRENDS IN WESTERN PALAEARCTIC BATS. CASE STUDY: MICROEVOLUTIONARY TRENDS AMONG BATS OF *RHINOLOPHUS* “*FERRUMEQUINUM*” GROUP (MAMMALIA: CHIROPTERA)

BRONISŁAW W. WOŁOSZYN

Abstract. A frequently recurring tendency in insectivorous bats is the cephalization of the skull. It has been shown that from the early Pliocene onwards, changes which appear to be microevolutionary trends have continued to take place in the skull structure. Some of these trends were analysed, and they were found to consist mainly in the reduction of splanchnocranium: shortening of the palate and of the premolar teethrow (both in the maxilla and the mandible). Postdental part of the mandible becomes shorter.

Résumé. Une tendance fréquemment rencontrée chez les chauve-souris insectivores est la céphalisation du crâne. On a démontré qu'encore à partir du Pliocène précoce, les changements qui paraissent constituer des tendances microévolutives ont continué à se manifester au niveau du crâne. Quelques-unes de ces tendances ont été analysées et on est arrivé à la conclusion qu'elles apparaissent par la réduction du splanchnocranium: le raccourcissement du palais et de la rangée de dents prémolaires (tant au niveau du maxillaire qu'à celui de la mandibule). La partie postdentale de la mandibule se raccourcit.

Key words: Chiroptera, “*Rhinolophus ferrumequinum* group”, microevolutionary trends, fossil bats, Neogene, Quaternary, Poland.

INTRODUCTION

The regime of physical factors which would have to be fulfilled in the adaptation to the aerial environment, were to be effectively led to the formation of a complex of adaptive traits which were subject to strong selection. This led to the formation of an optimal bat morphotype in a relatively short geological time. As a result of this process, bats as a group show a number of common aromorphoses, such as a capacity for active flight, the evolution of echolocation, active thermo-regulation allowing them to go into hibernation, and others.

The “model” of bats, evolved owing to this selection, has proved so ecologically successful that for about 50 millions of years i.e. at least from the Eocene onward the anatomy of these animals has not undergone any basic changes. The adaptation of the main evolutionary line of bats to a narrow trophic niche (since we have limited ourselves to insectivorous species) leads to a distinct tendency toward a decline in phenotypic variation, and certain evolutionary trends are repeated in independent phyletic lines.

In comparing the anatomy of the splanchnocranium in populations of fossil bats from various periods and recent species, certain characteristic sequences of changes can be observed, which have the character of microevolutionary trends.

In this respect I consider necessary to mention that microevolution means minor evolutionary events usually viewed over a short period of time, consisting of

changes of gene frequencies, chromosome structure or number of small morphological changes within a population over a few generations (A Dictionary of Ecology, Evolution and Systematics, 1982, Cambridge Univ. Press).

Main topic of this publication is focused on morphological changes observed among horseshoe (*Rhinolopus* sp.) bats during Neogene and Quaternary. Some years ago the author studied reach fossil material of bats from ten localities from southern Poland (Wołoszyn, 1987). Present work is an revaluation of some results presented in that publication.

Paleoclimatic background

The contemporary pattern of the bat fauna of Central Europe came into being as a result of a very long process, lasting millions of years. Two factors had a decisive effect of its course, first was migration from the south in periods when a more favorable climate prevailed, and the extinction or withdrawals of local population in period of deterioration of climate. These processes existed already in the Pliocene, becoming, however, more intensive in the Pleistocene.

In the Early Pliocene (about 6 my) on the northern shores of the Mediterranean Basin, a damp climate prevailed with a distinct rain season in the summer period. The chiropteran fauna of this region showed a considerable proportion of thermophilous elements (Rhinolophidae) and tropical ones (Hipposideridae and Megadermatidae) (Sigé & Legendre, 1983).

During this period Rhinolophidae and Miniopteridae were both represented on the territory of Central Europe (actually Southern Poland).

Greater climatic changes began roughly in the Middle Pliocene (about 3 my). In the initial stages of the evolution of the Mediterranean climate the most characteristic feature was a fluctuation of rhythmicity of the rain season, and vegetation become more xerothermic.

Climatic changes initiated in the mid-Pliocene continued, the climate slowly deteriorated and it worst during the Pleistocene. These climatic changes had a fundamental effect on the chiropteran fauna. Following a marked deterioration of the climate towards the close of the Pliocene (Suc, 1984), the Carpathian barrier began to play a considerable role in the distribution of bats.

In periods of harsh climate the range of the bats could have been even more restricted, solely to roost areas lying in the basin of the Mediterranean.

In warmer periods the bats migrated northwards, colonizing in turn the Basin of the Carpathians, and in climate optima crossing the barrier of the Carpathians and colonizing in turn of the mountains.

According to Topál (1979), horseshoe bats of the „*ferrumequinum*” group migrated into the Carpathians Basin at least twice in the Pliocene and at least once in the Pleistocene.

MATERIAL AND METHODS

In the fossil fauna of Poland, bats are represented by several dozen taxa both extinct and extant, belonging to three families: Rhinolophidae, Miniopteridae and Vespertilionidae. The present study is focused on horseshoe bats from „*ferrumequinum*” group.

The fossil remains of bats on which are subject of the present study come from three localities in Central and Southern Poland dated from the Early Pliocene to the Early Pleistocene (Tab. 1).

Table 1

Geological age of the faunas (partly after Wołoszyn, 1987).

Locality	<i>Rhinolophus</i> sp.	Geological age	approx. age in my	Biozones
Podlesice	<i>R. kowalskii</i> Topál	Early Pliocene	6	MN 14
Węże 1	<i>R. wenzensis</i> Wołoszyn	Lower Pliocene	3	MN 15/16
Kadzielnia 1	<i>R. cf. macrorhinus</i> Topál	Late Pliocene/Early Pleistoc.	1.8	MN 17/Q 1

The locality at Podlesice (Kraków – Częstochowa Upland) which is the most abundant in bone remains and also the oldest, dated the Early Pliocene (or very late Miocene) – Biozone MN 14 (Tab. 1) represents a relatively “modern” bat fauna lacking tropical elements. In this fauna the same extant families and genera are represented, yet recent species are lacking.

The fauna from Węże 1 locality – Biozone MN 15 (Kraków – Częstochowa Upland) is slightly younger than the previously mentioned one. It is however, rather different in its species composition. Particularly interesting is the presence of a large horseshoe bat, *R. wenzensis* Wołoszyn, most likely representing a side line of the “*ferrumequinum*” group. It has many primitive features but also some progressive ones. It is probable that the morphotype of the species erose owing to endemic evolution in an isolated population (Wołoszyn, 1987).

The locality at Kadzielnia 1 – Biozone MN 17 / Q 1 (Holy Cross Mts.). In the Early Pleistocene, further changes took place in the bat fauna. Archaic species of the “*ferrumequinum*” group were replaced by the more “modern” *R. macrorhinus* Topál.

The fossil material of bats is housed in the collection of the Institute of Systematics and Evolution of Animals, Polish Academy of Sciences in Kraków (Poland). The whole material consists of several thousand specimens, from among which the remains belonging to the taxa investigated were selected. The system of measurements used in this paper is described in the paper “Pliocene and Pleistocene Bats of Poland” (Wołoszyn, 1987).

RESULTS AND DISCUSSIONS

Storch (1974) demonstrated that the structure of the jaw apparatus in bats is correlated with the type of diet. In the studied case, specialization has developed toward modifying the dentition (Wołoszyn, 1987, 2009).

A frequently recurring tendency in insectivorous bats is the cephalization of the skull. Two directions of change have been observed:

- A simplification of the dental formula through a reduction and loss of teeth or their parts
- Molarization of premolars

This process brought about a decline in skull mass, mainly owing to a decrease in the weight of the jaw apparatus, and a simultaneous decrease in body weight, which is desirable in a flying animal.

Sigé (1974), in his paper on the genus *Stehlinia* from the Paleogene of Europe, and also later Van Valen (1979), in his essay on the evolution of bats, compiled those features.

Table 2 takes some of these traits relating to the splanchnocranium into account and the direction of changes with respect to modern species. Some of the examples mentioned in the table were discussed in the literature quoted in it.

Table 2

Compilation of unspecialized traits in the morphology of the splanchnocranium in fossil bats and direction of changes (trends) observed.

No	Unspecialized traits	Direction of changes observed	Author
1	Rostral part of skull elongated	Shortening of rostral part	Kuzjakin, 1950; Sigé, 1974; Van Valen, 1979; Wołoszyn 1987
2	Long palate	Shortening of palate	Topál, 1963, 1979; Wołoszyn, 1987
3	Dental formula: Maxilla: 2.1.3.3. Mandible: 3.1.3.3.	Simplification of dental formula	Handley, 1959; Miller, 1907; Van Valen, 1979; Wołoszyn, 1987, 2009
4	Unreduced M ³	Reduction of distal part of M ³	Handley, 1959; Rabeder, 1974; Wołoszyn, 1987
5	Elongated mandibular body	Shortening of mandibular body	Sigé, 1974; Topál, 1979; Wołoszyn, 1987
6	Frontal position of mental foramen	Distal shifting of mental foramen	Wołoszyn, 1987
7	Elongated premolar row	Shortening of premolar row	Kordos, 1975; Menu, 1985; Topál, 1963, 1979; Wołoszyn, 1987, 2009
8	Last premolar (P ⁴) of simple structure	Molarization of P ⁴	Handley, 1959; Kuzjakin, 1950; Menu, 1985; Wołoszyn, 1987, 2009
9	Molars of the "nyctalodonta" type	Appearance of molars of "myotodonta" type	Menu & Sigé, 1971
10	Massive talonids of M ₃	Reduction of talonid on M ₃ and increased robustness of talonids on M ₁ - M ₂	Menu & Sigé, 1971; Menu 1985

The aim of the review of microevolutionary trends relating to the splanchnocranium presented in the table 2 was to identify such trends which could be of use in identifying fossil material, and which could facilitate description of a relative chronology of the fossil faunas examined.

From this aspect it is interesting to trace the changes in the palatal length in the Rhinolophidae. The fossil species listed in table 3 are close in total cranial length. Over about 6 my i.e. from Podlesice to the recent, the palate has become reduced by about 20%.

Table 3

Shortening of the palate in bats of "*ferrumequinum*" group (partly after Wołoszyn, 1987).

Species	Geological age	Length of Palatum in mm (average)	%
<i>R. kowalskii</i> Topál	early Pliocene	3.03	100.0
<i>R. wenzensis</i> Wołoszyn	lower Pliocene	2.85	94.1
<i>R. cf. macrorhinus</i> Topál	early Pleistocene	2.80	92.4
<i>R. ferrumequinum</i> (Schreber)	recent	2.45	80.9

The small premolars P2 and P3 evidently have a minor role in chewing food. This is evident by the considerable degree of their reduction, and a clear tendency to disappear. A further proof of the low efficiency of these teeth is their high morphological lability. These are teeth in which anomalies most frequently appear (Wołoszyn, 1978).

The process of the reduction of small premolars takes place in a characteristic sequence. In the first stage they are compressed, the gaps between the teeth disappear, their crowns begin to become contiguous with each other and with the adjacent canines and large premolars.

In a further stage of evolution, these teeth began to project lingual from the toothrow (Vespertilionidae), or labial like in the Rhinolophidae. Later the surface of the crown became smaller, and finally disappeared altogether.

Examples of the decrease in the size of the small premolars among horseshoe bats of the "*ferrumequinum*" group are presented in table 2 and figures 1 and 2. In summary, the shortening of the length of the small premolar row takes place by their reduction, compression, and by projection from the toothrow and a decrease in crown surface.

Table 4

Shortening of the premolar toothrow in horseshoe bats of the "*ferrumequinum*" group (partly after Wołoszyn, 1987).

Species	Locality	average Length of P ₂ – P ₄ (in mm)	% of change
<i>Rhinolophus kowalskii</i> Topál	Podlesice	2.63	100.00
<i>R. wenzensis</i> Wołoszyn	Węże 1	2.46	93.5
<i>R. cf. macrorhinus</i> Topál	Kadzielnia 1	2.36	89.7
<i>R. ferrumequinum</i> (Schreber)	recent	1.97	74.9

The gradient of the molarization of teeth departs somewhat from that observed in other mammals. In insectivorous bats, immediately behind the canine there are some small premolars, which show no sign of molarization. The only teeth which undergo strong molarization are the last premolars (P₄ and P⁴), this being so pronounced that Kuzjakin (1950) sets these teeth apart in a separate group, which he calls "premolars prominentes", and considers them to be homologous with the carnassials of carnivores.

The second area of the mandible where shortening takes place is the postdental part of the mandibular body. Beginning with the Pliocene, the distance from the posterior margin of the talonid on M₃ to the articular surface of the articular process becomes shorter (Tab. 5)

The biological interpretation of the changes observed may be as follow: the mandible is essentially a second order lever. The surface of contact of the articular process of the mandible with the mandibular fosse of the skull is the fulcrum. The muscles of the masticatory apparatus (*m. temporalis*, *m. masseter*, *m. medianopterygoid*) while contracting raise the mandible upward, causing its teeth to press up on those of the maxilla, this being necessary to break down food.

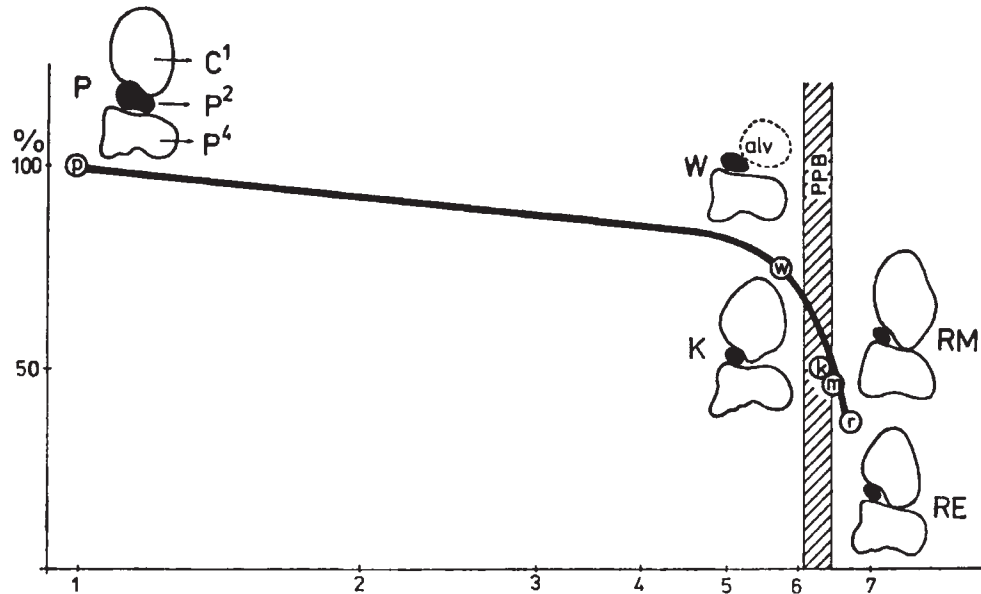


Fig. 1 - Decrease in size of the crown surface of P2 in horseshoe bats of the "ferrumequinum" group. The average surface of the crown of P2 in *R. kowalski* from Podlesice was assumed to be 100%. The time is given on the logarithmic abscissa. The age of Podlesice (about 6 my) was assumed to be the unit. Letter symbols: P – *Rhinolophus kowalskii* Topál, from Podlesice; W – *R. wenzensis* Wołoszyn, from Węże 1; K – *R. cf. macrorhinus* Topál, from Kadzielnia 1; RM – *R. macrorhinus* Topál, "modern"; RE – *R. ferrumequinum*, recent; PPB – Plio-Pleistocene boundary.

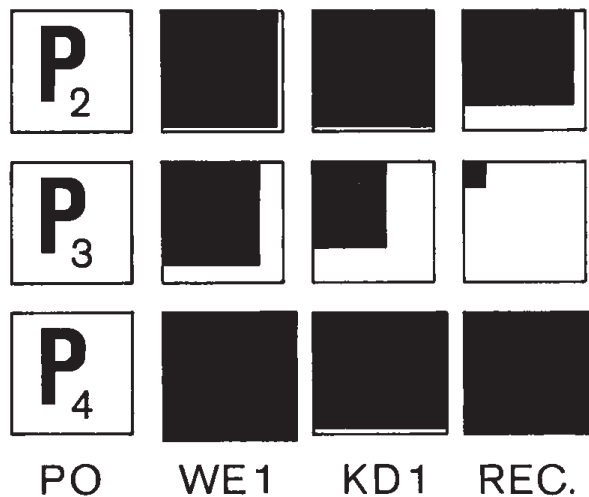


Fig. 2 - Comparison of relative lengths of premolars in several fossil species of horseshoe bats of the "ferrumequinum" group. The dimensions of teeth crown in *Rhinolophus kowalskii* Topál, from Podlesice are used as a standard (100%). Symbols: PO – *Rhinolophus kowalskii* Topál, from Podlesice; WE1 – *R. wenzensis* Wołoszyn, from Węże 1; KD1 – *R. cf. macrorhinus* Topál, from Kadzielnia 1; REC – *R. ferrumequinum*, recent. Shaded areas represent the size of the crowns of teeth (assumed to be rectangular): length x width (with respect to the standard).

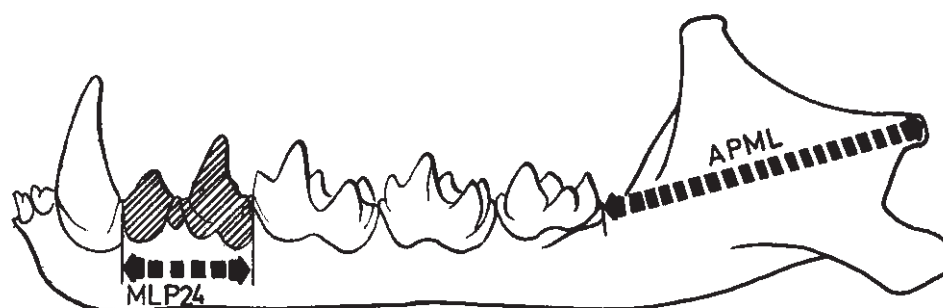


Fig. 3 - Mandible of horseshoe bat. The dashed line indicates those regions where the process of shortening is taking place. Premolars hatched. Symbols: MLP24 – Premolars length ($P_2 - P_4$); APML – Postdental length of mandible (Articular process - M_3 length).

Table 5
Relative length of small premolar row and postdental part of the mandibular body in Rhinolophid bat (partly after Wołoszyn, 1987).

Species	Locality	Geological age	I_{PD}	I_{PC}
<i>Rhinolophus kowalskii</i> Topál	Podlesice	early Pliocene	85.5	1.15
<i>R. wenezsis</i> Wołoszyn	Węże 1	late lower Pliocene	78.4	1.18
<i>R. ferrumequinum</i> (Schreber)	recent	recent	78.5	1.24

The pressure of the teeth is proportional of the length of the mandible. Assuming that during Neogene bats occupied a similar ecological niche as recently, and their diet was similar in its physical properties (hardness of insect exoskeletons, etc.) then the shortening of the mandibular body must have led to a shortening of the postdental part of the mandible.

This process brought about a decline in skull mass, mainly owing to a decrease in the weight of the jaw apparatus, and a simultaneous decrease in whole body weight, which is desirable in a flying animal.

In order to make a quantitative assessment of the shortening of the mandibular body following indices were adopted (Indices 1 and 2):

(1) Index of the postdental mandibular length:

$$I_{PD} = \frac{(\text{distance of articular process} - M_3) \times 100}{\text{Length of } P_4 - M_3}$$

(2) Index of premolar compression:

$$I_{PC} = \frac{\text{length of } P_2 + \text{length of } P_3 + \text{length of } P_4}{\text{Length of } P_2 - P_4}$$

Conclusions

The contemporary pattern of the bat fauna of Central Europe came into being as a result of a very long process, lasting millions of years. Two factors had a decisive effect of its course, first was migration from the south in periods when a more favorable climate prevailed, and the extinction or withdrawals of local population in period of deterioration of climate. These processes existed already in the Pliocene, becoming, however, more intensive in the Pleistocene.

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- Molarization of premolars;
- Shortening of the postdental part of mandibular body.

This process brought about a decline in skull mass, mainly owing to a decrease in the weight of the jaw apparatus, and a simultaneous decrease in body weight, which is desirable in a flying animal.

The examples presented in the tables 1-5 and in figures 1-3 confirm that among the bats studied there, microevolutionary trends leading to a considerable reduction of the jaw apparatus in a comparatively short geological period exist. This process involves the small premolars (both in mandible and skull) and the postdental part of the mandible.

Some of the trends described, e.g. the degree of reduction of the surface of the crown of premolars P_1 and P_2 , also the size and the position of small premolars, and the length of the postdental part of the mandibular body may be a good indicator of a relative age of faunas in the comparison of fossil materials.

TENDINȚE MICROEVOLUTIVE LA LILIECII DIN PALEARCTICUL DE VEST. STUDIU DE CAZ: TENDINȚE MICROEVOLUTIVE LA GRUPUL DE SPECII „*FERRUMEQUINUM*” DIN CADRUL GENULUI *RHINOLOPHUS* (MAMMALIA: CHIROPTERA)

REZUMAT

O tendință frecvent întâlnită la liliecii insectivori este cefalizarea craniului. S-a demonstrat că încă din Pliocenul timpuriu încoace, schimbările care par a fi tendințe microevolutive au continuat să se manifeste la nivelul craniului. Câteva din aceste tendințe au fost analizate și s-a ajuns la concluzia că

ele apar prin reducerea splanchnocraniului: scurtarea palatului și a șirului de dinți premolari (atât la nivelul maxilei cât și al mandibulei). Partea postdentală a mandibulei devine mai scurtă.

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LONG-TERM DYNAMICS OF ZOOPLANKTON IN THE MATIȚA AND MERHEI SHALLOW LAKES (THE DANUBE DELTA, ROMANIA). 1. DIVERSITY AND ABUNDANCE

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Abstract. The present paper presents significant changes occurred in the multi-annual dynamics of zooplankton diversity and abundance (1980-2007), under the pressure of human-induced eutrophication in two shallow lakes specific for the Danube Delta. Zooplankton community from lakes Mătița and Merhei was characterized by high species richness but low abundance values until 1981, in ecological conditions unaffected by eutrophication. For the next ten years, due to obvious increases of human pressures, zooplankton species richness decreased with 52% and 63%, respectively, while abundance values increased with 39% and 16%, respectively. After 1991, the social and economic changes in the Danube countries from the Central Europe led to nutrient input decreases. As a result, lake ecosystems from the Danube Delta showed lower trophicity values and their ecological parameters tended to recover. Analyses on the dynamics of the Shannon-Wiener's informational entropy index, Pielou's evenness and Simpson's index of dominance offered additional information and reduced the heterogeneity of the data regarding the species richness and the numerical abundance dynamics. Moreover, correlation analyses suggested the influences of human-induced changes of nutrient inputs on the multi-annual zooplankton dynamics.

Résumé. Des recherches à long terme, effectuées au cours de la période 1980-2007, sur le zooplancton de deux lacs de petite profondeur (Mătița et Merhei) qui sont représentatifs pour le système lacustre du Delta du Danube, mettent en évidence des modifications significatives de quelques paramètres écologiques. Elles sont la conséquence de variations amples du niveau de trophie écosystémique, générées par le facteur anthropique. On met en évidence trois périodes distinctes du point de vue écologique: la période de méso-eutrophie (1980), la période d'eutrophie-hypertrophie (1981-1991) et la période caractérisée par une légère tendance de rétablissement de l'état de référence (1992-2007). Au cours de la première période le zooplancton des lacs Mătița et Merhei est caractérisé par une richesse en espèces (119, respectivement 128 espèces), corrélée avec des valeurs relativement réduites de l'abondance (223, respectivement 387 ind./l). Au cours de la seconde période, la richesse en espèces se réduit drastiquement (avec 52%, respectivement 63%), de manière concomitante avec une croissance évidente (avec 39%, respectivement 16%) de l'abondance. Les recherches effectuées au cours de la troisième période mettent en évidence le fait que le processus de redressement de la diversité et de l'abondance du zooplancton est un processus lent et oscillant. La dynamique des indices d'entropie informationnels Shannon-Wiener, d'équitabilité Pielou et de dominance Simpson, corrélée avec la richesse en espèces et la dominance numérique indiquent une tendance d'abaissement de stabilité de la communauté zooplanctonique, due à l'accroissement du niveau de trophie, depuis la méso- vers la hypertrophie. La composition des espèces constantes en fréquence et de celles dominantes en nombre diffère d'une manière significative d'une période à l'autre, un nombre limité d'espèces maintenant ces caractéristiques au cours de toute la période analysée.

Key words: zooplankton, the Danube Delta, shallow lakes, diversity, abundance.

INTRODUCTION

The Mătița-Merhei complex is one of the largest lake systems in the Danube Delta (Romania). It is located in the central region of the Letea Island, comprising 108 shallow lakes, stretching on a surface of 5700 ha. Lakes Mătița (642 ha) and

Merhei (1368 ha) are the largest lakes from the complex (Gâstescu, 1971; Constantinescu & Menting, 2000). They are located at: 45°19' N, 29°37' E and 45°17' N, 29°22' E, respectively (Fig. 1).

The great distance from the lakes to the Danube River branches and the long-term siltation of the spillway rivulet in Merhei Lake led to the poor water circulation of the two lakes.

Characterized by a shallow depth (1.74 m), Merhei Lake perimeter has a high degree of sinuosity compared to Matîța Lake, thus having a higher value of the ratio between the shore line length and the total surface, a significant detail in zooplankton diversity dynamics.

In ecological conditions unaffected by eutrophication, the low depth of Merhei Lake favors the development of rich submerged vegetation, unlike Matîța Lake.



Fig. 1 - Matîța and Merhei lakes from the Danube Delta Biosphere Reserve (after Grigoraș & Constantinescu, 1995, touristic map).

The long-term research carried out in lakes Matîța and Merhei showed drastic changes in trophicity levels (Postolache, 2006; Vădineanu et al., 1989), together with the shift from the dominance of macrophyte primary producers to phytoplankton. In natural conditions, these changes occur over long periods of time, but here they were visible in only a few decades due to human impacts (Cărauș & Nicolescu, 2006).

These changes of ecological factors have been reflected in the structure and functions of aquatic communities (Rîșnoveanu & Vădineanu, 2003), including zooplankton (Zinevici & Parpală, 1992). They have been observed in our analyses from three ecologically-different periods of time, as follows: first, the period of natural balance (before 1981), characterized by meso-eutrophic conditions; second, the impact period (1981-1991), characterized by eutrophic and hypertrophic conditions; and third, the partial recovery period of structural and functional characteristics (1992-2007), characterized by the return to eutrophic conditions (Zinevici & Parpală, 2006).

The long-term studies concerning lakes Matița and Merhei can offer an image of the biocenotic structure dynamics of the entire Danube Delta lacustrine systems. A similar zooplankton dynamics, influenced by the increased human-induced eutrophication has been described in the South-Western shallow lagoons of the Baltic Sea as well (Feike et al., 2007).

Our research focuses on the changes occurred in the monthly, annual and multi-annual dynamics of zooplankton species richness and abundance, for all three periods of trophic state evolution.

The correlations between zooplankton and phytoplankton ecological parameters, together with the nutrient dynamics can point out the outstanding role played by the trophic state in zooplankton community dynamics. Analysis on the main ecological parameters of zooplankton community dynamics, but also on the nutrients and the structure of planktonic primary producers showed their dependence on the trophic status of ecosystems.

The use of the Shannon-Wiener's informational entropy index, Pielou's evenness and Simpson's index of dominance are able to correct and fill in the gaps of heterogeneous analysis of species diversity dynamics.

Using the „kriging” technique, the study presents for the first time the maps of the dynamics of zooplankton diversity. The method confirms once again the evolution of zooplankton diversity in Matița and Merhei lakes.

There are numerous difficulties related to long-term studies, like the present analyses on zooplankton community from lakes Matița and Merhei, for instance. This is the reason why long term syntheses are less frequent compared to short- or medium-term studies. Literature data are used frequently to fulfil the gaps that are usually present in the long term series, but the results can still be inconclusive due to the use of different methods (Clark et al., 2001; Kane, 2009). When different methodological approaches are comparable, the authors of syntheses are able to capture the true dynamics sense, even without the benefit of high precision analyses (Pitois & Fox, 2006).

The data used in analyzing zooplankton dynamics from lakes Matița and Merhei from 1980 to 2007 are the results of a unitary set of field and laboratory methods, carried out by the authors.

MATERIALS AND METHODS

The research took place between 1980 and 2007. The sampling, carried out monthly during the vegetation period (March-October), took place in 5 sampling sites for each ecosystem, using a 5 l Patalas-Schindler derrick. For each sample, 50 l were collected from the whole water column.

The samples were concentrated by filtering through a gauze planktonic net with a mesh size of 65 μm and subsequently by siphonage. The samples were preserved in 4% formaldehyde and analyzed using a planktonic microscope.

The ecological parameters were studied for each species. Data were subsequently aggregated for the total zooplankton community taxonomic groups, but also for the following trophic levels: herbivores and predators.

Taxonomic analyses reflected species richness. For species identification the following keys were used: Foissner et al., 1991, 1992, 1994, 1995; Kahl, 1930; (Ciliata); Bartoš, 1954; Grospietsch, 1972 (Testacea); Rudescu, 1960; Kutikova, 1970; Ruttner-Kolisko, 1974 (Rotatoria); Negrea, 1983; Brooks, 1959 (Cladocera); Damian-Georgescu, 1963, 1966, 1970 (Copepoda).

In order to establish the zooplankton trophic structure the following titles were used: Karabin, 1985; Hillbricht-Ilkowska, 1977; Kryuchkova, 1989 etc.

Zooplankton density was expressed as number of individuals/l.

The species with a frequency index that varied between 50 and 100% were considered persistent species. The first two species from the relative numerical abundance point of view were selected as dominant species.

The statistical analyses were focused on three directions:

1. Analysis of biological diversity. Distributions of specific abundances were compared and three biodiversity indices were calculated in addition to analyzing the species richness: Shannon-Wiener's informational entropy index, Pielou's evenness, Simpson's index of dominance (Magurran, 1988).

In addition to the computation of these indices, two tests were used for comparisons between the years, periods, or ecosystems: distributions of specific abundances were compared using the χ^2 test (Petrișor, 2000), comparisons involving Shannon-Wiener's informational entropy index were made using the *t* (*Student*) test (Magurran, 1988; Batten, 1976).

The values of all indices and tests were computed considering the monthly, annual and multi-annual dynamics (1980-2007), for all three periods of trophic state evolution and for every combination year-month, using Microsoft Excel spreadsheets. P-values were determined using the GraphPad Software on-line p-value calculator available at <http://www.graphpad.com/quickcalcs/PValue1.cfm>.

2. Analysis of correlations. Coefficients of determination were computed using Microsoft Excel Data Analysis extension between any of the following variables, when available: zooplankton density, species number and the value of Shannon-Wiener's informational entropy index.

All statistical calculations pertaining to the first two directions were performed, when possible, for several levels of data aggregation presented in table 1, for each ecosystem separately. Correlations were accounted for only if found significant ($p \leq 0.05$) any three of the eight levels of data aggregation in at least one of the two ecosystems. It is noteworthy mentioning that the reduced sample size (<30) could reduce the power of statistical analyses only on levels c, d, f, and g.

3. Spatial analyses of the densities of each taxonomic group, as well as for several ecological parameters: diversity measured by Shannon's Informational Entropy Index and species richness. The analyses were performed using ArcGIS 9.2 spatial interpolation through ordinary kriging over a virtual space defined by the

Table 1

Levels of data aggregation used in statistical analyses.

Primary level	Secondary level	Explanation	Number of observations	Notation	Remarks
<i>I. Raw data</i>	Raw data	Data grouped in separate rows for any possible combination of the year of collection, month of collection, species, taxonomic group, and trophic level	15372 (Matița), 13818 (Merhei)	a	
<i>II. Data summed by year</i>	Year and taxonomic group	Data aggregated by both year (summing data by year regardless of the month) and taxonomic group (summing data for all species within the group)	120 (Matița), 100 (Merhei)	b	Additional analyses for herbivores and predators separately
	Year and trophic level	Data aggregated by both year and trophic level (summing data for all taxonomic groups and species within the same level)	24 (Matița), 20 (Merhei)	c	
	Total	Data aggregated by year (summing data for all trophic levels, taxonomic groups, species, and months)	12 (Matița), 10 (Merhei)	d	
<i>III. Data summed by period</i>	Period and taxonomic group	Data aggregated by both period (summing data for all years within the period) and taxonomic group (summing data for all species within the group)	30 for both lakes	e	Additional analyses for herbivores and predators separately
	Period and trophic level	Data aggregated by period and trophic level	6 for both lakes	f	
	Total	Data aggregated by period (summing data for all trophic levels, taxonomic groups and species, and also for all years within the period)	3 for both lakes	g	
<i>IV. Data summed by year and month</i>	Year, month, and trophic level	Data aggregated by year and month (summing data for all trophic levels, taxonomic groups and species)	63 (Matița), 48 (Merhei)	h	

year and month (Cheval & Petrișor, 2003). The results were represented by prediction maps that highlighted clusters of either low values or high values, providing a visual overview of the overall status of analyzed parameters, but not a statistical measure of variation.

The data on DIN/TRP ($\mu\text{g/l}^{-1}$), phytoplankton density and biomass dynamics included in the correlation analyses were taken from the literature (Drăgășanu et al., 1960; Vădineanu et al., 1989; Rîșnoveanu & Vădineanu, 2000; Oosterberg & Bogdan, 2000; Oltean & Nicolescu, 1985; Căraș & Nicolescu, 2006).

RESULTS

From over almost three decades (1980-2007) of analysis, the zooplankton community of lakes Matîța and Merhei showed high species richness (272 species and 283 species, respectively). The ecological structure of zooplankton included a mixture of typical planktonic species, vegetation and nektonic-benthic species.

The taxonomic structure of herbivores reflected a clear dominance of rotifers in both ecosystems (56.52-57.92%). As for the predators, cyclopoid copepods were dominant (59.38-73.33%) (Fig. 2).

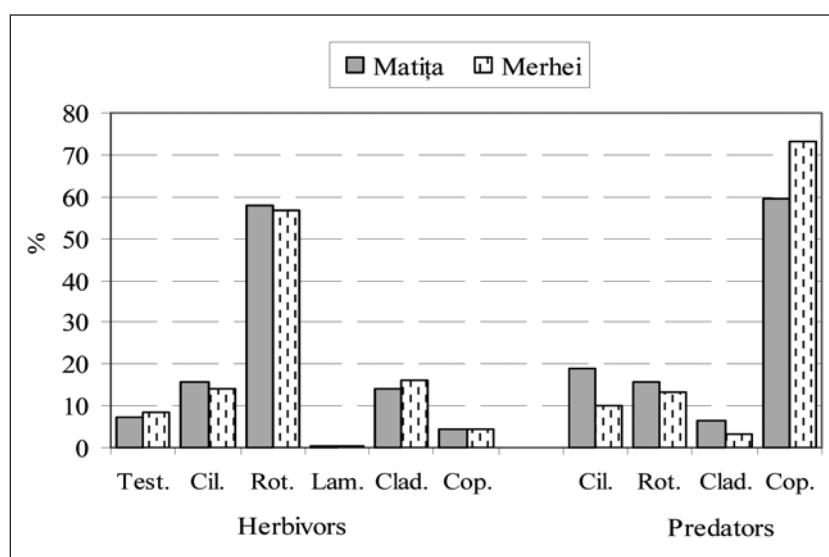


Fig. 2 - The taxonomic structure and species richness of zooplankton in Matîța and Merhei lakes from 1980 to 2007.

The multi-annual averages of zooplankton density in the two lakes were 859 and 1022 ind./l, respectively. Ciliates represented the most abundant community in the two lakes (34.28-29.48%), followed by rotifers (26.46-35.29%) as herbivores and cyclopoids as secondary predators (52.13% and 79.54%, respectively) (Fig. 3).

There were significant differences concerning the dynamics of annual values of species richness and numerical abundance between 1980 and 2007: an obvious decline in the first case related to the significant growth in the second case. The highest values of species richness (128 species in Matîța Lake, 119 in Merhei Lake) (Fig. 4) and the lowest densities (387 and 232 ind./l, respectively) (Fig. 5) were recorded in 1980, the reference year for the meso-eutrophic conditions. These differences were caused to a great extent by human-induced changes of nutrient concentrations, but also by natural variations of hydrological and thermal regimes.

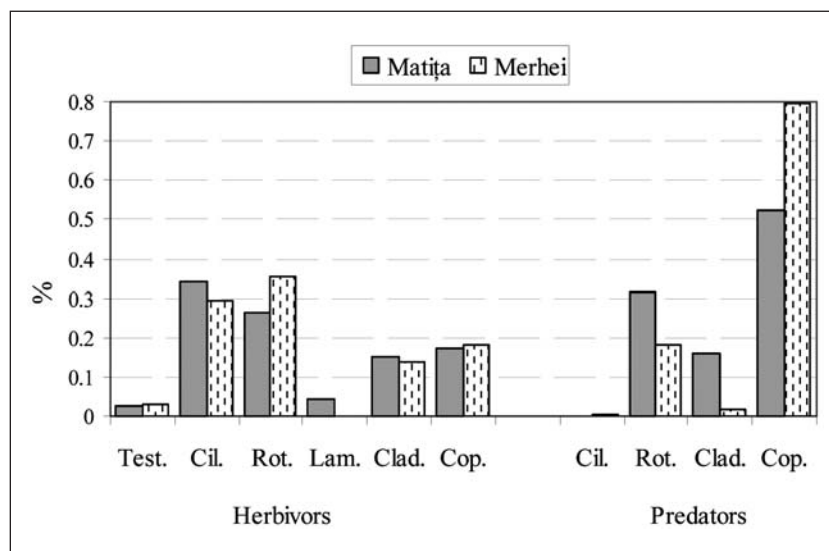


Fig. 3 - The multi-annual average values of zooplankton numerical abundance in Matîța and Merhei lakes (average values from 1980 to 2007).

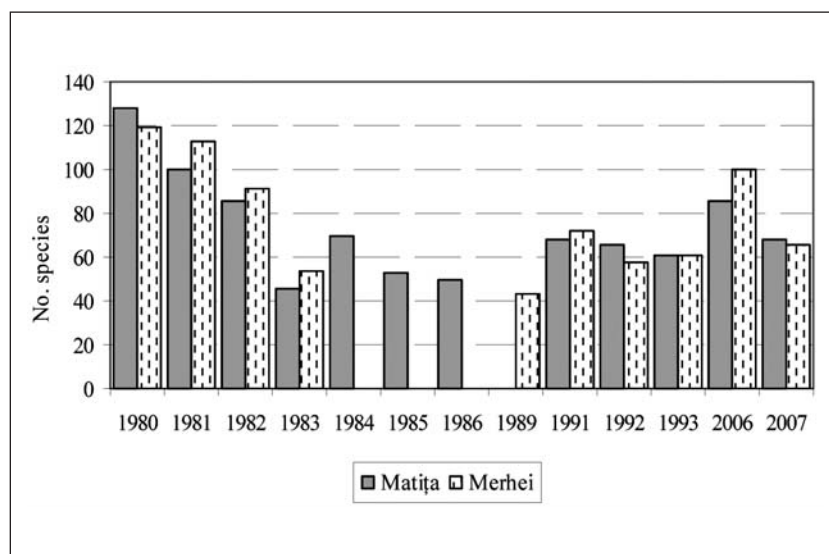


Fig. 4 - Dynamics of annual values of zooplankton species richness in Matîța and Merhei lakes (1980-2007).

The rise of trophic state to hypertrophic values during 1981-1991 led to obvious decreases in species richness (with 47.66% in Matîța Lake and 36.98% in Merhei Lake). On the other hand, the zooplankton density increased 2.6 and 6.2 times, respectively (Tabs 2, 3).

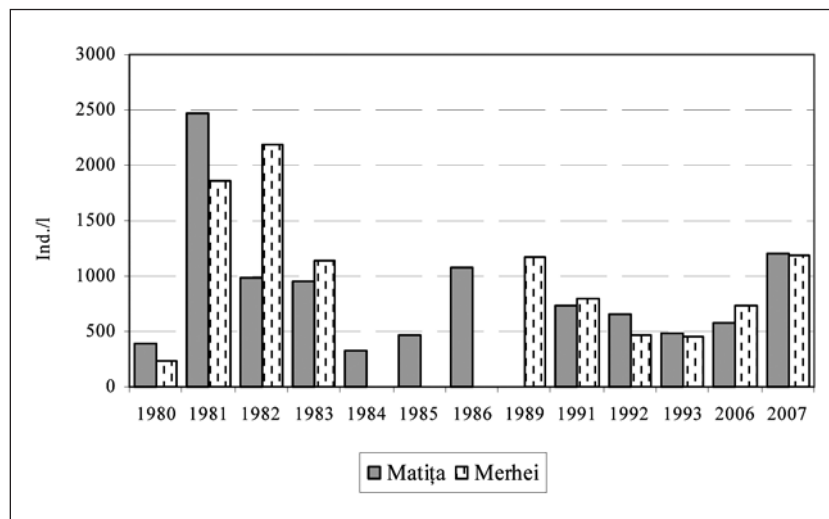


Fig. 5 - Dynamics of annual values of zooplankton numerical abundance in Matîța and Merhei lakes (1980-2007).

After 1991, zooplankton community tended to return to the initial values of ecological parameters, while the trophic levels slightly decreased.

Persistent and dominant species played important roles in the dynamics of zooplankton community structure and functions. Persistent species represented only 9.19% and 9.54 % respectively, from the species composition in lakes Matîța and Merhei between 1980 and 2007, while dominant ones represented 2.57% and 3.53% respectively from all the species identified in the study period (Tabs 4, 5).

Shannon-Wiener's informational entropy index dynamics indicated a downward trend in the relationship between species richness and their degree of abundance. Values recorded in 1980, in meso-eutrophic conditions, were the highest in the study period. In 1983, the index recorded the lowest values from the period 1980-2007, due to hypertrophic conditions. In 2006, because of a lower eutrophication impact, the informational index increased, while in 2007 it decreased again (Fig. 6 a).

Pielou's evenness index dynamics showed decreasing trends of uniformity in the distribution of individuals per species. As with the Shannon-Wiener informational index, peaks were observed in 1980, and minima in 1983 and early structural restoration in 2006 (Fig. 6 b).

The Simpson's index of dominance recorded a more pronounced downward dynamics. The highest values were recorded in 1980 and the lowest in 2007 (Fig. 6 c).

Table 6 includes the correlation results between zooplankton parameters and figure 7 shows a selection of spatial analysis results concerning the evolution trend of zooplankton diversity between 1980 and 2007. All these aspects are the results of statistical analyses corresponding to the directions stated in table 1.

Table 2

Average values of zooplankton species richness from Matița and Merhei lakes in three periods: reference (1980), impacted by eutrophication (1981-1991) and ecological recovery (1992-2007).

Taxonomic structure	No. of species and %	1980	1981-1991	1992-2007
M a t i ț a L a k e				
<i>Herbivores</i>	No. of species	112	58	63
Testacea	%	13.39	13.37	15.04
Ciliata	%	2.68	5.73	7.52
Rotatoria	%	59.83	58.6	60.15
Lamellibranchia	%	0.89	0.64	0.75
Cladocera	%	18.75	15.29	13.53
Copepoda	%	4.46	6.37	3.01
<i>Predators</i>	No. of species	16	9	7
Ciliata	%	18.75	11.54	-
Rotatoria	%	25.00	19.23	30.00
Cladocera	%	6.25	7.69	10.00
Copepoda	%	50.00	61.54	60.00
Total	No. of species	128	67	70
M e r h e i L a k e				
<i>Herbivores</i>	No. of species	109	66	64
Testacea	%	11.93	14.81	11.27
Ciliata	%	2.75	9.26	7.04
Rotatoria	%	52.29	54.32	64.8
Lamellibranchia	%	0.92	0.62	0.7
Cladocera	%	27.52	14.81	14.08
Copepoda	%	4.59	5.49	2.11
<i>Predators</i>	No. of species	10	9	7
Ciliata	%	10.00	4.76	12.50
Rotatoria	%	10.00	9.52	25.00
Cladocera	%	-	4.76	6.25
Copepoda	%	80.00	80.96	56.25
Total	No. of species	119	75	71

Table 3

Average values of zooplankton numerical abundance from Matița and Merhei lakes in the following periods: reference (1980), impact caused by eutrophication (1981-1991) and ecological recovery (1992-2007).

Taxonomic structure	Ind./l and %	1980	1981-1991	1992-2007
M a t i ț a L a k e				
<i>Herbivores</i>	ind./l	357.5	974.3	683
Testacea	%	0.92	0.56	7.32
Ciliata	%	16.85	44	12.33
Rotatoria	%	58.39	19.22	38.48
Lamellibranchia	%	4.58	2.42	8.18

Table 3 (continued)

Taxonomic structure	Ind./l and %	1980	1981-1991	1992-2007
Cladocera	%	5.66	17.84	10.19
Copepoda	%	13.2	15.21	23.5
<i>Predators</i>	Ind./l	29.2	25.8	46.8
Ciliata	%	-	-	0.21
Rotatoria	%	73.21	27.91	29.06
Cladocera	%	1.23	8.53	25.64
Copepoda	%	25.74	63.56	45.09
Total	Ind./l	386.7	1000.1	729.8
Merhei Lake				
<i>Herbivores</i>	Ind./l	225.3	1370.6	677
Testacea	%	2.66	3.61	1.59
Ciliata	%	2.66	39.55	6.23
Rotatoria	%	43.1	21.06	70.64
Lamellibranchia	%	0.18	0.09	0.46
Cladocera	%	4.26	18.8	2.84
Copepoda	%	47.14	16.89	18.24
<i>Predators</i>	Ind./l	6.7	57.8	34
Ciliata	%	-	-	1.76
Rotatoria	%	26.87	14.19	26.47
Cladocera	%	-	2.08	0.88
Copepoda	%	73.13	83.73	70.89
Total	Ind./l	232	1428.4	711

Table 4

The main persistent species from 1980 to 2007 and the dynamics of their frequency index (%) in periods with different trophic levels.

Persistent species	Ecosystem	1980	1981-1991	1992-2007	1980-2007
Herbivores					
<i>Brachionus angularis</i> Gosse	Matița	66.67	72.29	80.00	72.99
	Merhei	55.55	89.97	75.00	73.51
<i>Filinia longiseta</i> (Ehrenberg)	Merhei	77.78	73.68	50.00	67.16
<i>Keratella cochlearis</i> (Gosse)	Merhei	66.67	81.58	55.00	67.75
<i>Polyarthra remata</i> (Skorikov)	Matița	77.78	51.85	55.00	61.54
<i>Bosmina longirostris</i> (O. F. Müller)	Matița	88.89	72.22	50.00	70.37
	Merhei	88.89	78.95	35.00	67.61
<i>Chydorus sphaericus</i> (O. F. Müller)	Matița	55.55	77.78	75.00	69.44
	Merhei	88.89	86.84	80.00	85.24

Table 5

The dominant species from a numerical point of view in periods with different trophic levels.

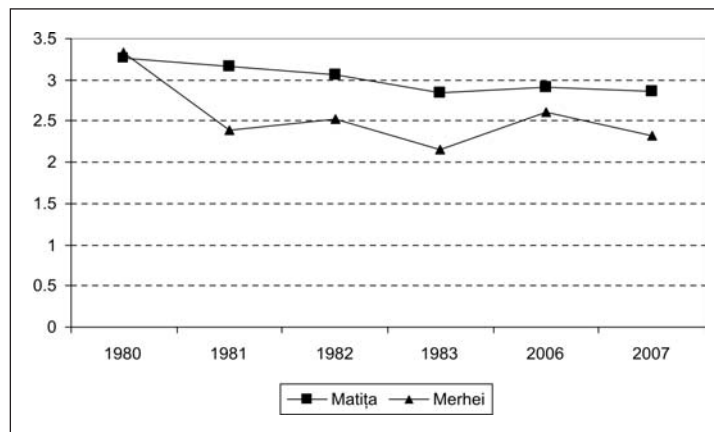
Persistent species	Ecosystem	1980	1981-1991	1992-2007	1980-2007
Herbivores					
<i>Carchesium polypinum</i> (Linnaeus)	Matița	+	+	-	-
<i>Epystilis plicatilis</i> Ehrenberg	Merhei	-	+	-	-
<i>Keratella cochlearis</i> (Gosse)	Matița	-	-	+	-
	Merhei	-	-	+	-
<i>Keratella quadrata</i> (O.F. Müller)	Merhei	+	-	-	-
<i>Synchaeta oblonga</i> Ehrenberg	Matița	+	-	-	-
<i>Synchaeta pectinata</i> Ehrenberg	Matița	-	-	+	-
	Merhei	-	-	+	-
<i>Chydorus sphaericus</i> (O.F. Müller)	Matița	-	+	-	-
	Merhei	-	+	-	-
Predators					
<i>Didinium nasutum</i> (O.F. Müller)	Merhei	+	-	-	-
<i>Asplanchna brightwelli</i> (Gosse)	Merhei	+	-	-	-
<i>Asplanchna herricki</i> de Guerne	Matița	-	-	+	-
<i>Asplanchna priodonta</i> Gosse	Matița	+	+	+	+
	Merhei	-	+	+	-
<i>Acanthocyclops vernalis</i> vernalis (Fischer)	Matița	-	+	-	-
	Merhei	-	+	-	-
<i>Mesocyclops crassus</i> (Fischer)	Merhei	-	-	+	-
<i>Leptodora kindtii</i> (Focke)	Matița	+	-	-	-

DISCUSSIONS

The trophic state of lakes Matița and Merhei before 1981 (included in the incipient mesotrophic-eutrophic limits) was characterized for the primary producers by the clear dominance of submerged macrophytes compared to planktonic producers (Enăceanu, 1953). Water blooms were rare during this period; they were short and located only in the upper layers of the water column. As a result, the biomass of primary producers recorded in most cases values that did not exceed the threshold of water blooms (5 mg wet weight/l) (Oltean, 1985).

Small chlorophyceae (nano-planktonic; Ø: 5-25 µm), well represented in the phytoplankton community, were an important food source for macro-consumer zooplankton. Aggregates composed of detritus and bacteria (Ø: 1-5 µm), coming from the decomposition of submerged macrophytes (especially at the end of vegetation season) and unconsumed algae also represented a significant food source, mainly for micro-consumer zooplankton.

The environment heterogeneity was positively influenced by the high abundance and diversity of submerged macrophytes, specific to Merhei Lake and to a certain extent to Matița Lake.

a. Shannon-Wiener's
informational entropy
index

b. Pielou's evenness

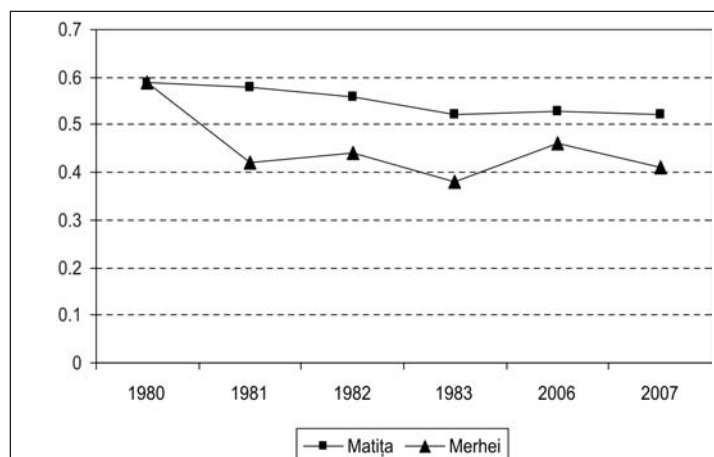
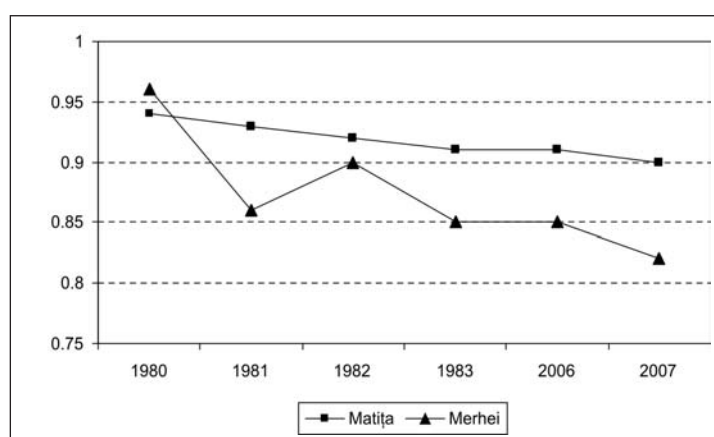
c. Simpson's index of
dominance

Fig. 6 - Dynamics of annual values of zooplankton diversity and dominance indicators in Matîța and Merhei lakes (1980-2007).

Table 6

Significant correlations ($p \leq 0.05$) between zooplankton parameters in lakes Matîța and Merhei.

Correlated variables	Level of data aggregation (please see Table 1)															
	a		b		c		d		e		f		g		h	
	R	p	R	p	R	p	R	p	R	p	R	p	R	p	R	p
<i>Matîța Lake</i>																
Zooplankton density and the number of species	0.08	*	0.34	*	0.68	*	0.15	0.65	0.63	*	0.57	0.24	-0.92	0.26	0.08	0.53
Shannon-Wiener's informational entropy index and the number of species	N/A	N/A	N/A	N/A	0.92	*	0.67	0.05	N/A	N/A	0.85	0.03	0.98	0.10	0.53	*
<i>Merhei Lake</i>																
Zooplankton density and the number of species	-0.21	*	0.50	*	0.69	*	0.12	0.74	0.82	*	0.48	0.33	-0.76	0.45	-0.21	0.16
Shannon-Wiener's informational entropy index and the number of species	N/A	N/A	N/A	N/A	0.87	*	0.73	0.06	N/A	N/A	0.97	*	0.85	0.36	0.47	*

N/A - not analyzed; * - significant at the 0.001 level; values in bold - significant at the 0.05 level; gray shading indicates statistical significance at a level less than the 0.05 threshold

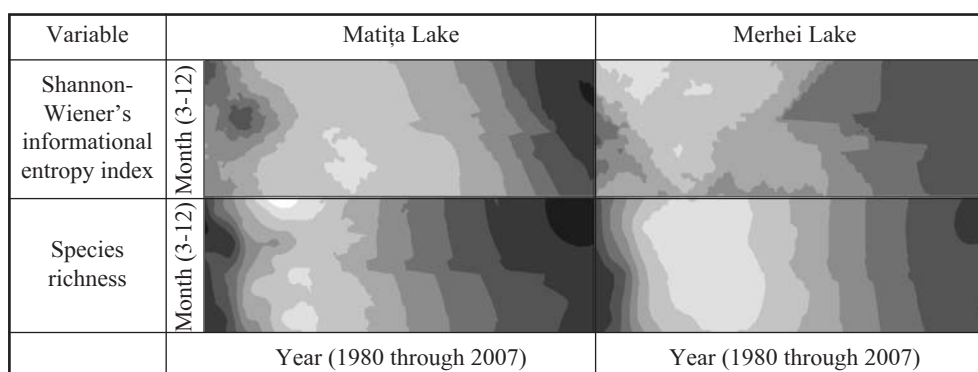


Fig. 7 - Ordinary kriging maps of zooplankton diversity evolution measured using Shannon-Wiener's informational entropy index and the species richness in lakes Matîța and Merhei. The gray shades indicate increases from low values (white) to high values (black) for both Shannon-Wiener's index and the species richness.

The presence of various food sources together with the high heterogeneity of the environment favored the formation of zooplankton communities characterized by high species richness in both lakes, but especially in Merhei Lake. The higher values of species richness in the second lake were caused by higher abundances of submerged vegetation and higher values of the ratio between the shore line length and the total surface.

The limitation of food sources for zooplankton community, characteristic to low-trophicity ecosystems before 1981, led to low values of numerical density.

Density data showed that eutrophication impact was more severe in Merhei Lake due to its deficient hydrological regime. This was caused by advanced siltation of Sulimanca spillway rivulet, the only possibility of water removal from Merhei Lake. On the contrary, Măța Lake had numerous ways of water outlet.

Beginning with 1981, significant increases in ecosystem trophic levels occurred, ranging between meso – to hypertrophic values. They were caused by human impacts and were aggravated by the hydrological and thermal regimes (Vădineanu et al., 2000; Rîșnoveanu, Postolache & Vădineanu, 2004; Postolache, 2006). Before 1981, DIN/TRP recorded high values, with a maximum of 96.6. Between 1981 and 1991 the values decreased, reaching a minimum of 8.5 in 1988. Beginning with 1997, a slightly growth trend was noticed, DIN/TRP reached 20.3 (Fig. 8).

Under hypertrophic conditions, water blooms became frequent and affected the whole water column. Annual averages of primary producer density increased more than three times in both lakes. Biomass also increased 11 times in Merhei Lake and 9 times in Măța Lake (Fig. 9) (Oltean & Nicolescu, 1985; Căraș & Nicolescu, 2006). The obvious increases of primary producer biomass were caused not only by the increasing number of individuals, but also by the ratio between micro-planktonic and nano-planktonic species. Long-term zooplankton dynamics of species richness and numerical abundance had a similar variation (Zinevici & Parpală, 2000).

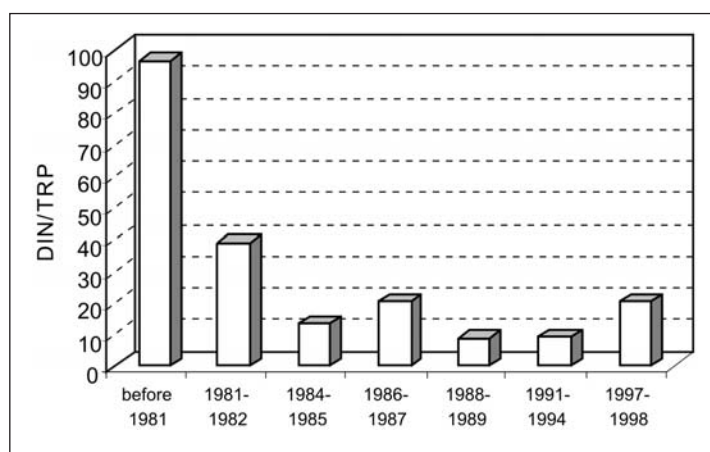


Fig. 8 - The dynamics of the water column DIN/TRP ($\mu\text{g/l}^{-1}$) ratio in the lower Danube River and the Danube Delta.

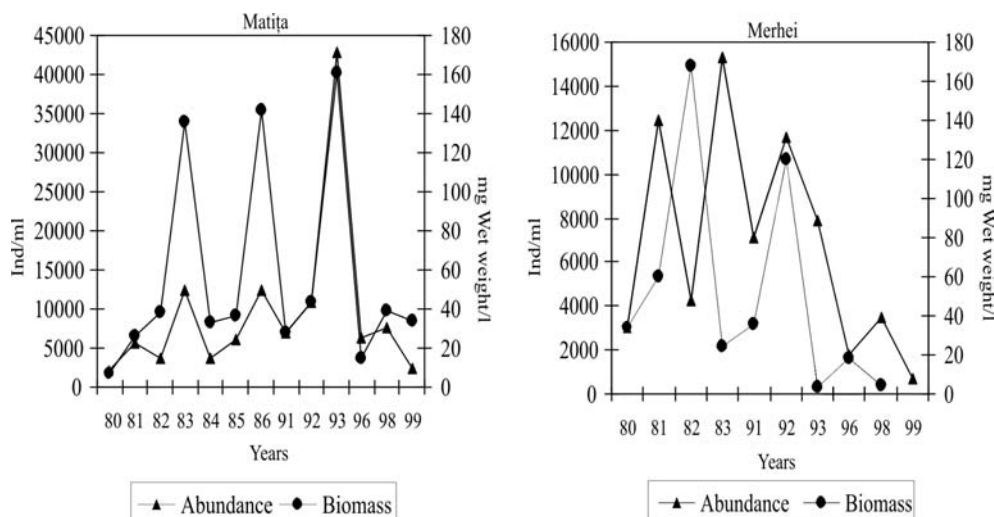


Fig. 9 - Phytoplankton density and biomass dynamics in lakes Matița and Merhei (Cărăuș & Nicolescu, 2006).

Planktonic primary producers caused the disappearance of submerged macrophytes by means of faster nutrient recycling and water transparency decreases. As a final effect, the heterogeneity of lake system decreased (Vădineanu et al., 2000).

This drawback in environment heterogeneity, together with the changes occurred in planktonic primary producers caused drastic decreases of zooplankton species richness during the poly- and hypertrophic phases. However, zooplankton abundance increased significantly.

The correlation between the two parameters showed the unfavorable character of the ecological changes for an important part of zooplankton species, according to the Thienemann principle (Botnariuc & Vădineanu, 1982). However, these changes of primary producers were favorable for cyanobacteria, capable to develop in the new ecological conditions, leading to significant increases of the total zooplankton density values: 2469.95 ind/l in Matița Lake and 2180.6 ind/l in Merhei Lake (Fig. 5).

A slight recovery tendency of diversity and structure of aquatic communities in the Danube Delta lake ecosystems occurred beginning with 1992, due to social and economic changes in some countries located in the Danube catchment area. These changes also affected the zooplankton community from lakes Matița and Merhei. However, zooplankton recovery process was slow and variable and it might have been significantly influenced by global climate change recorded in the region after the year 2000 (Zinevici & Parpală, 2007).

The dynamics of the Shannon-Wiener's informational entropy index, the Pielou's evenness and the Simpson's dominance index, correlated to species richness and numerical abundance dynamics showed the decreasing trend of zooplankton community stability, due to increases of the ecosystem trophic level from mesotrophic to hypertrophic.

Analyses of the before-mentioned parameters revealed that the restoration of ecological stability due to lower human-induced eutrophication impact was an extremely slow and oscillating process.

Comparative analyses of zooplankton in both lakes showed a more acute worsening of the ecological conditions, due to deficient hydrologic regime.

Changes in trophic levels between 1980 and 2007 significantly altered the structure and dynamics of persistent and dominant species that played an important role as key species in the structure and function of zooplankton community, viewed as a whole.

In the framework of drastic changes occurred in the dynamics of ecological factors, only a small number of persistent or dominant species became representative for the entire research period (Tabs 4, 5). Such situation has also been found in other ecosystem types (Ikauniece, 2001).

The species with the highest values of the persistence index, calculated for the period 1980-2007 were: *Brachionus angularis* Gosse, *Polyarthra remata* (Skorikov), *Bosmina longirostris* (O. F. Müller) and *Chydorus sphaericus* (O. F. Müller), in Matia Lake; *Brachionus angularis* Gosse, *Filinia longiseta* (Ehrenberg), *Keratella cochlearis* (Gosse), *Bosmina longirostris* (O. F. Müller) and *Chydorus sphaericus* (O. F. Müller), in Merhei Lake (Tab. 4).

Most of the numerical dominant species were characteristic only for one out of three study periods characterized by different trophic states. *Keratella quadrata* (O. F. Müller), *Synchaeta oblonga* Ehrenberg, *Didinium nasutum* (O. F. Müller), *Asplanchna brightwelli* (Gosse) and *Leptodora kindtii* (Focke) were characteristic for the mesotrophic-eutrophic period. *Epystilis plicatilis* Ehrenberg, *Chydorus sphaericus* (O. F. Müller) and *Acanthocyclops vernalis vernalis* (Fischer) were characteristic for the hypertrophic period and *Keratella cochlearis* (Gosse), *Synchaeta pectinata* Ehrenberg, *Asplanchna herricki* de Guerne and *Mesocyclops crassus* (Fischer) were specific for the period of recovery from hypertrophic to eutrophic conditions. *Carchesium polypinum* (Linnaeus) was the dominant species in the first two periods and *Asplanchna priodonta* Gosse was dominant in the last two periods (Merhei Lake) or in all three periods (Matia Lake) (Tab. 5).

The correlations between species richness and zooplankton density were significant, like those between species richness and the Shannon-Wiener's informational entropy index (Tab. 6).

The dominance of micro-consumer zooplankton, compared to macro-consumer zooplankton generated insignificant correlations between phytoplankton and zooplankton community.

Conclusions

The long-term research that extended on three decades in the shallow lakes Matia and Merhei showed important changes in species richness, species identity and abundance dynamics of plankton consumers. These changes were mainly caused by large variations of trophic levels between meso- to hypertrophic values, correlated with changes of the submerged macrophytes/phytoplankton ratio and changes in environment heterogeneity.

The dynamics of these parameters mentioned above showed several different phases from an ecological point of view: the natural balance period (1980), the human impact period (1981-1991) and the recovery period (1992-2007). Analyses carried out in the initial period showed high values of zooplankton diversity (119-

128 species), correlated to relatively low values of numerical abundance (232-387 ind./l). In the second period, a drastic diversity drawback was recorded (67-71 species), together with obvious increases of abundance (1000-1428 ind./l). In the third period, a slight tendency of recovery was observed because the two parameters recorded values comparable to those from the initial period (70-71 species, 711-730 ind./l respectively). However, the recovery process was slow and variable. It seemed to be strongly influenced by changes in hydrological and thermal regimes that became more and more acute after 2000.

The component of persistent and dominant species varied significantly during the three different periods of ecological research.

Long-term dynamics of specific richness, numerical abundance, as well evenness, diversity and dominance indices reflected the trend of progressive worsening of environmental conditions of zooplankton in Matița Lake and especially in Merhei Lake. This situation was caused by eutrophication and poor hydrological regime.

The changes of zooplankton dynamics from lakes Matița and Merhei from 1980 to 2007 could be considered representative for the whole lacustrine system in the Danube Delta. Provided to decision factors from the Danube Delta Biosphere Reserve, these long-term research data would contribute to an improved biodiversity management of this protected area.

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DINAMICA PE TERMEN LUNG A ZOOPLANCTONULUI DIN LACURILE DE MICĂ ADÂNCIME MATIȚA ȘI MERHEI (DELTA DUNĂRII, ROMÂNIA).

1. DIVERSITATE ȘI ABUNDENȚĂ

REZUMAT

Cercetări pe termen lung, efectuate în perioada 1980-2007, asupra zooplanctonului din două lacuri de mică adâncime, (Matița și Merhei) reprezentative pentru sistemul lacustru din Delta Dunării, evidențiază modificări semnificative ale unor parametri ecologici. Ele sunt consecința unor variații ample ale nivelului de trofie ecosistemică, generată de factorul antropic.

Se evidențiază trei perioade distincte din punct de vedere ecologic: perioada de meso-eutrofie (1980), perioada de eutrofie-hipertrofie (1981-1991) și perioada caracterizată printr-o ușoară tendință de revenire la starea de referință (1992-2007).

În prima perioadă zooplanctonul lacurilor Matița și Merhei se caracterizează prin bogăție specifică ridicată (119, respectiv 128 specii), corelată cu valori relativ reduse ale abundenței (223, respectiv 387 ind./l). În cea de a doua perioadă, bogăția specifică se reduce drastic (cu 52%, respectiv 63%), concomitent cu creșteri evidente (cu 39%, respectiv 16%) ale abundenței. Cercetările efectuate în cea de a treia perioadă evidențiază faptul că procesul de refacere a diversității și abundenței zooplanctonului este un proces lent și oscilant.

Dinamica indicilor de entropie informațională Shannon-Wiener, de echitabilitate Pielou și de dominanță Simpson, corelată cu bogăția specifică și dominanța numerică indică tendința de scădere a stabilității comunității zooplanctonice datorată creșterii nivelului de trofie de la meso la hipertrofie.

Componenta speciilor constante ca frecvență și a celor dominante numeric diferă semnificativ de la o perioadă la alta, doar un număr limitat de specii menținându-și aceste caracteristici în decursul întregii perioade analizate.

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ALIEN INVASIVE SPECIES AT THE ROMANIAN BLACK SEA COAST – PRESENT AND PERSPECTIVES

MARIUS SKOLKA, CRISTINA PREDĂ

Abstract. Using literature data and personal field observations we present an overview of aquatic animal alien invasive species at the Romanian Black Sea coast, including freshwater species encountered in this area. We discuss records, pathways of introduction, origin and impact on native communities for some of these alien invasive species. In perspective, we draw attention on the potential of other alien species to become invasive in the study area.

Résumé. Ce travail présente le résultat d'une synthèse effectuée en utilisant la littérature de spécialité et des observations et études personnelles concernant les espèces invasives dans la région côtière roumaine de la Mer Noire. On présente des aspects concernant les différentes catégories d'espèces invasives – stabilisées, occasionnelles et incertes – des écosystèmes marins et dulcicoles. L'origine géographique, l'impact sur les communautés d'organismes natifs, l'impact économique et les perspectives de ce phénomène sont aussi discutés.

Key words: alien invasive species, Black Sea, Romania.

INTRODUCTION

Invasive species are one of the great problems of the modern times. Globalization, increase of commercial trades and climatic changes make invasive species a general threat for all kinds of terrestrial, freshwater or marine ecosystems (Mooney, 2005; Perrings et al., 2010). Perhaps polar areas or the deep seas are the only ecosystems not affected by this global phenomenon.

Black Sea is a particular marine basin, with special hydrological characteristics, formed 10,000 years BP, when Mediterranean waters flowed to the Black Sea over the Bosphorus strait. The low salinity, low species diversity and highly affected coastal ecosystems by eutrophication combined with the high trade rate in the area have encouraged the establishment of alien species with high ecological plasticity (Leppäkoski & Mihnea, 1996). Some of these species had a radical impact on native communities in marine and freshwater ecosystems while others remained almost unnoticed (Zaitsev & Ozturk, 2001; Mee et al., 2005). The aim of the present paper is to present an overview of the alien invasive species' current status at the Romanian Black Sea coast (between Chilia Branch of the Danube to Vama Veche) including some species present in the freshwater coastal waters (paramarine lakes, coastal lagoons or estuaries connected with the sea and the Danube Delta). Aspects concerning records, pathways of introduction, origin and impact on native communities are discussed. New potential alien species for the referenced area are also presented.

MATERIAL AND METHODS

The terminology used for describing alien invasive species is sometimes confusing. Specialists and international organizations failed to adopt a unique terminology. In an attempt to offer an overview of the terms used in English

scientific literature in connection with the ecological problems of the invasive species phenomena, Colautti & MacIsaac (2004) listed no less than 33 terms. The impact of invasive species is considered from many points of view – impact on environment, on economy or human health, short or long-term impact, negative or positive effect etc. – and specialists failed to present a concrete and comprehensive definition. The reason is the lack of a general consensus of the scientists, economists and politicians about the importance of the different criteria used to define an invasive species.

In this paper, we divided alien species in three major categories: alien invasive species, casual species and questionable species (Carlton, 1996; Ruiz & Carlton, 2003; Mooney, 2005; Cox, 2004; Zenetos et al., 2005), as described below:

Alien invasive species are considered those species that established self-sustaining populations in new habitats situated at long distance from their native habitat, capable to spread in new territories independent from human activities. We consider in this category *established* and *naturalized* alien species, namely those species that are able to develop self-maintaining populations independent of any human activity, after their direct or indirect introduction (EU Commission, 2004). *Cryptogenic* species were also included in this category, which are species introduced before 1800 with uncertain origin and unknown way of introduction, or species with no evidence of their native or non-native status (Carlton, 1996; Ruiz & Carlton, 2003; Zenetos et al., 2005).

We also consider that an alien species always has “*per se*” a negative effect on native ecosystems. The presence of such a species changes the structure of native communities, affecting biodiversity. Considering the invasive status of one species or another, we should not take into account the impact on economy or the impact on human health (Mooney, 2005; Cox, 2004), but only the effect on biodiversity. An alien species is always an invasive one.

Casual invasive species category comprises, according to CIESM criteria (<http://www.ciesm.org/online/atlas/index.htm>), species mentioned once or for few times in a new area, requiring further investigations of their situation.

A third category – *questionable species* (Zenetos et al., 2005) should be used for species of which there is insufficient information, for alien species not verified by specialists or for species with uncertain taxonomic status.

The list of aquatic alien invasive species mentioned in this paper is based on published data from both national and international scientific papers, and on personal field observations performed during the last fifteen years. The list comprises 49 marine animal species and 20 freshwater species already present at the Romanian Black Sea coast.

RESULTS AND DISCUSSION

In comparison with the total number of marine animal taxa (Metazoa) mentioned for the Romanian littoral, the number of alien invasive species represents about 3.3% (Skolka et al., 2006). In the last decades of the 20th century, about 17.4% of these alien invasive species induced notable changes in native communities, both in marine and freshwater ecosystems. The most affected were the benthic (for example sandy bottoms in Sulina – Cap Midia sector) and pelagic ecosystems.

Invasive species at the Romanian littoral – short history

The first alien invasive species that reached the Black Sea (Tab. 1) were species from fouling associations. Probably the first of these species were the shipworm *Teredo navalis*, and the barnacle *Balanus improvisus*, arrived in the Black Sea area before 1900 (Grossu, 1962; Gomoiu & Skolka, 1996; Zaitsev & Ozturk, 2001). Started in the first decades of the 20th century, the rate of acclimatization of alien species increased, especially in the 1970 – 1990s (Fig. 1), due to the growing commercial changes and to the high human impact resulting from eutrophication, pollution, coastal development, overfishing.

Between 1900 and 1950 marine invasive species mentioned in this period such as *Blackfordia virginica* (Coelenterata: Hydrozoa) and *Perigonimus* (*Bougainvillia*) *megas* (Coelenterata: Hydrozoa) (Mordukhai-Boltovskoy, 1968) have not had major impacts on native communities. In freshwater ecosystems (Tab. 2) only the pumpkinseed fish *Lepomis gibosus* (Bănărescu, 1964) developed self sustaining populations and became widespread. The western mosquitofish *Gambusia affinis*, introduced in 1927 (Bănărescu, 1964), has an uncertain status in Romania and the influence of the kamptozoan *Urnatella gracilis* (Băcescu, 1954) on benthic communities is almost insignificant.

In 1950 – 1980 periods, the number of alien invasive species reports increased both in marine and freshwater ecosystems. Some of the most important marine species recorded in this period are the crab *Rithropanopaeus harrisii* (Băcescu, 1952, 1967), the gastropoda *Rapana venosa* (Grossu, 1986) and the bivalve *Mya arenaria* (Gomoiu, 1981 a, b) as well as the polychaete *Ficopomatus aenigmaticus* reported in mass populations in Constanța harbor (Pitiș & Lăcătușu, 1971). A small paddle-footed annelid of *Polydora* complex (Losovskaya & Nestorova, 1964; Surugiu, 2008) had established self-sustaining populations in marine benthic communities. Some marine species of pelagic copepods are reported also in this period (Porumb, 1980) but the most spectacular event for this period is the intrusion and afterwards the development of mass populations of the ctenophore *Mnemiopsis leidyi*, mentioned in the Black Sea in early 1990s (Malyshev & Arkhipov, 1992). In freshwater ecosystems, several species of East Asian cyprinid fishes were acclimatized for aquaculture at this time (Bănărescu, 1964; Iacob & Petrescu-Mag, 2008) including the Asian clam *Sinanodonta woodiana* (Petro, 1984). From benthic brackish water communities, the gastropod *Potamopyrgus antipodarum* (Grossu, 1986) is reported.

In 1980s and 1990s, the number of pelagic copepods reported at the Romanian littoral increased (Porumb, 1980; Skolka & Gomoiu, 2004). From benthic association the bivalves *Crassostrea virginica* which was introduced for aquaculture in 1970s and *Anadara inaequalis* recorded at the Romanian littoral in 1984 (Gomoiu, 1984), and the gastropod *Corambe obscura* observed at the Romanian coast only in 1997 (Gomoiu & Skolka, 1997) are registered.

Between 1990 and 2000, other invasive species were mentioned in the western part of the Black Sea, such as the nude comb-jelly *Beroe ovata* and the American blue crab *Callinectes sapidus* (Skolka, 1998). In freshwater ecosystems, the intrusion of the crab *Eriocheir sinensis* (Skolka & Gomoiu, 2004; Skolka et al., 2006) and the bivalve *Corbicula fluminea* (Bij de Vaate & Hulea, 2000) were reported.

After 2000, the number of invasive species reports decreased (Fig. 1). Only few new species were reported, and none of them became mass-invasive. This is the

Table 1

Marine alien invasive species at the Romanian littoral.

Species	Origin	First mention	Ecologic type	Vector	Pathway	Status and ecologic impact	References
<i>Blackfordia virginica</i> (Mayer, 1910)	North Atlantic	1940	benthos	accidental	fouling	Established. Insignificant impact; changes in benthic and plankton communities	Mordukhai-Boltovskoy, 1968
<i>Perigonimus (Bougainvillia) megas</i> (Kinne, 1956)	North Atlantic	1940	benthos	accidental	fouling	Casual. Insignificant ecologic impact; changes in benthic and plankton communities	Mordukhai-Boltovskoy, 1968
<i>Rathkea octopunctata</i> (Sars, 1835)	Atlanto-Mediterranean	1959	plankton	accidental	ballast water	Casual. Insignificant ecologic impact; changes in benthic and plankton communities	Porumb, 1959 b
<i>Mnemiopsis leidyi</i> (Agassiz, 1865)	North Atlantic	1987	plankton	accidental	ballast water	Established. Species with major ecologic and economic impact on plankton and nekton communities	Harbison & Volovik, 1993 Petran & Moldoveanu, 1994 - 1995
<i>Beroe ovata</i> (Bruguiere, 1789)	North Atlantic	1998	plankton	accidental	ballast water	Established. Predator specialized on <i>Mnemiopsis</i> . Major impact	Gomoiu & Skolka, 1998
<i>Polydora cornuta</i> (Bosc, 1802) native communities	Atlantic	1964 (?)	benthos	accidental	fouling	Established. Major ecologic impact on hard bottoms native communities	Surugiu, 2008 (Losovskaya & Nesterova, 1964)
<i>Ficopomatus aenigmaticus</i> (Fauvel, 1923)	North Atlantic	1954	benthos	accidental	fouling	Established. Major ecologic impact on hard bottoms native communities	Pitiș & Lăcătușu, 1971
<i>Rapana venosa</i> (Valenciennes, 1846)	Indo-Pacific	1963	benthos	accidental	ballast water	Established. Radical changes in benthic native communities	Gomoiu, 1972
<i>Corambe (Doridella) obscura</i> (Verrill, 1870)	North Atlantic	1990	benthos	accidental	fouling	Established. Predator; insignificant ecologic impact	Gomoiu & Skolka, 1997

Table 1 (continued)

Species	Origin	First mention	Ecologic type	Vector	Pathway	Status and ecologic impact	References
<i>Anadara (Scapharca) inaequivalvis</i> (Bruguiere, 1789)	Indo-Pacific	1984	benthos	accidental	ballast water	Established. Radical changes in benthic communities Dominant species	Gomoiu, 1984
<i>Musculista senhousia</i> (Conrad, 1837)	Indo-Pacific	2004	benthos	accidental	fouling	Casual. Radical changes in benthic communities	Micu & Micu, 2004
<i>Crassostrea virginica</i> (Gmelin, 1791)	North Atlantic	1974	benthos	deliberate	mariculture	Casual. Unknown	Skolka & Gomoiu, 2004
<i>Crassostrea gigas</i> (Gmelin, 1791)	Indo-Pacific	1980 (?)	benthos	deliberate	mariculture	Casual. Unknown	Skolka & Gomoiu, 2004
<i>Teredo navalis</i> (Linnaeus, 1758)	Atlanto-Mediterranean	?	benthos	accidental	fouling	Established. Minor ecologic impact	Grossu, 1962
<i>Mya arenaria</i> (Linnaeus, 1758)	North Atlantic	1968	benthos	accidental	ballast water	Established. Radical changes in benthic communities Dominant species	Gomoiu & Porumb, 1969
<i>Neocalanus gracilis</i> (Dana, 1849)	Cosmopolite	1979	plankton	accidental	ballast water	Established. Impact unknown.	Porumb, 1980
<i>Mesocalanus tenuicornis</i> (Dana, 1849)	Cosmopolite	1979	plankton	accidental	ballast water	Established. Impact unknown.	Porumb, 1980
<i>Paracalanus aculeatus</i> (Giesbrecht, 1888)	Cosmopolite	1979	plankton	accidental	ballast water	Established. Impact unknown.	Porumb, 1980
<i>Paracalanus nanus</i> Sars, 1907	Cosmopolite	1979	plankton	accidental	ballast water	Established. Impact unknown.	Porumb, 1994 - 1995
<i>Calocalanus pavo</i> (Dana, 1852)	Cosmopolite	1979	plankton	accidental	ballast water	Established. Impact unknown.	Porumb, 1994 - 1995
<i>Calocalanus plumulosus</i> (Claus, 1863)	Cosmopolite	1979	plankton	accidental	ballast water	Established. Impact unknown.	Porumb, 1994 - 1995
<i>Calocalanus arcuicornis</i> (Dana, 1849)	Cosmopolite	1979	plankton	accidental	ballast water	Established. Impact unknown.	Porumb, 1994 - 1995
<i>Glenocalanus vanus</i> (Giesbrecht, 1888)	Cosmopolite	1979	plankton	accidental	ballast water	Established. Impact unknown.	Porumb, 1994 - 1995

Table 1 (continued)

Species	Origin	First mention	Ecologic type	Vector	Pathway	Status and ecologic impact	References
<i>Microsetella rosea</i> (Dana, 1848)	Cosmopolite	1960 (?)	plankton	accidental	ballast	Established. Impact water	Porumb, 1994 - 1995 unknown.
<i>Corycaeus furcifer</i> Claus, 1863	Cosmopolite	?	plankton	accidental	ballast water	Established. Impact unknown.	Porumb, 1994 - 1995
<i>Corycaeus clausi</i> F. Dahl, 1894	Cosmopolite	?	plankton	accidental	ballast water	Established. Impact unknown.	Porumb, 1994 - 1995
<i>Corycaeus (Agetus) typicus</i> Kroyer, 1849	Cosmopolite	?	plankton	accidental	ballast water	Established. Impact unknown.	Porumb, 1994 - 1995
<i>Corycaeus (Agetus) flaccus</i> Giesbrecht, 1891	Cosmopolite	?	plankton	accidental	ballast water	Established. Impact unknown.	Porumb, 1994 - 1995
<i>Calocalanus pavoninus</i> Farran, 1936	Cosmopolite	?	plankton	accidental	ballast water	Established. Impact unknown.	Porumb, 1994 - 1995
<i>Calocalanus tenuis</i> Farran, 1926	Cosmopolite	?	plankton	accidental	ballast water	Established. Impact unknown.	Porumb, 1994 - 1995
<i>Oncaea mediterranea</i> Claus, 1863	Cosmopolite	?	plankton	accidental	ballast water	Established. Impact unknown.	Porumb, 1994 - 1995
<i>Oncaea minuta</i> Giesbrecht, 1892	Cosmopolite	?	plankton	accidental	ballast water	Established. Impact unknown.	Porumb, 1994 - 1995
<i>Oncaea dentipes</i> Giesbrecht, 1891	Cosmopolite	?	plankton	accidental	ballast water	Established. Impact unknown.	Porumb, 1994 - 1995
<i>Euterpina acutifrons</i> Brian, 1921	Cosmopolite	?	plankton	accidental	ballast water	Established. Impact unknown.	Porumb, 1994 - 1995
<i>Neocalanus gracilis</i> Dana, 1852	Cosmopolite	?	plankton	accidental	ballast water	Established. Impact unknown.	Porumb, 1994 - 1995
<i>Mecynocera clausi</i> Thompson, 1888	Cosmopolite	1979	plankton	accidental	ballast water	Established. Impact unknown.	Porumb, 1994 - 1995
<i>Pontella mediterranea</i> (Claus, 1863)	Atlanto-Mediterranean	?	plankton	accidental	ballast water	Established. Impact unknown.	Skolka & Gomoiu, 2004
<i>Lepas</i> sp.	Atlanto-Mediterranean	?	benthos	accidental	fouling	Casual. Insignificant	Skolka & Gomoiu, 2004
<i>Balanus improvisus</i> (Darwin, 1854)	North Atlantic	1844	benthos	accidental	fouling	Established. Major impact; larval stages represent a valuable food resource	Gomoiu & Skolka, 1996

Table 1 (continued)

Species	Origin	First mention	Ecologic type	Vector	Pathway	Status and ecologic impact	References
<i>Balanus perforatus</i> (Bruguère, 1789)	North Atlantic	?	benthos	accidental	fouling	Casual. Unknown	Skolka & Gomoiu, 2004
<i>Verruca spengleri</i> (Darwin, 1854)	Atlanto-Mediterranean	1957	benthos	accidental	fouling	Casual. Unknown	Porumb, 1959 a
<i>Sphaeroma walkeri</i> (Stebbing, 1905)	Indo-Pacific	2004	benthos	accidental	fouling	Casual. Minor impact	Skolka & Gomoiu, 2004
<i>Palaemon macrrodactylus</i> (Rathbun, 1902)	Indo-Pacific	2009	benthos	accidental	ballast water	Established. Changes in benthic communities	Micu & Niță, 2009
<i>Callinectes sapidus</i> (Rathbun, 1896)	North Atlantic	1980	benthos	accidental	unknown	Casual. Insignificant	Skolka, 1998
<i>Rithropanopeus harrisi tridentatus</i> (Maitland, 1874)	Indo-Pacific	1950	benthos	accidental	fouling	Established. Major impact in benthic communities	Băcescu, 1967
<i>Hemigrapsus sanguineus</i> (de Haan, 1835)	Indo-Pacific	2010	benthos	accidental	fouling	Casual. Insignificant	Micu et al., 2010
<i>Electra crustulenta</i> (Pallas, 1776)	Atlanto-Mediterranean	?	benthos	accidental	fouling	Casual. Insignificant; changes in structure of benthic communities	Skolka O., 1982
<i>Styela clava</i> (Herdmann, 1881)	American Atlantic waters	2004	benthos	accidental	fouling	Casual. Plankton feeder; changes in benthic communities	Micu & Micu, 2004
<i>Mugil soley</i> (Basiliewsky, 1855)	North East Pacific	1972	nekton	deliberate	mariculture	Established. Changes communities in marine fish	Bănărescu, 1964

Table 2

Freshwater alien invasive species in Black Sea Coastal area and Danube Delta.

Species	Origin	First mention	Ecologic type	Vector	Pathway	Status and ecologic impact	References
<i>Umatella gracilis</i> (Leidy, 1851)	North America	1950	benthos	accidental	fouling	Casual. Insignificant	Băcescu, 1964
<i>Potamopyrgus antipodarum</i> (Gray, 1843)	South Pacific	1952	benthos	accidental	fouling	Established. Insignificant impact. Changes in benthic associations	Grossu, 1986

Table 2 (continued)

Species	Origin	First mention	Ecologic type	Vector	Pathway	Status and ecologic impact	References
<i>Sinanodontia woodiana</i> (Lea, 1834)	East Asia	1962	benthos	deliberate	aquaculture	Established. Significant	Skolka & Gomoiu, 2004; Popa et al., 2007
<i>Dreissena rostriformis bugensis</i> (Andrusov, 1897)	Ponto-caspic	2005	benthos	accidental	fouling	Casual. Unknown	Micu & Telembici, 2004 Popa & Popa, 2006
<i>Corbicula fluminea</i> (O. F. Müller, 1774)	East Asia	1997	benthos	accidental	canal	Established. Major impact; dominant species	Bij de Vatte & Hulea, 2000
<i>Eriocheir sinensis</i> (H. Milne Edwards, 1853)	East Asia	1997	benthos	accidental	unknown	Established. Unclear impact; concurrent species for native crayfish	Skolka, 1998
<i>Gambusia affinis holbrooki</i> (Baird and Girard, 1853)	North America	1925	nekton	deliberate	aquaculture	Questionable. Unclear impact; concurrent for native species. Actual status unclear	Bănărescu, 1964
<i>Aristichthys nobilis</i> (Richardson, 1845)	China	1962	nekton	deliberate	aquaculture	Established. Major impact, radical changes in native fish communities	Source DAISIE
<i>Ctenopharyngodon idella</i> (Valenciennes, 1844)	East Asia	1959	nekton	deliberate	aquaculture	Established. Major impact, radical changes in native fish communities	Source DAISIE
<i>Hypophthalmichthys molytrix</i> (Valenciennes, 1844)	East Asia	1960	nekton	deliberate	aquaculture	Established. Major impact, radical changes in native fish communities	Staraş & Oţel, 1998
<i>Ictalurus melas</i> Rafinesque, 1820	North America	after 1990	nekton	deliberate	aquaculture	Questionable. Impact and changes in native fish communities	Source DAISIE
<i>Ictalurus nebulosus</i> (Lesueur, 1819)	North America	1910	nekton	deliberate	aquaculture	Questionable. Impact and changes in native fish communities	Bănărescu, 1964
<i>Ictalurus punctatus</i> (Rafinesque, 1818)	North America	1978	nekton	deliberate	aquaculture	Questionable. Impact and changes in native fish communities	Source DAISIE

Table 2 (continued)

Species	Origin	First mention	Ecologic type	Vector	Pathway	Status and ecologic impact	References
<i>Ichtiobus niger</i> (Rafinesque, 1819)	North America	1978	nekton	deliberate	aquaculture	Questionable. Impact and changes in native fish communities	Source DAISIE
<i>Carassius gibelio</i> (Bloch, 1782)	East Asia	1912	nekton	deliberate	aquaculture	Established. Major impact, on native fish communities. Dominant species.	Bănărescu, 1964
<i>Lepomis (Eupomatis) gibbosus</i> (Linnaeus, 1758)	North America	1930	nekton	deliberate	aquaculture	Established. Major impact, on native fish communities. Dominant species.	Bănărescu, 1964
<i>Megalobrama terminalis</i> (Richardson, 1846)	East Asia	1965	nekton	deliberate	aquaculture	Questionable. Impact and changes in native fish communities	Source DAISIE
<i>Mylopharyngodon piceus</i> (Richardson, 1846)	East Asia	1963	nekton	deliberate	aquaculture	Questionable. Impact and changes in native fish communities	Source DAISIE
<i>Parabramis pekinensis</i> (Basilevsky, 1855)	East Asia	1964	nekton	deliberate	aquaculture	Questionable. Impact and changes in native fish communities	Source DAISIE
<i>Pseudorasbora parva</i> (Temminck et Schlegel, 1846)	East Asia	1966	nekton	deliberate	aquaculture	Questionable. Impact and changes in native fish communities	Source DAISIE

case of *Musculista senhousia* (Mollusca: Bivalvia), *Styela clava* (Chordata: Ascidiacea) (Micu & Micu, 2004) and the isopod *Sphaeroma walkeri* (Skolka & Gomoiu, 2004) for marine ecosystems and quagga mussel *Dreissena rostriformis bugensis* (Micu & Telembici, 2004) in freshwater ones. Recently, two new invasive species of crustaceans were reported from marine ecosystems: the Asian prawn *Palaemon macrodactylus* which has already established a large population in the northern part of the Romanian Black Sea coast (Micu & Niță, 2009) and the Asian shore crab *Hemigrapsus sanguineus*, a single specimen encountered in Constanța area (Micu et al., 2010).

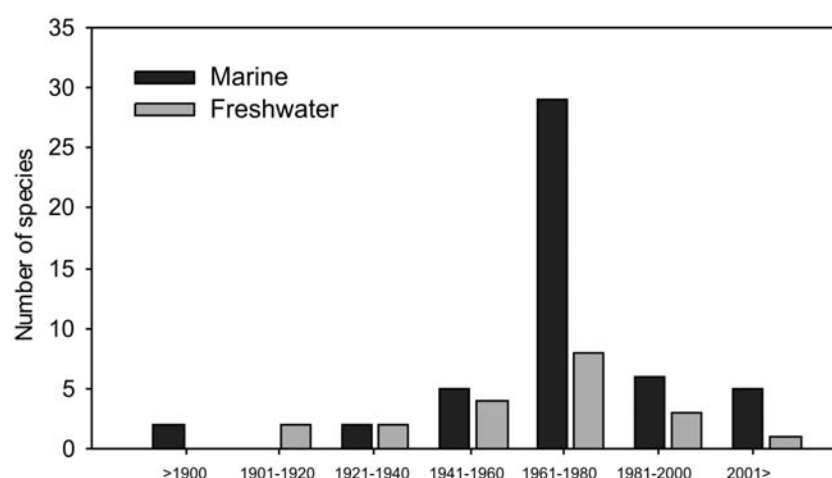


Fig. 1 - Number of marine and freshwater alien invasive species mentioned at the Romanian Black Sea Coast after 1900.

Causes of invasion, invasion routes and geographic origin of alien species

The intrusion of alien species in the Romanian Black Sea coastal area has similar causes with those encountered in other regions. Most species were accidentally introduced in fouling communities from ships' hulls and in ballast water while other species were introduced for aquaculture and mariculture (Fig 2). First records of most alien invasive species in the Black Sea basin are mentioned from the north-western and north-eastern part of the basin (Zaitsev & Ozturk, 2001), in the vicinity of Odessa, Sevastopol and Novorossiysk harbors. The development of shipping activities in these areas and the intended species introduction for mariculture between 1970 and 1980 are the main causes of the invasive species phenomenon in the entire Black Sea.

For the marine ecosystems, about 60% of the alien invasive species were accidentally introduced with ballast water and about 33% in fouling associations. Only about 6% were intentionally introduced for economic purposes (Fig. 3). For freshwater ecosystems, the situation is different: the high majority of alien invasive species was introduced for aquaculture (Fig. 3).

Analyzing the geographic origin of marine alien invasive species, most of them (43%) are cosmopolite planktonic species, 12% have Atlantic-Mediterranean origin, 27% are North Atlantic species and 18% are Indo Pacific (Fig. 4).

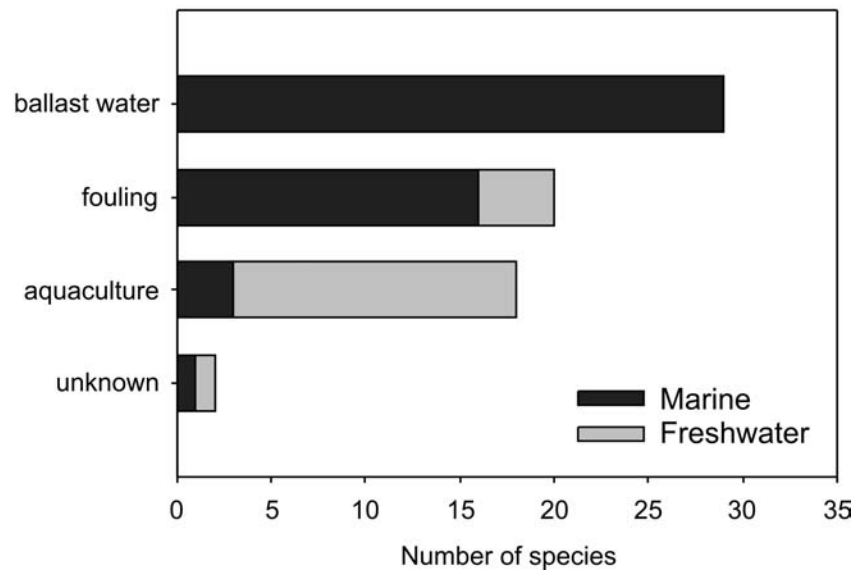


Fig. 2 - Introduction pathways of aquatic invasive species at the Romanian Black Sea Coast.

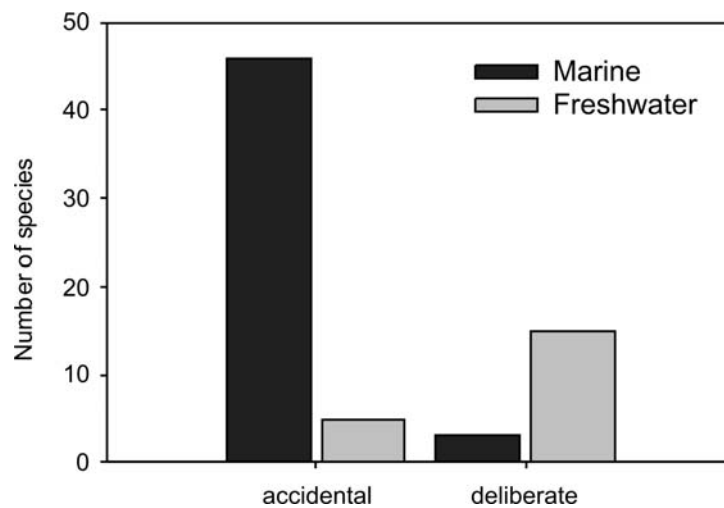


Fig. 3 - Introduction of aquatic invasive species at the Romanian Black Sea Coast.

The freshwater invasive species along the Romanian Black Sea Coast originate in two major areas - North America and East Asia. North-American species represent 55% while 35% of species originate in East Asia. Ponto-Caspian and South Pacific species represent only 5% each (Fig. 5).

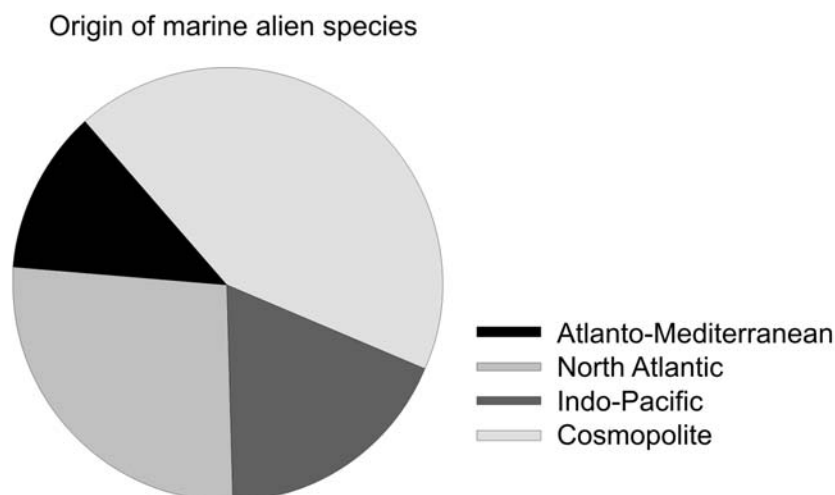


Fig. 4 - Origin of marine alien invasive species at the Romanian Black Sea Coast.

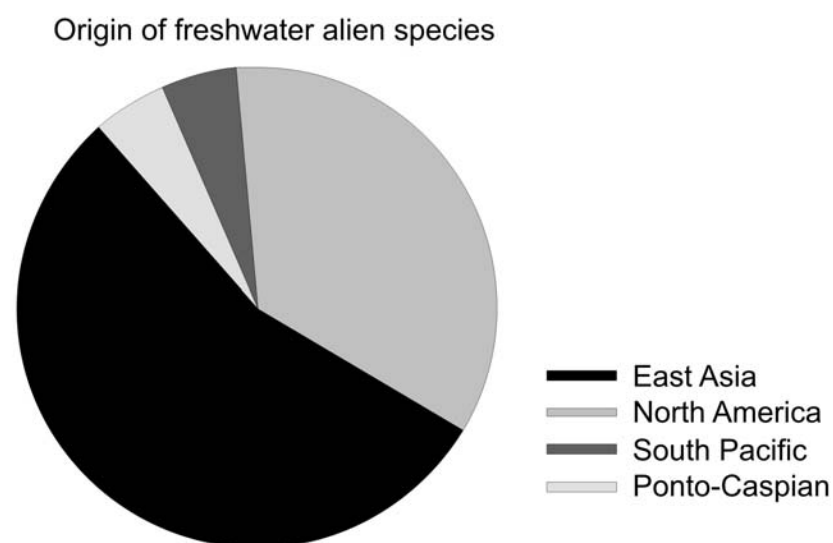


Fig. 5 - Origin of freshwater alien invasive species at the Romanian Black Sea Coast.

Alien invasive species

Considering the Black Sea ecosystems affected by invasive species, we can notice that the most affected are the pelagic and benthic associations from 0 to 50 m depth, both on rocky and sandy bottoms. The benthic communities below this depth do not seem affected by invasive species (Safriel & Ritte, 1983). Although some alien species proved not only the capacity to adapt to the particular conditions of the Black Sea, but became dominant in native pelagic or benthic associations, other established species had a low impact on native communities. At the Romanian Black Sea Coast, species like *Balanus improvisus*, *Rapana venosa*, *Mya arenaria*,

Anadara inaequalis, *Mnemiopsis leidyi*, *Beroe ovata*, *Polydora cornuta* etc. can be included in the alien invasive species category. In the category of established species with no visible impact on marine ecosystems are *Blackfordia virginica*, *Corambe obscura*, *Teredo navalis* and some pelagic copepods (Tab. 1).

Mnemiopsis leidyi. This ctenophore, the rainbow comb jelly is the invasive species with the highest impact on the associations of zooplanktonic and neritic species in the Black Sea (Malyshev & Arkhipov 1992; Harbison & Volovik, 1993). The feeding habits, ecology and the lack of predators combined with the particular conditions of the Black Sea have transformed it quickly into dominant species and its mass development has affected the whole pelagic zone. Among the effects of its penetration and acclimatization in the Black Sea can be mentioned the drastic reduction of pelagic fish populations (Zaitsev, 1992; Niermann et al., 1993, 1994; Zaitsev & Mamaev, 1997; Shiganova & Bulgakova, 2000) – also affected by overfishing, as well as the modification of the structure of the native gelatinous zooplankton (Shushkina et al., 1990; Petran & Moldoveanu, 1994 – 1995; Shiganova et al., 2000, 2001, 2004).

Beroe ovata. The success of *Mnemiopsis leidyi* is directly connected to the success of the nude ctenophores of genus *Beroe*, which appeared in zooplankton few years after the acclimatization of the first species (Finenko et al., 2000; Lebedeva & Shushkina, 1994; Gomoiu & Skolka, 1998; Skolka, 1998; Shushkina et al., 2000). As a result of the penetration of the second species of ctenophore, the populations of *M. leidyi* decreased after 2000 (Kideys, 2002).

Ficopomatus aenigmaticus (Annelida: Polychaeta) has proved a particular success in populating the habitats in harbor areas. Resistant in a marine environment affected by a high human impact, *Ficopomatus aenigmaticus* developed large populations at the Romanian littoral (Pitiș & Lăcătușu, 1971). The mass populations of this species induce changes in benthic communities, offering at the same time ecological niches and substrata for various species including other fouling species (Micu & Micu, 2004).

Rapana venosa. The veined rapa whelk, the largest species of predatory gastropod in the Black Sea, has also large populations along the entire length of the Romanian littoral (Gomoiu, 1972). The impact on native bivalve communities was important since *R. venosa* contributed at the disappearance of oyster banks from the eastern part of the Black Sea (Chukhchin, 1984).

Mya arenaria and *Anadara (Scapharca) inaequalis*. Both *Mya arenaria* (Beshevly & Kolyagyn, 1967; Gomoiu & Porumb, 1969; Gomoiu & Petran, 1973; Gomoiu, 1981 a, b) and the Asian bivalve *Anadara inaequalis* (Gomoiu, 1984) represent two other cases of invasive species with particular success in the invaded areas. Both species succeeded shortly after acclimatization to become dominant species on the shallow sandy bottoms characterized by waters with low salinity.

Pelagic copepods. From the plankton communities of the Black Sea Romanian coastal waters about 20 species of copepods of *Neocalanus*, *Mesocalanus*, *Calocalanus*, *Ctenocalanus*, *Corycaeus*, *Euterpina*, *Oncaea*, *Microsetella* etc. genera were mentioned (Porumb, 1994 – 1995). All of them are cosmopolite species, reported for the first time in the northern part of the Black Sea in 1960 – 1970 and accidentally introduced with ballast water.

Balanus improvisus is the invasive species with the highest ecological success among the crustaceans. Arrived in the Black Sea in the second half of the 19th century (Gomoiu & Skolka, 1996; Skolka & Gomoiu, 2004) it developed large

populations on all types of hard substrate. A possible collateral effect of its successful establishment could be the inability of other species of barnacles to install on the rocky littoral of the Black Sea. Species like *Balanus eburneus* (Gould, 1841) or *Balanus amphitrite* (Darwin, 1854), frequent in the European marine basins and also resistant to anthropic impact, did not succeed in establishing populations in the Black Sea.

Rhithropanopeus harrisii proved to be the crab with the greatest impact (Băcescu, 1952). Having a large ecological plasticity, it populated both freshwater and marine habitats (Băcescu, 1967), and currently it is frequently present on rocky bottoms dominated by the Black Sea mussels *Mytilus galloprovincialis* (Lamarck, 1819). Extremely resistant to harsh environment conditions and its feeding behavior – predatory as well as scavenger or phytophagous – enabled it to become very efficient in exploiting certain ecological niches. Also, the large populations of this small crab make him a valuable trophic resource for native fishes.

Palaemon macrodactylus. This Asian prawn was recently reported from the northern part of Romanian Black Sea coast in large populations. This species is one of the most probable to spread all over the Black Sea shores (Micu & Niță, 2009).

In freshwater ecosystems, species like *Corbicula fluminea*, *Lepomis gibbosus* and some Asian cyprinids became dominant in native pelagic or benthic associations. Species that had a low impact on native communities are *Eriocheir sinensis*, *Sinanodonta woodiana* and *Dreissena rostriformis bugensis*.

Corbicula fluminea, the Asian clam compared to other freshwater invaders, is a much more dynamic species. Having entered in the Danube River after the opening of the Rhine-Danube canal, it later established stabile populations in western part of Europe, from Great Britain (Elliott & zu Ermgassen, 2008) to the Balkans (Paunović et al., 2007). *Corbicula fluminea* has become rapidly a numerous species not only in the Danube and the Danube Delta, but also in the paramarine lakes or in the Danube-Black Sea Canal.

Freshwater fish species. *Lepomis gibbosus*, *Hypophthalmichthys molytrix*, *Ctenopharyngodon idella*, *Carassius gibelio* proved to be successful species in populating new habitats (Bănărescu, 1964; Staraș & Oțel, 1998). *Lepomis gibbosus*, introduced in breeding farms, became a dominant species and the impact on fish communities was a major one. The Asian cyprinids also became dominant species, changing the structure of fish communities (Staraș & Oțel, 1998).

The bivalve *Teredo navalis*, the American blue crab *Callinectes sapidus* or the small gastropod *Corambe obscura* are the species that did not produce major modifications in the structure of native organisms' communities at the Romanian littoral.

Corambe obscura developed after acclimatization large populations. It is a predatory species that feeds exclusively on bryozoans and occupied an ecological niche with no efficient native competitors (Roginskaya & Grintsov, 1990; Gomoiu & Skolka, 1997).

Teredo navalis the shipworm occupies an exclusivist ecological niche and does not compete with any of the native species (Grossu, 1962; Skolka & Gomoiu, 2004).

Polydora cornuta became common in mussel communities on hard substrata. It resembles to other native *Polydora* species (Surugiu, 2008), and the impact on native communities is unclear.

In freshwater ecosystems, the same low ecological impact is proved by species like the gastropod *Potamopyrgus antipodarum*, the Chinese mitten crab *Eriocheir sinensis*, and *Sinanodonta woodiana*.

Potamopyrgus antipodarum became after acclimatization a widespread species in the Razelm – Sinoe lagoon complex (Grossu, 1986). This little gastropod knows a rapid expansion in the north-western part of the Black Sea littoral developing large populations at the Ukrainian Coast (Son, 2008).

Sinanodonta woodiana. The Chinese pond mussel is one of the freshwater bivalves accidentally introduced (Petro, 1984; Sarkany-Kiss, 1986), which spread out in Central Europe (Kiss & Petro, 1992; Beran, 2008). At the Romanian littoral, it was reported after 1990 in the Danube Delta (Skolka & Gomoiu, 2004; Popa et al., 2007) where it has developed populations alongside the native bivalve species *Anodonta cygnaea* (Linnaeus, 1758). Afterwards it spread north, being reported from Republic of Moldavia in 2003 (Munjiu & Shubernetski, 2008).

Eriocheir sinensis is present at the mouths of the Danube and in a number of lakes in the Danube Delta. The Chinese mitten crab is quite frequent in some areas (Oțel, 2004), but not abundant. The relationship between this species and the native crayfish *Astacus leptodactylus* (Eschscholtz, 1823) has not been studied yet.

Casual species

For the marine ecosystems, 13 species were included in this category. The hydrozoans *Perigonimus megas* and *Rathkea octopunctata*, the bryozoan *Electra crustulenta* and the barnacle *Balanus perforatus* were not mentioned for a long period and their situation needs to be reconsidered. In the same situation is the small cirriped *Verruca spengleri*, mentioned only as larval stage (Porumb, 1959 a). *Lepas* sp. and *Sphaeroma walkeri*, both of them frequently present in fouling associations of marine ships (Skolka, unpublished data), have not been found in natural habitats. Species like *Musculista senhousia* and *Styela clava* were mentioned only as isolated specimens in the southern part of Constanța harbor. Only one specimen of the Asian shore crab *Hemigrapsus sanguineus* was reported from the marina of Constanța tourist harbor (Micu et al., 2010). Isolated specimens of *Callinectes sapidus* were encountered in the southern part of the Romanian littoral (Skolka, 1998; Petrescu et al., 2000). The big size of the American blue crab makes the occurrence of large populations little probable. Oysters like *Crassostrea virginica* and *Crassostrea gigas*, both species introduced for aquaculture, seem to be in the acclimatization period still (Zolotarev & Orlenko, 1999; Zolonitsky & Monina 1992; Ladigina & Pirkova, 2002; Skolka & Gomoiu, 2004).

For the freshwater ecosystems, only two species are included in this category: *Urnatella gracilis* and *Dreissena rostriformis*. *Urnatella gracilis*, a North-American species of Kamptozoa was mentioned for the first time in Romania in the 1950s. Since then, this species was reported only occasionally. Its situation should be reconsidered. The quagga mussel *Dreissena rostriformis bugensis* was reported in the lower Danube (Micu & Telembici, 2004; Popa & Popa, 2006) and it is also present in the Danube Delta (Orlova et al., 2004; Van der Velde & Platvoet, 2007). Its presence is difficult to assess due to the resemblance with the more common zebra mussel *D. polymorpha*.

Questionable species

In this category were included only freshwater fish species. The western mosquitofish *Gambusia affinis* was introduced in 1927 as pest-control in Mangalia Lake. No further data are available at present (Iacob & Petrescu-Mag, 2008). During the last decades, 31 fish species were introduced successfully in freshwater ecosystems for aquaculture. Acclimatized in artificial pounds, these species are

capable to develop self-sustaining populations in natural ecosystems (Iacob & Petrescu-Mag, 2008; DAISIE). Taking account of the current economic situation and of the uncontrolled development of aquaculture in private ponds, these species represent a real threat to biodiversity. Among these 31 species we consider as questionable, for freshwater ecosystems along the Black Sea coast and for the Danube Delta, the black bullhead *Ictalurus melas*, brown bullhead *Ictalurus nebulosus*, the Channel catfish *Ictalurus punctatus*, the black buffalo *Ictiobus niger*, the black carp *Mylopharyngodon piceus*, the white Amur bream *Parabramis pekinensis*, the black Amur bream *Megalobrama terminalis*, and the topmouth gudgeon *Pseudorasbora parva*.

Impact on native communities

In general terms, there are two major aspects: one is the obvious direct connection between the increased economical development of human society and bioinvasions, and the other is the effect of invasive species on economy and human health (Perrings et al., 2005). The economic impact of the alien invasive species at the Romanian littoral is insufficiently known. Most invasive species have had no visible economic effect but, in some cases, the effects on marine or freshwater ecosystems were reflected also on human economy. Some obvious examples are the species introduced for aquaculture (fish, crustaceans and bivalve mollusks) but the most relevant is that of *Mnemiopsis leidyi*. It had important economic effects in the Black, Azov and Caspian seas areas (Zaitsev & Ozturk, 2001; Nadolinski, 2004). Specialists are afraid that the same effects would repeat in the near future in the Baltic Sea following the rainbow comb jellies' intrusion in 2006. Several studies (Avsar, 1996 – 1997; Kideys, 1994; Lebedeva & Shushkina, 1994; Mutlu et al., 1994; Niermann et al., 1993, 1994; Petran & Moldoveanu, 1994 – 1995; Onciu et al., 2007; Shushkina et al., 1990, 2000; Shiganova & Bulgakova, 2000; Nadolinski, 2004) carried out in the so-called “*Mnemiopsis* period” showed that the stocks of many fish species decreased dramatically as a result of *M. leidyi* invasion. In 1960s, 26 species of fish were reported as economically valuable in the north-western part of the Black Sea. In the 1980s, the number decreased at six, and the total yield of 900,000 tones in the mid 1980s decreased to only 100,000 tones in 1992 (Avsar, 1996 – 1997). The stocks of predatory fish as mackerel, bluefish, bonito etc, were replaced by pelagic omnivorous feeders, species with low economical importance. The economic impact of *Mnemiopsis* for 1980 – 1990 period was estimated at 200,000,000 \$/year (Caddy & Griffiths, 1990) for the entire Black Sea basin. Acclimatization of the nude ctenophore *Beroe ovata*, few years after the establishment of *M. leidyi*, had an indirect economic impact. Predation by *Beroe ovata* induces a general decrease of *M. leidyi* populations (Shiganova et al., 2001) therefore a predator – prey relationship established between the two species (Kideys, 2002; Abolmasova et al., 2002).

Other species have not had such a visible economic impact: *Eriocheir sinensis* was considered a harmful species because the adults damaged the river banks with their underwater shelters and fed with fish caught in fishing nets. Fouling organisms, like barnacles or the polychaete *Ficopomatus aenigmaticus*, are harmful because their biomass increases the fuel consumption of the ships. Such organisms also increase the corrosion rate of metallic submerged structures.

Mya arenaria, dominant species on sandy bottoms, induced structural changes in native associations previously dominated by the bivalve *Lentidium mediterraneum* (Costa, 1829). Since the tiny *Lentidium mediterraneum* is a food

resource for the juveniles of many native bottom fish species while the juveniles of *Mya arenaria* are consumed by the adults of the same species (Zaitsev, 2001), the economic impact may be considered somewhat balanced. Juveniles and adults of the white fingered mud crab *Rhithropanopeus harrisii* represent an additional food resource for native fish species like gobies, sturgeons, turbot and flounder.

Rapana venosa, as top predator for bivalve associations contributed to the disappearance of large oyster banks in the Black Sea. After 1980, the commercial exploitation of this species began over the entire Black Sea littoral, leading to a decrease of *Rapana venosa* stocks (Zaitsev & Ozturk, 2001). This is the only case in which a notable decrease of the population of an invasive species with major impact was registered as a direct result of human activities and had a positive economic impact at the same time.

Potential invasions – perspectives

Predicting future invasions in one definite area is a real challenge for scientists. Despite the low number of alien invasive species with radical impact on native ecosystems, the effects of these species are irreversible and so unexpected that human society has to take measures in order to stop, prevent or at least predict what invasive species could establish in a given area. The climate changes reflected in global warming represent another opportunity for invasive species to spread out (Gollasch & Nehring, 2006).

Potentially invasive species in marine ecosystems

The development of Constanța Harbor and the increasing commercial activities in the area (Fig. 6; APM Constanța) represent further opportunities for other alien species, already reported from other parts of Europe, to become invasive at the Romanian Black Sea coast. It is quite obvious that the number of invasive species at the Romanian littoral will increase in the future. As in the case of alien invasive species already acclimatized in the Black Sea area, the most likely invasive species would be benthic species introduced in fouling associations or for mariculture, and pelagic species introduced with ballast water.

a. Benthic species in the infralittoral zone

Several types of organisms can be introduced in this category: crustaceans, polychaetes, bivalves. Some of these potential invasive species are cirripeds like *Balanus amphitrite* (Darwin, 1854) or *Balanus crenatus* (Bruguière, 1789) – both of them mentioned from other parts of Black Sea basin – and the southern Pacific barnacle *Elmnius modestus* (Darwin, 1854), very common now in western Europe (Crisp, 1958; Barnes & Stone, 1972). An obstacle in the way of their establishment is *Balanus improvisus*, which dominates very efficiently its ecological niche. In the European waters, there are a number of species whose ecological preferences match the general characteristics of the Black Sea. The barnacles have proven several times extremely plastic species from an ecological point of view. Almost all these barnacles have proven to be successful invasive species (Kerckhof, 2002). Other species are successful invaders in other parts of the globe, like the overbite clam *Potamocorbula amurensis* (Schrenck, 1861) native from the Far East, an invasive species on the Pacific coasts of the USA. The polychaeta fauna of the western Black Sea coast is relatively well known (Marinov, 1966, 1977, 1990; Surugiu, 2008) but it is possible that a number of species already reported in other parts of the Black Sea like *Ancistrosyllis tentaculata* (Treadwell, 1941), *Streblospio shrubsolii*

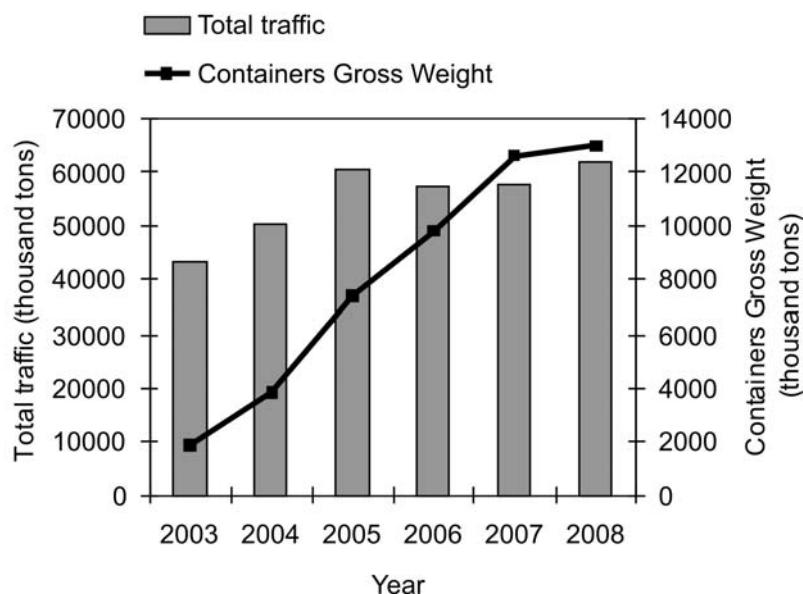


Fig. 6 - Commercial trades in Constanța harbor between 2003 and 2008.

(Buchanan, 1890), *Glycera capitata* (Örsted, 1843), *Streptosyllis varians* (Webster and Benedict, 1885) are present at the Romanian littoral as well. For now, only species like *Ficopomatus aenigmaticus* and *Polydora cornuta* are reported invasive for the Romanian Black Sea Coast (Surugiu, 2008). There is a high possibility for the occurrence of North American species *Marenzelleria neglecta* (Sikorski et Bick, 2004). Very efficient in populating different types of benthic habitats, *M. neglecta* became one of the dominant invasive species in the Baltic Sea basin (Gollasch & Leppäkoski, 1999; Leppäkoski et al., 2002).

b. Benthic species introduced through mariculture

This category includes a number of bivalves, and crustaceans. Breeding in controlled conditions usually leads to acclimatization and sometimes to the stabilization of these species in natural habitats. Three species of Asian shrimps: the Hokkai shrimps *Pandalus latirostris* (Rathbun, 1902) and *Pandalus kessleri* (Czerniavsky, 1878), and the Kuruma prawn *Marsupenaeus japonicus* (Bate, 1888) were introduced on the north-eastern part of the Black Sea (Băcescu, 1967; CIESM official data).

c. Pelagic species

Studies carried out all over the world are showing that ballast water is a major source of new invasions and the incidence of new invasions via ballast water is continuing to increase (Gollasch et al., 2000). The microalgae and copepods are most suitable groups to be transported with ballast water.

Potentially invasive species in freshwater ecosystems

For the freshwater ecosystems, future invaders would possibly be introduced as species with economic interest and several examples exist all over Europe. Fish and crustacean species are the most suitable candidates as potential invaders.

a. Aquaculture

A number of Asian cyprinids have proven very competitive as they were introduced on a large scale. The spiny-cheek crayfish, *Orconectes limosus* (Rafinesque, 1817) was mentioned in 2009 (Pârvulescu et al., 2009) from the south-western part of Romania in the Danube, after his introduction in Hungary. Other north-American crayfish species could be new invaders in freshwater habitats in the Romanian littoral zone such as *Orconectes virilis* (Hagen, 1870), *Orconectes juvenilis* (Hagen, 1870), *Procambarus clarkii* (Girard, 1852) and *Pacifastacus leniusculus* (Peckny & Pöckl, 2000) (Holdich et al., 1999; Ahern et al., 2008; Chucholl & Daudey, 2008; Semenchenko et al., 2009).

b. Aquarium and pet trade industry

Accidental releases from aquarium industry represent another major threat, especially for freshwater ecosystems from the Romanian littoral. Many of these species are characterized by ecological particularities such as high competitiveness, asexual reproduction, polyphagy etc. In the last years, the aquarium industry knew a large-scale development all over Romania, and the number of commercialized ornamental species increased. Aquarium species with potential invasive risk are coelenterates like *Craspedacusta sowerbyi* (Lancaster, 1880), gastropods like *Ampularia* species, *Physella heterostrophia* (Say, 1817), *Ferrissia fragilis* (Tryon, 1863) mentioned in European Union countries (Gollasch & Nehring, 2006) or in Belarus and Ukraine (Alexandrov et al., 2007; Semenchenko et al., 2009). Vertebrates like the Chinese firebelly newt *Cynops orientalis* (David, 1873), the oriental fire-bellied toad *Bombina orientalis* (Boulenger, 1890) or crustaceans like the Asian shrimps in *Caridina* or *Neocaridina* genera are potential invaders for freshwater ecosystems also. The North American tortoise *Trachemis scripta* is already reported from some aquatic habitats in Romania (DAISIE).

c. Parasite species

Parasites represent a particular category of present and potential invasive species insufficiently studied. Certain parasite species can penetrate new habitats with their invasive hosts. Their number is quite high and they are often ignored. Some of the most common parasites introduced with freshwater fish are the ciliate *Trichodina reticulata* (Hirschmann et Partsch, 1955), the monogen flatworm *Eudiplozoon nipponicum* (Goto, 1891) and tapeworm *Bothriocephalus acheilognathii* (Yamaguti, 1934), species with East Asian origin (Lom & Dykova, 1992). *Trichodina reticulata* is ectocommensal on several invertebrates and Cyprinids, feeding on bacteria.

Conclusions

In terms of future bioinvasions at the Romanian coastal area, the data accumulated so far allows us to draw some conclusions and to estimate the evolution of the phenomenon. Thus, analyzing the way alien species arrived into the Black Sea basin, two major acclimatization “waves” in the Black Sea can be observed: one between 1950 and 1959 and a second one between 1980 and 1989. The first wave can be associated to the intensification of commercial exchanges in the post-war period, especially to the increased traffic in the former Soviet harbors and Constanța harbor. The second wave of “immigrants” can be associated to the radical eutrophication phenomena that affected the entire Black Sea basin and caused structural modifications of the marine communities in coastal waters. Intentional

introductions of species for aquaculture is another major pathway, over 20 species (one having a major impact) being introduced in the Black Sea area. Considering these disturbances, the intrusion and acclimatization of invasive species occurred more easily. The phenomenon was observed also in other parts of the world.

Considering the evolution of the invasive species phenomenon at European level, we can make some predictions for the western Black Sea coast. The intrusion of new alien species is expected to continue in the future, at a comparable rate to that recorded in the last decade. Usually, every 5-6 years, a new alien species is recorded at the Romanian littoral (Skolka & Gomoiu, 2004), a phenomenon in direct connection with the commercial trades performed in the coastal zone. The development of Constanța South-Agigea harbor area and increased traffic will generate a higher risk for new invasive species arrivals. The current global economic crisis will only slow down the introduction rate of new species.

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SPECII INVAZIVE LA LITORALUL ROMÂNESC AL MĂRII NEGRE – PREZENT ȘI PERSPECTIVE

REZUMAT

Speciile invazive reprezintă una dintre problemele cele mai complexe cu care se confruntă societatea contemporană. Nu întotdeauna corect înțeles, acest fenomen produce în primul rând prejudicii de ordin ecologic. Speciile invazive afectează biodiversitatea ecosistemelor unde se instalează în urma acțiunii directe sau indirecte a omului prin simpla lor prezență, fără a mai fi nevoie să apreciem efectele economice sau de altă natură. În lucrarea de față, autorii încearcă să ofere o sinteză asupra situației speciilor animale invazive în ecosistemele marine din zona litorală românească și din ecosistemele dulcicole din dreptul coastei, inclusiv din Delta Dunării.

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FACTORS INFLUENCING THE BREEDING HABITAT USE BY AMPHIBIANS IN THE ALPINE AREA OF THE RETEZAT NATIONAL PARK (ROMANIA)

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Abstract. We analyzed the distribution of amphibians according to the characteristics of breeding ponds in the alpine areas of the Retezat National Park. We inventoried 50 aquatic habitats between 1920 and 2260 m a.s.l. Three amphibian species are present at high altitudes: *Rana temporaria*, *Bufo bufo* and *Mesotriton alpestris*. They were found in 70% of the aquatic habitats, but only 48% were used as spawning sites. Human impacts and predators were the most influential variables explaining the occurrence of *R. temporaria*, whereas location and pond adjacent terrain were important for *M. alpestris*. Moderate grazing had a positive effect by maintaining low vegetation or providing nutrients input in the oligotrophic aquatic habitats.

Résumé. Nous avons analysé l'accessibilité des habitats et leur utilisation par les espèces d'amphibiens en deux zones situées à haute altitude dans le Parc National Retezat, qui occupent une superficie d'environ 2400 ha. Dans la zone étudiée (altitude 1920-2260 m) on a inventorié 50 habitats aquatiques. Les amphibiens (*Rana temporaria*, *Bufo bufo* et *Mesotriton alpestris*) sont présents dans 70% des habitats aquatiques inventoriés mais seulement 48% de ceux-ci sont utilisés pour la reproduction. Les variables qui influencent le plus la présence des espèces sont l'impact humain, la présence des prédateurs et les caractéristiques des habitats aquatiques pour *R. temporaria* et l'altitude et le terrain environnant dans le cas de *M. alpestris*. L'impact humain modéré peut avoir des effets bénéfiques par l'entrée de nutriments dans les lacs oligotrophes et en facilitant la dispersion des individus.

Key words: Amphibia, alpine area, habitat use, Retezat National Park, Romania.

INTRODUCTION

The alpine regions are some of the last undisturbed environments in Europe, but are still threatened by climate change and atmospheric deposition (Wathne & Hansen, 1997). Temperature increases lead to changes in alpine ponds hydroperiod and promote modification in the freshwater biota (Thuillier et al., 2005; Cannone et al., 2008). Because of their sensitivity, the freshwater communities are excellent systems for the study of the negative effects of climate change. Amphibians seem to be especially sensitive because of their biphasic life cycle. Amphibians have the highest proportion of species threatened with extinction among vertebrates, with more than 40% of species in decline (Stuart et al., 2004). They actively select habitats for breeding according to different aquatic and surrounding terrestrial landscape characteristics. Changes in the hydroperiod length could transform shallow permanent alpine lakes in temporary aquatic habitats, affecting the quality and proportion of available aquatic habitats. Some studies have already shown the effects of climate change on breeding phenology, reporting earlier breeding activities in amphibians (Terhivuo, 1988; Beebe & Griffiths, 2005).

Considering the rapid environmental changes that alpine landscapes are facing, it is important to understand the relationships between the aquatic habitats characteristics and their use by amphibians. These studies are important in developing conservation policies and for monitoring. In addition, high altitude landscapes are also impacted by changes in the grazing intensity (either intensification or decrease) and tourism. The impact of grazing on amphibians is still controversial, with some studies documenting its negative impact on amphibians (Schmutzer et al., 2008), others reporting a differential species-specific response (Burton et al., 2009), or even beneficial by removing vegetation in excess (Pyke & Marty, 2005).

High altitude areas in the Retezat National Park (RNP) have a complex structure, being modelled by past glaciation events and harbour a variety of permanent and temporary aquatic habitats. There is a low human impact, nevertheless grazing and trekking proved to have negative effects on vegetation (Mountford, 2006). The study area is situated at high altitudes and comprises two nearby zones with different levels of protection; one is the Scientific Reserve Gemenele – Negru, a strictly protected area, and the other is Zănoaga – Bucura, an area where controlled tourism and limited grazing are allowed. The aim of our research was to investigate the use and selection of aquatic habitats by amphibians in the alpine area based on environmental characteristics.

MATERIAL AND METHODS

Study area

The Retezat National Park (RNP) is the oldest protected area in Romania and one of the least human-affected protected areas in Central Europe (Fig. 1). It covers a surface of 38,138 ha and an altitude range between 794 and 2,509 m a.s.l.. The mean annual temperature varies between -2°C in the alpine area and 6°C in the valleys. The mean annual precipitation varies between 900 and 1,300 mm/year (Fărcaș & Sorocovschi, 1992).

The Scientific Reserve Gemenele is a strictly protected area with a surface of 1,630 ha. The Zănoaga-Bucura area is delimited by the Bucurelu, Porții, Zănoaga and Răsucit glacial lakes. The past management of the area had alternating periods when grazing was allowed, regulated or prohibited. The two areas cover together a surface of 2,400 ha and have an altitudinal range between 1,920 and 2,260 m a.s.l. (Fig. 1). All the investigated aquatic habitats are located above the tree line.

The aquatic habitats and amphibians were inventoried during the period 2000–2006. The geographic coordinates and altitude of each aquatic habitat were recorded with a handheld Garmin GPS device. The water temperature, pH and conductivity values were measured with a portable Oakton Waterproof pH/mV/C Meter. Each site was characterized by a number of aquatic and terrestrial (landscape) variables (Tab. 1).

Three amphibian species occur within the study area: *Rana temporaria*, *Bufo bufo* and *Mesotriton alpestris*. A single female of *Bombina variegata* was found in the area, but no breeding population exists above the tree line. Amphibians were inventoried based on visual transects on land and dip-netting in water. All life stages (eggs, larvae, juveniles and adults) were considered.

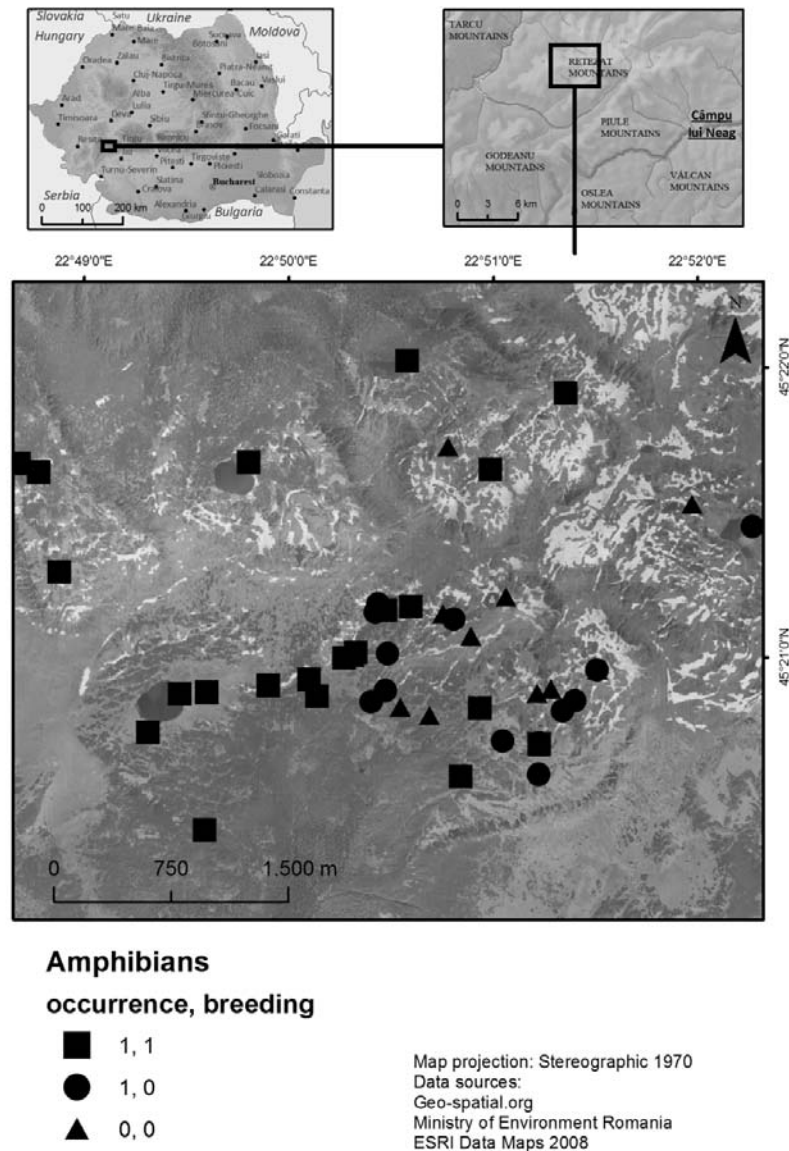


Fig. 1 - The location of sample sites in the RNP (Retezat National Park).

Data analysis

All continuous variables were z-transformed (standardized to an average of zero and a standard deviation of one) in order to allow comparability of predictors' effect (Ćirović et al., 2008). Correlated variables were subject to a Principal Component Analysis (PCA). Uncorrelated variables and first PCA axes were used to build 12 a priori models. The models were built by considering that different local

Table 1

The variables scored for each inventoried aquatic habitat.

Category of variables	Variable	Covariate
Localization (Loc)	Latitude (Lat) Longitude (Long) Altitude (Alt) (m)	
Aquatic habitat	Pond permanency (Pp) Pond depth (D) (cm) Pond surface (S) (m ²) pH Conductivity (C) (μs/cm) Water temperature (Wt) (°C) Fish (PF) Invertebrate predators (Prd)	Permanent pond; temporary pond presence; absence presence; absence
Landscape	Adjacent terrain (100 m radius) Human impact (Grazing)	Pasture (Mdw); Scree (Scr); Dwarf pine (Dp) presence; absence

and landscape processes induced different associations between the species distribution and habitat features (Van Buskirk, 2005). The details about the model selection approach and the ecological background of similar models were presented in Johnson & Omland (2004) and Van Buskirk (2005). We used generalized linear models (GLMs) to relate the explanatory variables (pond and landscape characteristics) to the binary coded response variable (species occurrence). A binomial error distribution (logit regression) was assumed to relate the binary response variable and continuous explanatory variables. Akaike information criterion (AIC) was used to select the best model and rank the remaining models and “model averaging” to calculate the parameter estimates (Tab. 3). For each model, the AIC value was calculated using correction for small samples sizes (AICc) (Burnham & Anderson, 2002). Model averaging was performed with AICcmodavg package (Mazerolle, 2009) and R software (R Development Core Team, 2009).

RESULTS

We inventoried 50 aquatic habitats of which 32 were permanent glacial lakes (Fig. 1). The aquatic habitats were surrounded by grassland, scree or alpine shrubs. All aquatic habitats were of natural origin, oligotrophic, with a depth ranging between 0.1 and 29 m (Tab. 2). Amphibians were present in 70% of the aquatic habitats, but only 48% were used for reproduction. The most common species were *Rana temporaria* with 68% pond occupancy and the largest altitudinal range, followed by *Mesotriton alpestris* with 28%, and *Bufo bufo* with only 10% pond occupancy (Fig. 2). Because of its low frequency of occurrence, *B. bufo* was not included in the following analyses.

Table 3 summarizes the model selection results and table 4 presents the parameter estimates of the used covariates. The best model for predicting *R. temporaria* and *M. alpestris* occurrences was the human impact and location model, respectively. Akaike parameter weights indicated that the human impacts and

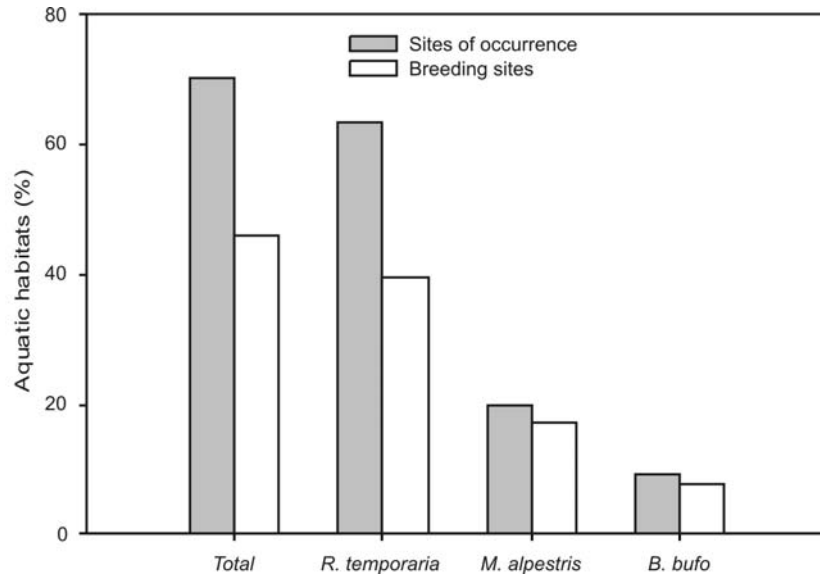


Fig. 2 - Occurrence and breeding of amphibians in the investigated aquatic habitats.

Table 2

The characteristics of the aquatic habitats in the alpine area (RNP).

	Average	Standard Deviation	Range (min-max)
Altitude (m)	2071.7	70.5	1920 - 2260
Water surface (m ²)	4459.3	11051.3	12.6 - 60000
Depth (cm)	207.7	532.9	10 - 2900
Water temperature (°C)	12.5	3.3	5.3 - 20.1
pH			4.6 - 8.5
Conductivity (µS/cm)	12.7	4.1	5.6 - 25.5

predators were the most influential variables of *R. temporaria* occurrence, whereas the location and pond adjacent terrain were important for *M. alpestris*.

DISCUSSIONS

Amphibians use aquatic habitats differently in relation to landscape and aquatic habitat characteristics. Localization, hydroperiod, landscape characteristics, particularly the availability of terrestrial refugia were found to be important in determining the suitability of the breeding sites for *M. alpestris* and *R. temporaria* (Marnell, 1998; Bosch & Martinez-Solano, 2003; Van Buskirk, 2005; Hartel et al., 2010). Although the study area had a high density of aquatic habitats, the level of pond occupancy was low, probably due to the isolation of some water bodies. Even if each species has specific habitat requirements, the variables used in the study were of low discriminative power. Since the studied amphibian species have a

Table 3

The model selection results for predicting the occurrence of *R. temporaria* and *M. alpestris* in ponds from the Retezat National Park. Statistics include the number of estimated parameters (K), the second order Akaike Information Criterion (AICc), AIC difference (Δi), and Akaike weights (w_i). The values in bold indicate the best model and the models with substantial weights ($\Delta(Q)AIC(c) \leq 2$). Where Loc - first PCA axis on Alt, Lat and Long; Wch - First PCA axis on pH and C; PR - first PCA axis on PF and Prd; HP - First axis PCA on S, D, Pp, Tw.

Models	Covariates	<i>R. temporaria</i>				<i>M. alpestris</i>		
		K	AICc	Δi	w_i	AICc	Δi	W_i
1	Loc, HP, Wch, PR, Mdw, Dp, Scr, HI	9	78.111	13.459	0.000	69.102	8.818	0.003
2	Loc	2	66.774	2.122	0.080	60.284	0.000	0.267
3	HP	2	66.110	1.458	0.111	63.453	3.169	0.055
4	Wch	2	66.899	2.247	0.075	63.445	3.161	0.055
5	PR	2	65.838	1.186	0.127	62.737	2.453	0.078
6	Wch, HP, PR	4	70.038	5.386	0.016	65.765	5.481	0.017
7	Mdw, Dp, Scr	4	69.720	5.068	0.018	60.566	0.282	0.232
8	Wch, HP	3	68.099	3.447	0.041	65.661	5.377	0.018
9	Wch, PR	3	67.911	3.259	0.045	64.696	4.412	0.029
10	HI	2	64.652	0.000	0.230	63.401	3.117	0.056
11	HI, Mdw, Dp	4	67.146	2.494	0.066	61.262	0.978	0.164
12	HI, PR	3	65.033	0.380	0.190	64.949	4.665	0.026

Table 4

The coefficients of covariates predicting the occurrence of *R. temporaria* and *M. alpestris* in ponds from the Retezat National Park that were obtained by model averaging.

Covariates	<i>R. temporaria</i>	<i>M. alpestris</i>
HI	1.074	0.149
Mdw	-0.091	0.428
Dp	0.047	-0.929
Scr	0.103	-0.683
Loc	-0.123	0.538
HP	0.332	-0.213
Wch	-0.119	-0.123
PR	0.416	0.332

metapopulation structure, their distribution may change in time because of metapopulation functioning (Skelly et al., 1999).

Mesotriton alpestris

The alpine newt can tolerate cold temperatures being considered as a temperate-climate euryeuous species (Griffiths, 1996). However, the pond localization was an important factor in this study, influencing the occurrence of species, its altitudinal range in this area being lower than *R. temporaria*'s. In our study the landscape variables were more important for this species than the aquatic

habitats characteristics. The specific preferences of species are masked in harsh environments, the animals being constrained to use available resources (Bosch & Martinez-Solano, 2003). Scree and dwarf pine may play an important role in newt distribution by increasing the difficulty of migration, while pastures may facilitate dispersion and could represent an important habitat for terrestrial stage feeding.

The alpine newt is negatively affected by fish (Joly et al., 2001; Orizaola & Brana, 2006; Denoël & Ficetola, 2008); nevertheless in our study this factor does not have a significant importance. Generally, predator fish was introduced in the study area in lakes deeper than 3 to 4 m. We found this species in shallow aquatic habitats, with only three lakes deeper than 1 m.

Rana temporaria

This species is the only one reaching high elevation lakes in RNP and avoids aquatic habitats with fish. Previous field observations reported negative impact of fish on *R. temporaria* populations (Meyer et al., 1998). Experimental studies showed that the larvae displayed behavioural responses in the presence of fish chemical cues (Nyström & Åbjörnsson, 2000), but could not coexist with predatory fish (Meyer et al., 1998; Nyström & Åbjörnsson, 2000). In our study, the aquatic habitat characteristics were more important for this species than landscape variables, highlighting the importance of aquatic habitats for reproduction and overwintering habitat. The adults use aquatic habitat as overwinter habitat but water should be deep enough not to be affected by the frost or by lack of oxygen; otherwise mass-mortality could occur (Cogălniceanu & Hartel, 2005).

The human impact model showed a positive correlation between grazing and the occurrence of both species. Grazing is usually considered to have a negative impact on amphibians at low altitudes (Knutson et al., 2004; Schmutzer et al., 2008; Burton et al., 2009). Grazing in the alpine areas could have a positive effect by maintaining low vegetation or facilitating dispersion and by providing a nutrient input to the oligotrophic aquatic habitats. Nevertheless this is not a major variable shaping the amphibian communities in the studied areas because the same species are present also in the strictly protected area, where grazing has been prohibited since 1960.

Based on trends in past daily temperatures from high altitude meteorological stations, Micu & Micu (2008) estimated that winters would become warmer and drier in the Carpathians. In the light of predicted climate change, it is expected that alpine species will adjust behaviourally and physiologically to the new conditions of their habitats (Carey, 2005). Understanding the aquatic habitat features and the local breeding habitat preferences of amphibians is a starting point for comparative studies that will allow developing predictive models on the effects of climate change on amphibians that inhabit the alpine area. In a harsh environment like the studied alpine area, species distribution is mostly limited by environmental factors and there is little habitat choice. The low human impact in the area is not detrimental to the persistence of amphibian populations. The predicted climate changes will nevertheless impose shifts in habitat use and will require constant monitoring for adaptive management. Actually, low grazing and prohibited stocking with predatory fish represent the main management measures for amphibian protection in the area.

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FACTORI CE INFLUENȚEAZĂ UTILIZAREA HABITATELOR ACVATICE DE CĂTRE COMUNITĂȚILE DE AMFIBIENI DIN ZONA ALPINĂ A PARCULUI NAȚIONAL RETEZAT (ROMÂNIA)

REZUMAT

Modul în care speciile utilizează habitatele este important pentru conservarea biodiversității. Populațiile de amfibieni ce ocupă habitate în zone situate la altitudini ridicate sunt mai vulnerabile la schimbările climatice decât cele de la altitudini scăzute. Am analizat accesibilitatea habitatelor acvatice și utilizarea acestora de către speciile de amfibieni în două zone situate la altitudini ridicate în Parcul Național Retezat ce ocupă o suprafață de aproximativ 2400 ha. În zona studiată (altitudine 1920-2260 m) au fost inventariate 50 de habitate acvatice. Cele trei specii de amfibieni (*Rana temporaria*, *Bufo bufo* și *Mesotriton alpestris*) sunt prezente în 70% din habitatele acvatice inventariate, dar numai 48% dintre acestea sunt utilizate pentru reproducere. Variabilele care influențează cel mai mult prezența speciilor sunt impactul uman, prezența prădătorilor și caracteristicile habitatelor acvatice pentru *R. temporaria* și altitudinea și zona terestră limitrofă habitatelor acvatice în cazul lui *M. alpestris*. Impactul uman moderat reprezentat de pășunatul alpin poate avea efecte benefice prin intrările de nutrienți în lacurile oligotrofe și prin facilitarea dispersiei indivizilor.

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DYNAMICS OF *ASIO OTUS* L., 1758 (AVES: STRIGIFORMES) WINTER-SPRING TROPHIC REGIME IN WESTERN PLAIN (ROMANIA)

ANA MARIA BENEDEK, IOAN SÎRBU

Abstract. The trophic regime of *Asio otus* is dominated by *Microtus arvalis*. In both areas the proportion of this species in the long-eared owl's food presents an important seasonal variation. In winter it moves usually through tunnels under the snow, thus being less frequently hunted. When the main prey is scarce, alternative food resources are exploited, in these areas mice, which become dominant as a group. A significant variation is recorded also by the mean biomass of preys of *Asio otus* from Satu Mare. The average body mass increases with one third from January to March, when the efficiency of hunt is maximum.

Résumé. La diète d'*Asio otus* est dominée par *Microtus arvalis*. La proportion de cette espèce dans la nourriture de l'hibou moyen duc présente une variation significative. Durant l'hiver le campagnol de champs se déplace sous la neige et il est ainsi moins chassé. Quand la proie principale est rare sont exploitées les ressources alternatives, les murides, qui deviennent dominants. La biomasse moyenne de la proie d'hibou présente aussi une variation saisonnière significative à Satu Mare. Elle augmente d'un tiers de Janvier à Mars, quand l'efficacité de la chasse est maximale.

Key words: long-eared owl, diet, *Microtus arvalis*, mice, rodents, Satu Mare, Cefa.

INTRODUCTION

Although being a feeding specialist preying on Microtidae, *Asio otus* presents in some cases a high variability of its trophic regime, several groups of animals being used as main or alternative food resources. Insects and other invertebrates represent an accidental prey, having a low frequency. Amphibians and reptiles are also preyed upon accidentally (Romanowski & Zmihorski, 2008; Petrescu, 1997). Birds are an alternative food resource, which can be important preys for the long-eared owls in some environments or in some periods (Wijnandts, 1984), reaching over 90% of the preys in some urban environments (Kiat et al., 2008). In Romania the highest ratio (59.3%) of birds was recorded also in a locality, namely Tulcea, at the border of the Danube Delta (Sándor & Kiss, 2008). Among the small mammals, bats are very rarely identified in *Asio otus* pellets (Cecere & Vicini, 2000), although they may represent an important food resource for other owls, like *Strix aluco* (Benedek, 2004). Insectivores appear commonly in the *Asio otus* pellets, usually in low numbers, representing less than 1% (Cecere & Vicini, 2000; Romanowski & Zmihorski, 2008; Benedek, 2004; Murariu et al., 1991). Muridae (mainly *Apodemus* spp. in natural environments, *Mus musculus* and *Rattus norvegicus* in urban areas) represent the main alternative food resource (Cecere & Vicini, 2000; Sike, 2003-2004; Rubolini et al., 2003), several studies revealing their dominance both in numbers and in biomass (Murariu et al., 1991; Petrescu, 1997; Bertolino et al., 2001; Rubolini et al., 2003).

A significant geographical pattern of *Asio otus* diet can be identified, with a stronger feeding specialization in the northern part of the range. In southern Europe

the diet comprises 3 groups of main food resources (muridae, microtidae, and birds) (Galeoti & Canova, 1994; Bertolino et al., 2001) instead of just one (microtidae) in the rest of the continent. The voles are represented in the diet by different species depending on the geographic area. *Microtus arvalis* is the main prey in the central part of Europe. In Romania, it is constantly found in the pellets, being usually the dominant species in the diet. Its share is however very variable, between 8.8% (Murariu et al., 1991) and 88.8% (Benedek, 2004). Among the other voles, in some mountainous areas (probably only in years of peak densities) *M. agrestis* may become an important food resource, reaching 12.96% (Banaru, 1998). In Great Britain, because *M. arvalis* is not present, *M. agrestis* represents the main prey of the long-eared owl (Mikkola, 1983). In northern Europe besides the two species mentioned before, *M. oeconomus* represents an important food resource (Nilsson, 1981; Canova, 1989). In southern Europe these species are replaced by *M. savii* (Cecere & Vicini, 2000). The other vole species appear only sporadically in *Asio otus* pellets, as they either do not commonly occur in habitats where the owl hunts, being typical forest dwelling rodents (*Clethrionomys glareolus*, *Pitymys subterraneus*), or are very rare (*P. tatricus*, *P. bavaricus*, etc).

The importance of voles as main prey for the long-eared owl is revealed by some studies that show a significant, strong and positive correlation between the vole population density and the number of owl breeding pairs, clutch size and number of young produced (Korpimäki, 1984). The preference of *Asio otus* (and also other raptor birds) for *M. arvalis* is explained by its body mass, which is close to the weight of “ideal prey”, its habitat represented mainly by open fields where the owl hunts, with short vegetation, being more exposed to predators. It is less agile than mice, is gregarious and it is mostly nocturnal and crepuscular, overlapping its activity period with the long-eared owl.

Besides the geographic variation of *Asio otus* trophic regime, several studies pointed out a significant temporal dynamics, a seasonal change (Romanowski & Zmihorski, 2008; Bertolino et al., 2001).

The present study, concerning the composition of *Asio otus*' diet, aims to reveal a possible pattern of its dynamics, comparing it with the results recorded in other areas of Europe.

MATERIAL AND METHODS

The present study was based on the analysis of two sets of *Asio otus* pellets. The first set consisted of four samples totalizing 200 pellets collected from Satu Mare town on the 14th of January, 13th of February, 5th and 20th of March 2000. They come from a colony of 45-50 specimens which overwintered in 5 *Thuja orientalis* from a garden in the vicinity of town centre. The second set comprised 100 pellets from Cefa Nature Park Reserve, collected in January and February 2007. The prey species were identified using the characters of dentition, the maxillary and mandibular bones, in accordance with Pucek (1981), Murariu (2000), Popescu & Murariu (2001). Some of the skeletal remains from the pellets were not complete, making impossible their identification to the species level. Thus the specimens belonging to *Sylvaemus* subgenus (*Apodemus flavicollis*, *A. sylvaticus* – prevailing in both sets of pellets, and *A. uralensis*) are considered together. Due to the difficulties of distinguishing them based on morphological and anatomical criteria, the two *Mus* species (*Mus musculus* – probably more frequent in Satu Mare, and *M.*

spicilegus – likely more abundant in Cefa Nature Park), are also considered together.

For the gravimetric structure of *Asio otus*' diet we used the mean values for each species calculated on the biomasses of the specimens captured in Cefa Nature Reserve between 2005-2009 (Benedek & Sirbu, unpublished data), and where not available, we used the values from the literature (Murariu, 2000; Popescu & Murariu, 2001). For the unidentified *Apodemus* specimens it was used a weighted mean of the species' biomass.

The significance of differences along the study period between the ratios of Microtidae and Muridae in the diet was tested using Z test for two proportions, and between the biomass of preys using t test. The width of ecological niche's trophic dimension was characterized by means of Levins B standardized index, calculated on relative abundance.

RESULTS

In the pellets from Satu Mare 546 prey specimens were identified, all rodents (Tab. 1). The prevailing species is *Microtus arvalis*, other important food resources for *Asio otus* in this area being the species of *Sylvaemus* subgenus and *Micromys minutus*.

Table 1

Number of specimens and biomass of prey species identified in *Asio otus* pellets from Satu Mare in winter-spring 2000.

Sample	Species	<i>M. arvalis</i>	<i>A. agrarius</i>	<i>Sylvaemus</i> spp	<i>M. minutus</i>	<i>Mus</i> spp.	Total	Mean prey biomass (g)
14.01.2000	No.	31	13	45	31	6	126	19.65
	Gr.	930	266.5	967.5	217	96	2477	
13.02.2000	No.	88	10	22	17	1	138	25.02
	Gr.	2640	205	473	119	16	3453	
05.03.2000	No.	129	4	10	3	0	146	28.68
	Gr.	3870	82	215	21	0	4188	
21.03.2000	No.	102	11	17	6	0	136	27.15
	Gr.	3060	225.5	365.5	42	0	3693	
Total	No.	350	38	94	57	7	546	25.29
	Gr.	10500	779	2021	399	112	13811	

The mean number of preys per pellet varied between 2.52 (in January) and 2.95 (at the beginning of March), and the mean biomass between 49.54 g and 83.76 g, values recorded in the same periods.

The share of *M. arvalis* (the only Microtidae species identified in the pellets) in the diet of *Asio otus* in the whole period of study is 64.1%, but among the four lots there is a high variation (Fig. 1). In January it represents only 24.6% of the prey specimens, dominant being the Muridae, especially *Micromys minutus* and the species of *Sylvaemus* subgenus. In February the share of *M. arvalis* increases, having a value close to the mean per the entire period, and continues to raise until the beginning of March, when it reaches the maximum of 88.3%, while the mice become accidental preys (*Mus* are not present anymore in the pellets). At the end of March the ratios of the prey species get again close to the mean values from the whole study period.

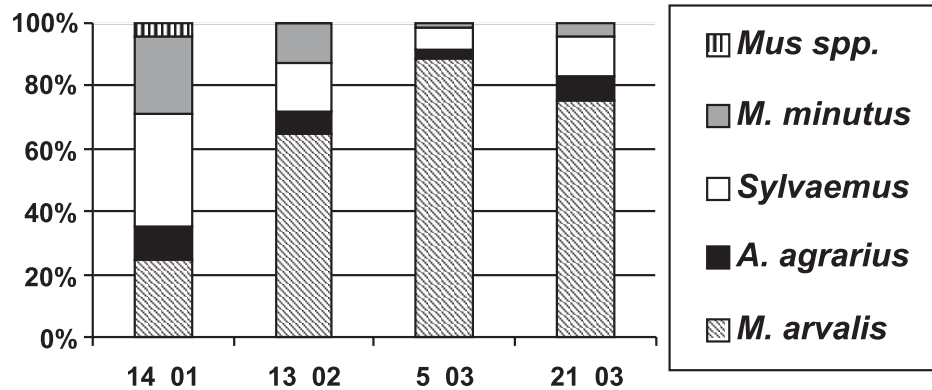


Fig. 1 - Dynamics of *Asio otus*' diet numerical composition in Satu Mare between January and March 2000.

Considering the ratio between voles and mice, the Z test for two proportions confirms a significant variation of diet structure from January to February and from February to the beginning of March ($Z_{\text{January-February}}=3.98$, $Z_{\text{February-March}}=2.88$, $p < 0.01$), but the following (during the month of March) change is not significant.

A more detailed image of the diet composition's fluctuations in the period of research can be obtained by spline cubic interpolation (Fig. 2).

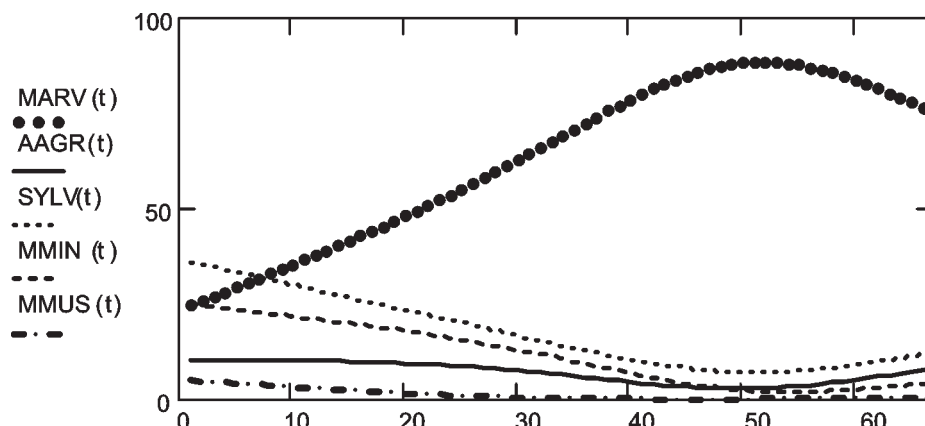


Fig. 2 - Time dynamics of the trophic resources spline cubic function interpolation (relative abundance of each prey related to time range in terms of days) (the codes are MARV- *Microtus arvalis*, AAGR – *Apodemus agrarius*, SYLV – species of *Sylvaemus* subgenus, MMIN – *Micromys minutus*, MMUS – *Mus musculus*).

Table 2

Pearson correlation matrix for the prey species in *Asio otus* diet
(the codes are the same as for fig. 2).

	MARV	AAGR	SYLV	MIN	MMUS
MARV	1.000				
AAGR	-0.946	1.000			
SYL	-0.997	0.935	1.000		
MMIN	-0.991	0.926	0.981	1.000	
MMUS	0.941	0.816	0.962	0.910	1.000

Considering the Pearson correlation matrix (Tab. 2), based on all interpolated time series, for 67 days (lags), the relative abundance of *Microtus arvalis* in the diet is strongly and negatively correlated with all the other resources, while the rest of prey species are strongly and positively correlated. All coefficients are significant at $\alpha = 0.01$.

All cross-correlation functions between *Microtus arvalis* and any other food resource show a high degree of instantaneous negative correlation, highly significant ($p < 0.01$), which decreases with both negative and positive time lags. Between the mice species the cross-correlation function shows a similar pattern, namely a strong, highly significant and positive instantaneous correlation, which decreases both with positive and negative lags.

Levins B index shows an important variation of the niche's width along the period of study (Fig. 3). In winter *Asio otus* appears to be a generalist feeder, preying in similar proportions on several species (mainly *Microtus arvalis* and *Micromys minutus*). Later, due to the increased availability of *M. arvalis*, it turns to a specialized diet, the calculated niche width value being the lowest at the beginning of March. This pattern appears to be widely spread in central and northern Europe, but is the opposite to that from southern Europe, where the food-niche breadth was low in autumn and winter but increased markedly from May to August (Bertolino et al., 2001).

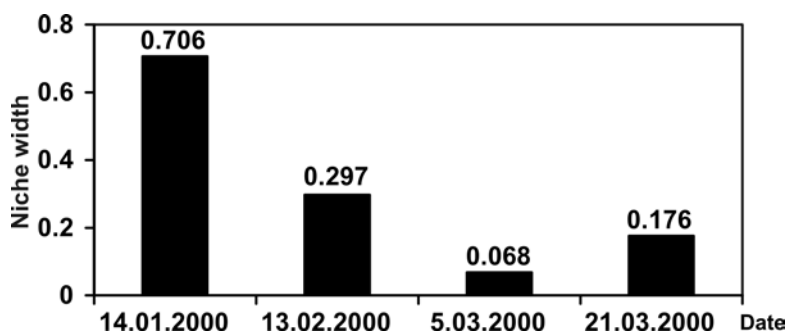


Fig. 3 - Temporal dynamics of the trophic dimension of ecological niches' width in the *Asio otus* population from Satu Mare, given by the Levins-B standardized measure.

The dynamics of *Asio otus* diet's gravimetric composition presents a pattern similar to the numerical structure, but the values are different (Fig. 4) due to the higher biomass of *M. arvalis* compared to the mice (especially *M. minutus*, abundant during winter but with a mean body mass of only 7 g).

The mean weight of prey specimens in the analyzed pellets records an increase from winter to spring, from 19.6 g in January to a mean of 28 g in March (Tab. 1). The t test showed a highly significant difference between the mean values from one sampling date to the other ($t_{\text{January-February}} = 5.44$, $t_{\text{February-March}} = 6.14$, $t_{\text{March-March}} = 3.92$, $p < 0.01$).

The diet of *Asio otus* population from Cefa Nature Park presents a more diverse and balanced structure. Besides the rodents found also in Satu Mare, two species of shrews were present, although in low number. *M. arvalis*, which is the dominant prey species also in this area, represents only one third (36.3%) of the identified specimens.

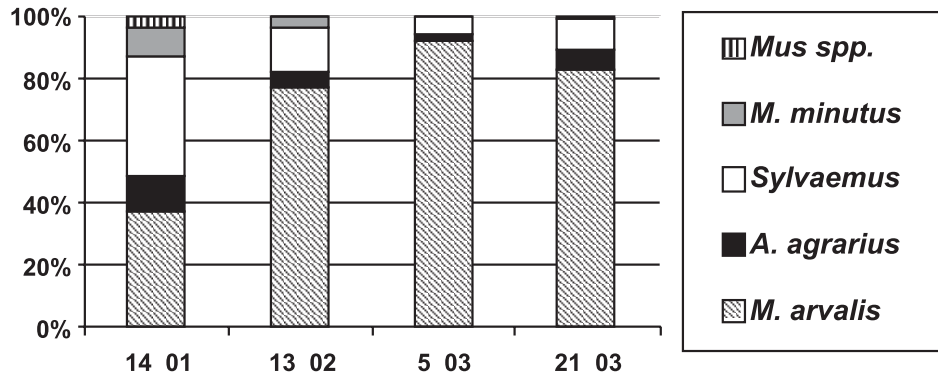


Fig. 4 - Dynamics of *Asio otus* diet's biomass composition in Satu Mare between January and March 2000.

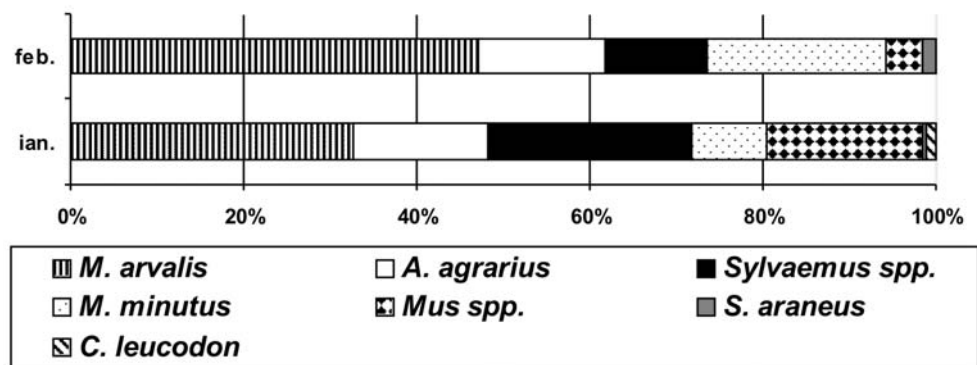


Fig. 5 - Dynamics of *Asio otus* diet's biomass composition in Cefa Nature Park.

Considering separately the two lots of pellets (Fig. 5), there is a significant difference in the numerical composition of the diet concerning the ratio between voles and mice ($Z = 2.21$, $p < 0.05$). Like in Satu Mare, the share of *M. arvalis* in the pellets increases from one third (32%) in January to almost one half (47%) in February. Contrary to Satu Mare, where all mice recorded a more or less significant decrease of their ratio, in the pellets from Cefa *M. minutus* presents a significantly higher share in February than in January ($Z = 2.73$, $p < 0.01$) and *A. agrarius* has a constant share in *Asio otus* diet during the two months ($Z = 0.25$, $p > 0.2$), probably due to its high availability in the area, characterized by a high humidity that favours this hygrophilous mouse, but also because it is less agile than its related species.

In Cefa Nature Park the decrease of Muridae ratio among the prey specimens is given by the species of the genus *Mus* and subgenus *Sylvaemus*.

DISCUSSION

The dynamics of *Asio otus* diet composition in the two localities (Satu Mare and Cefa Nature Reserve) in the same period of the year show some similarities, indicating the influence of season and meteorological conditions on the long-eared

owl's feeding. In both areas a significant increase of *M. arvalis* ratio is recorded passing from winter to spring (in Satu Mare), or from mid to the end of winter (in case of Cefa Nature Park). The seasonal change of diet was recorded also in other areas, both in northern (Poland) and southern (Italy) Europe (Romanowski & Zmihorski, 2008; Bertolino et al., 2001; Cecere & Vicini, 2000). The low frequency of the common vole in the pellets sampled in the mid-winter followed by a significant increase during the end of winter and beginning of spring is explained by the reduced availability of this rodent for the long-eared owl. Although voles are also active during the cold season, they more frequently move under the snow, while mice prefer moving on the snow surface (Jdrezejewska & Jdrezewski, 1998). There is a significant, strong and negative correlation between the ratio of *M. arvalis* (and voles in general) in the owl's diet and the depth of snow cover (Canova, 1989; Sándor et al., 1997).

The proportions of common vole and mice are strongly and negatively correlated, as the reduction of voles' availability leads to exploitation of alternative resources (Mikkola, 1983). The melting of snow in spring gives the predator access to the voles and mice are less preyed upon. Thus, in March the shares of *Sylvemus* spp. and *Mus* spp. drop significantly.

The peculiarities of the owls' diet composition in Cefa Nature Park reflects the structure of small mammals communities in the area. The park, comprising a mosaic of habitats, especially wetlands, shelters a rich fauna of small mammals, dominated by *Apodemus agrarius* (Benedek & Sîrbu, 2009). Thus, in this locality *A. agrarius* has not only a higher proportion in the owl's diet during winter, but it also remains constant in spring. Because dry grassland is less represented in the park, the frequency and density of common vole population is low, this species is less abundant in the pellets from Cefa compared to the results based on samples collected by the authors elsewhere (Benedek, 2004; Benedek & Sîrbu, unpublished data), but also to most of the data published from Romania (Banaru, 1998; Murariu et al., 1991; Sike, 2003-2004). The high diversity of mammal fauna from Cefa Nature Park is illustrated also by the presence of the two insectivore species, *Sorex araneus* and *Crocidura leucodon*.

An important aspect of feeding energetics in raptors is represented by the ratio between the energy spent for hunting and the intake of energy by consuming the kill. In the Satu Mare population the significant increase of the prey mean body weight shows that for the same hunting effort (or even less, as voles are less agile than mice – personal observations - and therefore easier to catch) the amount of food obtained in spring is significantly higher (with one third) than in winter, in the presence of snow cover.

Conclusions

The diet of the studied *Asio otus* populations is dominated by *Microtus arvalis*, its main prey species in Romania. There is a significant difference between the ratio of the common vole in the pellets from the two localities, due to peculiar characteristics of small mammal community from Cefa Nature Park. In both areas the proportion of *M. arvalis* in the long-eared owl's food presents an important seasonal variation. In winter it moves usually through tunnels under the snow, thus it is less frequently hunted. When the main prey is scarce, alternative food resources are exploited. In the two areas they are represented by mice, which become dominant as a group. Among them *A. agrarius* has a higher and constant ratio in

Cefa Nature Reserve, due to the humidity of the region. Birds were not identified in neither of the pellet sets. Shrews were identified only from Cefa, in low numbers. A significant variation is recorded also by the mean biomass of preys of *Asio otus* from Satu Mare. The average body mass increases from January to March, when it gets with one third higher.

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DINAMICA REGIMULUI TROFIC DE IARNĂ-PRIMĂVARĂ AL SPECIEI *ASIO OTUS* L., 1758 (AVES: STRIGIFORMES) ÎN CÂMPIA DE VEST (ROMÂNIA)

REZUMAT

Regimul trofic al populațiilor studiate de *Asio otus* este dominat de *Microtus arvalis*. Ponderea acestuia înregistrează însă o variație sezonieră puternică. În timpul iernii șoarecele de câmp se deplasează de obicei prin tunele săpate în zăpadă, fiind astfel mai puțin vânat. Când prada principală este puțin disponibilă sunt exploatate resurse alternative, în acest caz muridele, care devin dominante ca grup în cadrul dietei. O variație semnificativă este înregistrată de asemenea de biomasa medie a prăzii, care crește cu o treime din ianuarie până în martie, când randamentul este maxim.

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ECOLOGICAL ASPECTS OF BAT HIBERNACULA IN TEMPERATE CLIMATE ZONE OF CENTRAL EUROPE

GRZEGORZ KŁYS, BRONISŁAW W. WOŁOSZYN

Abstract. In temperate climate zone, undergrounds (caves) are the main place for bat hibernation. It is possible to distinguish three kinds of usage of caves by bats: caves used as a hibernaculum, where bats spend the winter period, caves used as shelters for reproductive colonies during the summer period, and caves used as temporary shelters during transitional period (spring and fall) and also as places for food. Caves used as hibernaculum must offer a suitable microclimate for bats. Several important physical factors decide on the selection by bats of a refuge for a period of hibernation. The hibernaculum should have a zone of total darkness. During hibernation bats pay special attention to air circulation, humidity and temperature. These factors are also of significance in forming the microclimate condition inside cave system. Throughout the influence above mentioned factors, a connection between microclimatic condition and topoclimate appears in the cave system and, as a consequence, a refugiolimate forms.

Résumé. Dans la zone de climat tempéré, les refuges souterrains sont le principal lieu d'hibernation des chauves-souris. On distingue trois modes d'utilisation des grottes par les chauves-souris: les grottes utilisées en tant que lieu d'hibernation, dans lequel les chauves-souris restent pendant l'hiver; les grottes utilisées comme gîtes pour les colonies de reproduction au cours de l'été et les grottes utilisées comme gîtes temporaires au cours des périodes de transition (au printemps et en automne) comme endroits propices pour y trouver leur nourriture. Les grottes qui constituent des refuges pour l'hibernation doivent offrir un microclimat optimum. Quelques facteurs physiques importants contribuent à la sélection d'un refuge pour la période d'hibernation. L'endroit d'hibernation est totalement obscur. Les chauves-souris sont particulièrement attentives pendant l'hibernation à la circulation de l'air, à l'humidité et à la température. Ces facteurs sont très importants pour la formation des conditions microclimatiques et topoclimatiques qui apparaissent dans le réseau de galeries.

Key words: Chiroptera, ecology, hibernation, cave microclimate, refugiolimate.

INTRODUCTION

Bats are small, endothermic mammals. They have high metabolic rates and food intakes. But food supply for bats is usually seasonal. For this reason animals such as bats (and another small vertebrate insectivorous animal) need to choose adequate strategies in order to survive during the period when food is scarce.

Among some survival strategies there are: switch to an alternative and more plentiful food supply, store food in times of plenty, migrate to a place where there is food or hibernate (Altringham, 1996).

The majority of bats from temperate zones across the globe choose the last-named option. We can name such survival strategy “escape in time”, this in contrast to the survival strategy used by a lot of migratory bird species, namely “escape in space” (Wołoszyn, 2007).

For hibernating bats it is very important to find a safe and ecologically adequate hibernaculum (Wołoszyn, 2008). Before they began to use man-made shelters, bats used two main types of roosts: caves and trees.

Bats will prepare themselves for hibernation by depositing large reserves of fat. To do this, many bats appear to depend more on regular post-feeding torpor than an increase feeding activity.

Some bats are known to forage close to the sites used at least in the early stage of hibernation. A bat will typically enter hibernation with fat reserves of 20 – 30 % body weight (Altringham, 1996). At least 165 days has been estimated to be maximum, uninterrupted hibernation period possible for medium size vespertilionid bat (Altringham, op. cit.; Kunz & Fenton, 2003; Mitchell-Jones et al., 2007). In the wild, hibernation is usually interrupted by frequent arousal.

Torpor used on a daily basis for energy budgeting, or for long period of hibernation, is an important and integral component of the life history strategy of bats above all in the temperate regions, like Europe.

MATERIAL AND METHODS

Among all types of refugees, the caves are more important because they provide permanent roosts which can be used by many generations of bats.

Bats can use underground shelters dependent of environmental conditions and geographical position. During hibernation, bats are exposed to disturbance, and extensive disturbance may be dangerous to them and may limit their chances of surviving the winter time. For this reason, protection of hibernacula is substantial for bat protection.

During hibernation bats pay special attention to temperature, air circulation, and humidity. These factors are also of significance in forming the microclimate condition inside cave system.

Throughout the influence above mentioned factors, a connection between microclimatic condition and topoclimate appears in the cave system and, as a consequence, a refugioclimate forms.

In temperate climate zone including Central Europe, caves are the main place for bat hibernation, but it is possible to distinguish three kinds of usage of caves by bats:

- Caves used as a hibernaculum, where bats spend the winter period
- Caves used as shelters for reproductive colonies during the summer period
- Caves used as temporary shelters during transitional period (spring and fall) and also as places for food.

RESULTS

1. Underground systems as a principal place of hibernating bats

In Central European climate zone caves are the main places for bat hibernation during winter. However, bats also use man-made constructions very often such as various kinds of buildings, cellars, left drifts (for example, Tarnogóra-Bytom old mine system, Silesia, Poland), dungeons, wells, etc., provided that they constitute suitable microclimates (Altringham, 1996; Kłys, 2003; Kłys et al., 2007; Kłys & Wołoszyn, 2005; Mitchell-Jones et al., 2007; Postawa, 2000; Wołoszyn, 1976, 1998, 2004).

Natural as well as artificial rock hollows comprise a special environment, which is characterised by a suitable ecoclimate, peculiar conditions for organic material circulation and very often by a specific animal world (Vandel, 1965).

A characteristic feature of cave climate is the predominance of three elements: temperature and humidity of air and absence of light. The aforementioned climate factors show a distinct gradient. As far as making one's way inside the cave the amount of light decreases gradually until complete darkness prevails.

Temperature and air humidity are very changeable in parts near the entrance, whereas deep inside the cave they are very stable.

2. *Characteristics of underground shelters*

In the Underground system, which is becoming 'popular' for bat hibernation, microclimatic conditions are different in comparison to the outside environment. They change already in small distances (Chromow, 1977). Microclimate here is more stable and milder, which certainly depends on the size of the underground system and the scale of climatic changes, on long-term, seasonal and day-to-day basis. Of crucial importance to a number of morphological and geographical factors there are: cave within an area, exposure and size of the entrance, size and horizontal expansion and horizontal tunnels, and also water flow and type of bedrock (Mitchell-Jones et. al., 2007; Kłys, 2003; Kozakiewicz, 1997; Postawa, 2000; Wołoszyn, 1976).

Animals living in caves show different degrees of adaptation to such an environment. Taking into consideration that aspect, three ecological groups were singled out: troglobiont, troglophile, troglaxene, the most species-rich group of cave inhabitants. These are species living mostly on the surface, which occasionally penetrate the caves and manage to survive in such extreme environment. To the troglaxene group belong bats, which regularly hibernate in caves.

For choosing an appropriate system of underground hibernaculum bats must have three main elements of the choice the refugee for a period of hibernation by bats: hibernaculum should have a zone of total darkness, where a stable temperature, humidity, usually close to fully saturate the air with water vapor, a small flow of air. The wintering depends on the species.

As far as meteorological conditions in places of hibernation (refugioclimate) are concerned, the strategy of bat hibernation needs to be considered. Thus we were able to single out two main types of hibernacula, the first being air as the cooling factor for bats (as e.g., *Rhinolophus* sp.), the other being rock features (e.g., for some species of the genera *Myotis* and *Plecotus* which simply prefer to squeeze into cracks very often). Of course, we know a number of intermediate forms, in which bats use both strategies for cooling or create a group. Certainly, a complex array of factors has an impact on the organism of hibernating bats, and not all of them are known at times. That is why data collected in a hibernaculum should concern, first of all, all factors of cooling, such as air and type of rock as well as a strategy of hibernation and others which would seem interesting to the observer.

One of the items in research of bat hibernation is to specify the individual value of physical factors (mutually complementary). Also extremely important is the methodology for measuring these factors (Kłys et al., 2005). Many papers on meteorological conditions at bat occurrences lack a description of methodology and measuring equipment, which precludes proper interpretation of such data (Kłys et al., 2005). It often happens that do not take into account the presence of someone who is measuring the measurement (Caputa & Kłys, 2005).

3. *The most important physical factors that govern bat hibernation.*

Caves used as hibernaculum must offer a suitable microclimate for bats. During hibernation bats pay special attention to air circulation, humidity and temperature. These factors are also of significance in forming the microclimate condition inside cave system.

Several important physical factors decide on the selection by bats of a refuge for a period of hibernation:

- Darkness
- Temperature
- Humidity
- Air circulation
- Thermal conduction of rocks
- Impact of outside/external climate condition
- Phases changes of air
- Penetration of geothermal warmth

Throughout the influence above mentioned factors, a connection between microclimatic condition and topoclimate appears in the cave system and, as a consequence, a refugioclimate forms.

3.1. Darkness

The hibernaculum should have a zone of total darkness. As far as making one's way inside the cave the amount of light decreases gradually until complete darkness prevails. That is where we find most overwintering bats.

3.2. Temperature

In a study of hibernating bats, the most important factor is often considered to be the air temperature, because this is an universal indicator of rapid response even to small changes in circulation and in terms of humidity in the subterranean setting. However, it is very difficult to deal with thermal conditions of this system without knowledge of humidity and intensity of air circulation.

Air temperature inside the deeper portions of cave is independent to a remarkable degree of seasonal changes which take place at the surface and keep the level close to average many years' air temperature around the cave.

Choose a place with a stable temperature, where temperatures are low in amplitude (Kłys, 2008 a). It should be noted that temperature so far was the primary parameter to characterize hibernating bats, and numerous authors wrote about the temperature of such animals. Before going into hibernation, bats choose locations with a relatively low temperature, from 17°C to near 15°C (Harmata, 1969, 1973). However, each species prefers different amplitudes of temperature (Harmata, 1969, 1973). Information published in same papers on bats hibernating in air temperature below 0°C probably were the result of the fact that the measurements concerned only the temperature of the cave corridor and not the temperature of refugioclimate.

3.3. Humidity

Air humidity (relative and absolute) in cave systems is a factor which is variable in time and space. It depends on climate, season and intensity of rainfall and air direction (outside the subterranean system). Differences between air humidity near the entrance and in deeper parts can be significant. Air humidity inside corridors situated close to the entrance changes seasonally.

The humidity regime is as complex as the temperature regime. It was formed as a result of incoming humidity from the surface, progressively cooled air inside and its humidification during the contact with underground and infiltrated waters.

In contrast to subterranean air temperature, spatial distribution of humidity and its course are characterised by a relatively low variability. This is the result of different processes that form humidity conditions. In the undergrounds, water vapour essentially comes from two sources: from incoming air (process of circulation: outside – inside), from dropping infiltrated water in the molecular

processes of diffusion and evaporation. An additional source of water vapour is stagnant water or water flows on the bottom. A decrease of air temperature causes an increase of relative humidity and, in some cases, flowing air loses some water vapour as a result of condensation.

Of course, when bats choose a place for hibernation, humidity plays an important role (Thomas & Cloutier, 1992). Air saturated by water vapour cannot take off heat from the bats' bodies through evaporation without simultaneously increasing air temperature. The lower the relative humidity of the air, the greater the role played by cooling of the body through evaporation. Lesiński (1986) and Bogdanowicz & Urbańczyk (1983), indicating relative humidity for hibernating bats in the field of 75–95%, suggested that species exposed to lower temperatures during hibernation (including the Brown long-eared bat) are more plastic than those favouring higher temperatures, where humidity specifications are concerned. Bernard et al. (1991) gave values of relative humidity in the field of 69–97 %. At the Tarnowskie Góry-Bytom underground system, relative humidity near hibernating bats was 95–100% (Kłys, 2008 b).

3.4. Air circulation

Air circulation of different rates appears in almost all underground systems. The flow of air is also different in the various parts of such systems. In large chambers, air movement is almost imperceptible, and it increases very rapidly in the narrow corridors.

In the past it was generally recognised that air movement negatively affects the choice of place for bat hibernation; animals usually choose places where there is a lack of air (Kallen, 1964; Tinkle & Patterson, 1965).

Such applications can probably explained the small movements of air below 0.1 ms^{-1} . As a result of the study, carried out recently by the senior author (Kłys, 2003) it appears that these suggestions are erroneous, and that some species of bats do not spend the winter period in places where movement was below 0.1 ms^{-1} . The results show that both studied species of bats (i.e. *Myotis myotis* and *Plecotus auritus*) spend the winter period in nearby locations with much larger movement of air, and if only the structure (morphology) of wall is so complex they are able to find microniches where parameters of air flow are optimal. In our studies it appeared that they were limited to $0.02 - 0.09 \text{ ms}^{-1}$. Thus, slow movement of air in the underground systems is of great importance in shelter habitat during the winter. Air speed is such that it causes a rapid entry of bats into the hibernation, and so slowly that it does not lead to rapid cooling of hibernated bats. Our studies show that bats can link very precisely the movement of air to the value of other examined factors.

3.5. Impact of outside/external climate condition

Constant circulation of atmospheric air with air inside is the most important factor shaping the climate in an underground system. Air circulation has an impact on the variability of temperature, humidity and air pressure, as well as on processes of evaporation and condensation. The main cause of appearance of air circulation underground is the difference in density of two air masses: surface and underground, two surface masses (exogenic factors) or two underground ones (endogenic factors). At the same time, as shown by research into the exchange of air flow and change the existing atmosphere, although these changes are minor. This is responsible for the transmission of information with the outside world in places where bats hibernate.

Thus, the choice of places for hibernation depends on parameters of air flow, causing an increase in opportunities for heat exchange between bats bodies and

surrounding air molecules. As a consequence, it results in a more rapid way to put heat convection when entering hibernation (other methods are limited). The shortening of the time simultaneously saves energy.

It was assumed previously that the flow of air is a negative factor for bats. Recent research indicates, however, the important and positive role of this factor in the selection of spaces for hibernation. Its action can be demonstrated in at least two examples:

- A moderate flow of air accelerates biological cooling of bats and facilitates them to entry into hibernation (Kłys, 2003);
- In vertical caves located highly in the mountains, with many entrances, warmer air is sucked into the bottom hole and is directed up through corridors to the top hole while heating corridors located above. This allows bats to find a convenient place to hibernate in higher positions than would be possible in caves developed horizontally (Piksa & Nowak, 2000).

4. *Caves used as shelters for reproductive colonies during the summer period*

In Central European climate zone, bats undergo strong synantropisation and do not form reproductive colonies in caves. We know two exceptions in Poland:

- Cave *Studnisko* in the Sokolie Mountains (Góy Sokolie), in which there is a reproductive colony of the Mouse-eared bat (*Myotis myotis*) (Gas & Postawa, 2001);
- MRU – Reserve *Nietoperek*, where the same species forms a reproductive colony (Sachanowicz et. al., 2006).

5. *Caves used as temporary shelters during transition period and also as places for feeding activity*

During the transition period, i.e., when bats change their shelters - in spring from winter shelters to summer ones and in autumn vice versa, using caves for temporary refuge. The area near the entrance of the cave is used by bats during the summer as foraging place. The increased air humidity and absence of a stronger flow of air enable bats to feed on insects here (Altringham, 1996; Ciechanowski et. al., 2004; Kozakiewicz, 1996; Labocha et. al., 2005; Postawa et. al., 2005).

DISCUSSIONS

Understanding the main habitat factors governing bat hibernation and knowledge of the link between habitat conditions (ecoclimate) could have essential theoretical and practical significance. Knowledge of these factors enables forecast, creation of artificial habitats for threatened and endangered species of bats. There is a possibility to modulate conditions for hibernation – artificial habitats and protection of those already in existence. For large systems, changes caused by excessive ventilation are not as dangerous for hibernating bats as small systems where an increase or decrease of air flow would have a negative impact on bats.

The sum of factors such as temperature, humidity and air traffic are elements of refugiolclimate conducting potential areas for bat hibernation. It should be noted that air traffic is the most important factor in the choice of place for bat hibernation. At the same time, the sum of many variables can determine comfort of hibernation.

Bat bodies, when entering hibernation, may cast off heat to the environment by radiation, evaporation, convection and conduction. The amount of heat given off absorbed by the body through convection depends on heat conductivity of the body,

and the difference between air temperature surrounding the body (rock) and skin. By convection, i.e. direct heat rise from the surface of the skin, increases the intensity of heat at the surface of the bat's body. This is the only way to reduce, in a short time, body temperature (at high humidity). A slow entry into hibernation (long-term reduction of body temperature) would increase loss of energy. The size of cooling air operations, i.e. cooling intensity, expresses the heat loss of 1 cm² area within one second. Bats need the shortest time to go into hibernation. Wind factor (air flow) has a twofold task; first, to shorten the time for going into hibernation, and second, remove heat to maintain life processes within the hibernating bat. In our studies it appeared that they are limited to 0.02 – 0.09 ms⁻¹. Thus, slow movement of air in the underground systems is of great importance in shelter habitat during the winter.

Donation of heat from the body through convection depends on the rate of air and is directly proportional to the difference of temperature of the body surface and air.

With a certain combination of factors such as temperature, humidity and air traffic the settling of hibernating bats reaches its optimum.

ASPECTE ECOLOGICE ALE ADĂPOSTURILOR DE HIBERNARE ALE LILIECILOR ÎN ZONA DE CLIMĂ TEMPERATĂ DIN EUROPA CENTRALĂ

REZUMAT

În zona de climă temperată, adăposturile subterane sunt principalul loc de hibernare al liliecilor. Se pot distinge trei moduri de folosire a peșterilor de către lilieci: peșteri folosite ca loc de hibernare, în care liliecii stau în perioada de iarnă, peșteri folosite ca adăposturi pentru coloniile de reproducere în timpul verii și peșteri folosite ca adăposturi temporare în timpul perioadelor de tranziție (primăvara și toamna) sau locuri de procurare a hranei. Peșterile folosite ca locuri de hibernare trebuie să ofere liliecilor un microclimat optim. Câțiva factori fizici importanți contribuie la selectarea unui refugiu de către lilieci pentru perioada de hibernare. Locul de hibernare trebuie să fie total întunecat. Pentru perioada hibernării liliecii sunt foarte atenți la circulația aerului, umiditate și temperatură. Acești factori sunt foarte importanți în formarea condițiilor microclimatice și topoclimatice care apar în rețeaua de galerii.

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DR. DUMITRU MURARIU AT HIS 70TH ANNIVERSARY

If it is said that the appearances are deceptive, about the first impression it is said that it counts. The first impression on the main curator Dumitru Murariu was positive when I met him, in 1980. Then, I saw a thin and active man, wearing a perfect suit, with a large forehead and a jovial smile of a man who appreciates humour and has a playful perspective on existence. Although our ways, probably the outlook too, did not intersected but later, I found out soon that he came from that north-eastern region of Romania which was the cradle of the most important Romanian intellectuals and naturalists – Bucovina.

He was born in the telluric sign of the zodiac Virgo, on the 21st of September 1940, in Ungureni locality of the Botoşani County. He graduated “A. T. Laurian”

High School of the Botoșani town and attended the course of the Faculty of Biology-Geography of the “Al. I. Cuza” University, Biology – Zoology Department, in Iași, Moldavian capital, between 1961–1966.

Within the period 1966 – 1969 he worked as biologist - bacteriologist, at the laboratory of “Pantelimon” TBC Unified Hospital of Bucharest, also presenting scientific papers at the Society of Medical Sciences of Bucharest.

Because it is said that man influences his destiny by his will and actions, Dr. Murariu choose to be zoologist and curator at “Grigore Antipa” National Museum of Natural History, in 1969, where he was hired through competition. Here, he went through all hierarchical levels, from simple a guide to chief of department, and since 1991, general director.

In 1975, he presented his PhD thesis, “Tegumentary glands of insectivores (Mammalia) from Romania”, guided by the Emerit Professor G. T. Dornescu.

With a special energy, Dr. Murariu faced easily but professionally the curator position, which I, myself, know so well: field activity, management of the scientific collections, public relations, guiding, conferences and temporary exhibitions. Yet, research attracted him more, and just it was to bring him accomplishments. One of them was a Fulbright Scholarship, in USA, between 1975 and 1976, when he worked in museums from Washington D. C., New York, Pittsburgh, Chicago, in mammal morphology, systematics and ecology, approaching deeply the investigations by histology and histo-chemistry techniques on integumentary glands of eight species of North American shrews.

When he came back to his “Museum”, with a modern experience of researcher and curator, Dr. Murariu dedicated to the field, laboratory and museum activity for 36 years. Many time alone but sometime within researching teams he crossed the country, from the Danube and the Danube Floodplain, from Dobrogea and the Southern and Western Plains, till the numerous summits of the Romanian Carpathians (from Banat and Prahova Valley to Piatra Craiului and Maramureș), “planting” traps for micromammals (difficult!). Gladly, I confirm that when I reached the chalets in different locations I found out that our charismatic colleague D. Murariu, who was able to be pleasant for ordinary people, had already been there. He was collaborator at the Institute of Biology of Bucharest, he participated to 34 researching projects with practical applications (impact studies and of ecological notifications), many of them led by him. His work was not sterile, materializing in 174 de papers and articles (88 fundamental scientific papers and 86 on museology). It has to be mentioning the seven reports with foreign finances (LIFE, PHARE, BioCASE).

As a result of his studies on the scientific collections from Romania and from “Grigore Antipa” National Museum of Natural History of Bucharest, which he substantially enriched, he participated at 23 international congresses.

Being one of the hardest working Romanian zoologists who I ever met, Dr. Dumitru Murariu worked for decades all day with only one lunch break. Probably this is the reason why he succeeded in publishing numerous scientific and popularization books, as the 4 volumes for the Academy collections “Fauna României” (“Romanian Fauna”), on the Insectivora, Rodentia, Lagomorpha, Carnivora (between 2000 – 2005), or the 3 volumes of the collection “Din viața mamiferelor” (“Life of the mammals”), between 1988 and 1998.

We cannot finish the presentation of his activity without mentioning his actions of environmental protection, being co-author of the Red Book of the

European mammals, the Red Book of Romanian vertebrates and the book "Chiroptere din România" ("Chiropterans of Romania") (2003).

From Dr. Dumitru Murariu's complex activity, the educational activity couldn't be ignored. He held courses of biodiversity and ecology at the Technical University of Constructions (1992 – 1994), he was occasional lecturer for the museologists' training (1986 – 2004), he has not less than 85 conferences in the Museum amphitheatre and in different schools and had over 130 interviews for written media, radio and TV. He is director of the publication of *Travaux du Muséum National d'Histoire Naturelle „Grigore Antipa”*, the most valuable Romanian journal of zoology.

Nature served itself when gifted Dr. Murariu with a special energy for studying it. Full of energy he participated at the international expeditions of "Grigore Antipa" National Museum of Natural History in Indonesia (1991), Brazil (1994) and in the Mediterranean basin (Morocco, Tunisia, Turkey, between 2006 and 2009), expeditions which enriched the collections of the museum and offered the opportunity of the description of over 40 new taxa.

Valuable successor of Dr. Grigore Antipa, Acad. Mihai Băcescu, general director of "Grigore Antipa" National Museum of Natural History, Dr. Dumitru Murariu, implied in the rehabilitation of the museum building (since 1996) as well as in the management, marketing and organization of numerous and successful temporary exhibitions.

Beginning with 2009, "Grigore Antipa" Museum is in a rearranging process of the permanent exhibition. Once again, when some colleagues were afraid of such kind of implementation, Dr. Murariu proved to be a modern spirit and made a calculated risk for this change for the general public, according to Antipa's visionary intuition.

Life member of American Society of Mammalogists, member of the European Mammalogists Society, member of consulting Committee of "Eurobats", of UICN, of Species Conservation Committee - Rodentia, of the Scientists Association of Romania, of the Naturalist Museologist Association of Romania, president of the Romanian Federation of Chiropterology, laureate of the Cultural Merit Order, in Rank of Officer of E category – "National Cultural Patrimony", Dr. Dumitru Murariu is appointed Correspondent Member of Romanian Academy, since 2006. This meritorious appointment was received by him at the phone, while he was in his tent, in Tunisian desert together with me.

The "young" Academician Dumitru Murariu never forget his old colleagues with whom he went in trips, with whom he supported continuously the publishing of the well-known scientific journal, with whom he acted for the science popularization. He joined the young generation, where he feels wonderfully, because he has the same young ambitions from spiritual and biological point of view. Personally I wish him health, energy and lucidity, to be the same modest, good-natured, discerning Moldavian person who Mother Nature endowed, not only for personal success but also for the team of naturalists from Kiseleff Avenue and from Romania.

CORNELIU PÂRVU

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In memoriam

DR. DAN GABRIEL MANOLELI

(3rd of October 1942 – 26th of June 2010)

It was with great sadness that Ecological University of Bucharest announced the passing of Dan Gabriel Manoleli, professor and scientist, one of the best of his generation.

Professor Manoleli died on June 26, 2010, following eight months-long, valiant battle with a pulmonary cancer.

Born in 1942 in Râmnicu-Vâlcea, Vâlcea county, Romania, he studied biology at the University of Bucharest where he graduated in 1966. Then he specialized in zoology (M.Sc. degree in 1967) and systematics of Polichaeta and Hirudinea, receiving PhD in 1988.

For Dan Manoleli there were two very productive and creative periods in his scientific and educational career.

From 1967 and to 1989 he was dedicated to systematics and taxonomy, working on Black Sea, the Danube, the Danube Delta, rivers and springs of the Romanian Plain, developing a methodology of research and publishing almost 30 scientific papers. In this period he was employed at “Ioan Borcea” Station for Marine Research, Agigea, Constanța county and then, for 17 years, at “Grigore Antipa” National Museum of Natural History, Bucharest. Working in the museum, he was museographer and senior researcher, head of the Department of Invertebrate

Zoology, being implied in planning and coordinating the scientific activities, staff management, and scientific expeditions on the Danube and the Danube Delta in collaboration with the Romanian Geological Institute. For his scientific activity, it was a good opportunity to benefit a scholarship in Monaco, Oceanographic Institute, working with Jacques Yves Cousteau team.

At the middle of 1980s he became a Pioneer of the impact studies in Romania and conducted many such studies concerning the genetic fund conservation.

The second period began in 1990. Because of his scientific background and being a very known person in the field of biology and nature conservation Dan Manoleli was appointed a counselor in the Commission of Public Administration, Physical Planning and Ecological Equilibrium of the Parliament of Romania. At the same time he applied for a position of professor within the Department of Ecology, University of Bucharest. As a counselor he strongly contributed to the implementation of the legislation for environment protection, and he was a member of the Romanian team for the Rio de Janeiro Conference in 1992. As a teacher in the Department of Ecology he prepared courses on Principles of Ecology, Environmental Management, Sustainable Development and Introduction in Taxonomy, the last one as a natural follow-up of his previous experience.

In the University of Bucharest, Dan Manoleli established and coordinated a Center of Ecological Services for Impact Studies and Environmental Politics, strongly contributed to implementation the Bologna strategy in university, promoted ECTS (European Credit Transfer System) and the partnership with business sector and civil society. In the same time he was an associated professor at National School of Political and Administrative Studies.

In addition to the scholarly activities, throughout his career, Dan Manoleli participated in numerous activities of the Civil Society becoming one of its leaders. So, he founded and coordinated, as president, *The Society for Development of Civil Society*, was the President of International Association *Network of Black Sea NGOs* and Director of *Ecological Group of Collaboration*.

Dan Manoleli joined Ecological University of Bucharest in 2006, in a very difficult moment of his career, being browned-off the hostile conjuncture within department. The Ecological University gave Dan Manoleli a warm reception and in



a very short time he became a respected member of the academic staff. In the new position he lectured on Principles of taxonomy (the old love!) and Environmental Politics and also launched the program *National Biodiversity Strategy and Action Plan* – Romania, with GEF/UNDP support.

He was an author of, and contributor to scores of books and articles, and was acknowledged in many more texts written by others. As a nationally recognized expert in nature conservation Dan Manoleli was a frequent speaker in Romania and abroad, being invited at 25 international conferences.

He was invited professor at University of Braunschweig, University Aix en Provence-Marseille, University Aristoteles of Thessaloniki and University of Rennes.

Very dedicated to nature, loving its beauty from the beginning of his activity, Dan Manoleli as a real naturalist in the classic understanding, was fighting to promote the ecological principles of nature conservation. Perhaps the most long impact of Manoleli's work in nature conservation was the development of national programmes such as *Romanian National Capacity Self Assessment for Global Environment Management; requirements of the UN Convention on Biological Diversity*.

Professor Manoleli was a dedicated teacher, talented scientific researcher and supportive student mentor, his personal warmth, his love of the classroom and his ability to connect with students was remarkable. He was an esteemed and loyal colleague whose love of teaching and desire to be on the cutting edge of accounting theory and practice made him a leading expert in Romania and abroad.

Dan Manoleli impressed people with his charming, affable and friendly personality, being an excellent diplomat and often easily solved problems in the scientific teams or civil society organizations. Dan Manoleli always put the needs of collaborators and those of his students above his own. He was always there to listen and never turned away anyone who was in need of his advice, assistance, expertise or even his financial help.

As a chair he provided invaluable leadership and vision. As a professor and researcher his energy, creativity and success is surpassed by none. As a mentor he paved a path of success for those of us here and those that have moved on. As a colleague he provided constant support and encouragement. We mourn the loss of a most amazing researcher, professor, mentor, colleague and above all our friend.

The environment research community and civil society recently lost a wonderful leader, colleague and mentor when Dan Manoleli passed away in June 2010.

NICOLAE GĂLDEAN

Selected publications

1969 - Contributions à l'étude de la dynamique des polychètes du littoral roumain de la Mer Noire devant la Station de Recherches Marines d'Agigea. *Lucr. Stat. Cerc. mar.* „Prof. Ioan Borcea“, Agigea, 3:77-85.

1970 - Quelques données concernant l'hydremie et la teneur en ions de K, Na, Ca et Mg chez quatre espèces de Polychètes du Lac Belona (Roumanie). *Trav. Mus. Hist. nat.* „Grigore Antipa“, 10: 33-41.

1971 - Contribution à la connaissance de la faune du Lac Belona (Eforie Nord, Mer Noire) avec références spéciales à certaines hydrozoaires (Leptolida). Trav. Mus. Hist. nat. „Grigore Antipa“, 11: 25-31. (M. Guțu & D. Manoleli)

1972 - Contributions concernant la systématique et la distribution du genre *Erpobdella* de Blainville 1818 (Hirudinea, Erpobdellidae) en Roumanie. Trav. Mus. Hist. nat. „Grigore Antipa“, 12: 39-44.

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1973 - Contribution à la connaissance de la faune de Polychètes des fonds à Phyllophora du littoral roumain de la Mer Noire. Rapp. Comm. int. Mer Médit., 22 (4): 75.

1974 - Abyssal environment and ecology of the World oceans. R. J. Menzies, R. Y. George & C. T. Rowe, J. Wiley & Sons, New-York, London, Toronto, 1973, 488 pp. Stud. Cerc. Biol. ser. Zool., 6: 602-604. (review)

1974 - Contributions to the knowledge of the Hirudinea from the eastern Romanian Plain and from the Monts of Vrancea. Trav. Mus. Hist. nat. „Grigore Antipa“, 14: 79-83.

1974 - Considerations sur le rôle des algues dans la nourriture des Polychètes reliques ponto - casiens du Danube. Trav. Mus. Hist. nat. „Grigore Antipa“, 15: 23-30. (L. Gruia & D. Manoleli)

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GEF, MOTT Foundation for *“Biodiversity Conservation in Romania”* and *“Energy Efficiency” Projects 1993 – 1995 – consulting expert*

“Implementing the Polluter Pays Principle” under the Center of Public Policy Program financed by Open Society Foundation 1999 – 2000 – director

“Remediu” (“Enironmental Magazine”) – A quarterly environmental Review financed by the Holland Government – director

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Dezvoltarea Durabilă Economică, Socială a Sectorului 3 din București Consiliul Sector 3, CESEC, Universitatea din București, 2001 – 2002 - director

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Socio-economic and environmental impact assessment of conservation measures regarding the species and communitarian interest habitats – Ministry of Environment and Sustainable Development – 2007-2008 expert

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COMPTES RENDUS

BO BEOLENS, MICHAEL WATKINS, MICHAEL GRAYSON (eds), 2009 - The Eponym Dictionary of Mammals. The Johns Hopkins University Press, Baltimore, Maryland, U.S.A., I – XIII + 574 pp. ISBN-13: 978-0-8018-9304-9 and ISBN-10: 0-8018-9304-6, price (hardcover), \$65.00.

Usually, dictionaries aim at some large categories of users, as regards their age, education, social categories. Humanity is more and more interested in enriching its knowledge in numerous fields. Never, a dictionary could include all terms, as comprehensive as it can be, especially those characteristic to different specialized fields.

In the field of the natural sciences there are a few dictionaries of wide circulation and the readers do not find easily the source for clearing better the sense of several terms. There are some dictionaries of biology (*“A Dictionary of Biology”*, edited by Abercombie, C.J. Hickman and M.L. Johnoson/1973; *“Mic Dicționar de biologie”*, edited by Crăciun Teofil and Virginia Crăciun/1976; *“The Wonderworth Dictionary of Biology”*, edited by Peter M.B. Walker/1995); other of zoology (*„A Dictionary of Zoology”*, edited by Michael Allaby/2003); of botany, of ecology etc.

There is not a dictionary of eponyms, yet, of explaining the assignment of some scientific or vernacular names to the mammal species. Such a lack is completed by the publishing of *The Eponym Dictionary of Mammals*, edited by the above-mentioned team, the first two from the well known „John Hopkins University” of Baltimore - Maryland - U.S.A., where a special monograph paper, *Mammal Species of the World. A Taxonomic & Geographic Reference* (Third Edition/2005), was printed; the third author of the dictionary is carrying on his activity in London.

Not infrequently, we remarked confusions between the word etymology and eponyms. The first refer to the origin of a word, explaining the evolution of the etymon (etymologic sense – Greek *etymon* = truth), while eponyms also originated from a Greek word, (*epōnymos* or *epōnumos*) which includes the suffix *epi* = on + *onyma* or *onoma* = name.

In other words, *Columbus Day* is eponym of Christofor Columbus or we can say Christophor Columbus is eponym person of the holiday. In the same manner America is the eponym of Amerigo Vespucci; capital of Greece is the eponym of goddess, Athena, etc.

In the case of mammals, the common/vernacular and scientific name of species derived from the name of a person, of a place (oikonames), a foundation, etc. Therefore, we appreciate *The Eponym Dictionary of Mammals* as an original and difficult work explaining the name's origins of more than 2000 species: 2290 in case of vernacular names and 2166 in case of scientific names, among a total of more than 5300 recognized recent mammal species. Such a work wouldn't be possible without a previous experience of the first two authors, editing the eponym dictionary *Whose Bird?* and without a co-operation, supporting, working hardly, the work and scientific rigour of 37 scientists from prestigious research institutions on all continents. All content of the Dictionary is simple, most part (460 pages) indicating

where persons with a certain letter can be found; this part represents 80.13% of the entire book. In introduction (pages IX – XIII), some persons' notoriety is mentioned, those to whom some mammal species names were dedicated as well as the anonymity of others. Using this book the reader should be familiarized with the meaning of some abbreviations: in case of an alternative vernacular/English names for a species they are put in brackets, preceded by *Alt.* and in case of synonymies, the alternative scientific names are preceded by *Syn.*

The eponyms for mammals refer to legendary and to real persons since antiquity (e.g. priestess Io, goddess Iris, Hector), to classical scientists (e.g. Linné, Darwin, Cuvier) up to contemporary ones (e.g. Anita Kelley Pearson, Sydney Anderson, David Frederik Attenborough, Howard and Rhonda Hawk, Robert S. Hoffmann, Don Ellis Wilson, Lady Alison Jolly). But the eponym persons were not only scientists or teachers. Some of them were militaries (e.g. General Petr Kuzmich Kozlov, Colonel Henry Nason Dunn, Major Friedrich Robert von Beringe), physicians (e.g. Richard Harlan), explorers, expeditionaries and collectors (e.g. William Astor Chanler, Peter and Joseph Bernard, Audley Cecil Buller, A.W. Waters), diplomats (e.g. John Lane Harrington), travellers, traders, ship owners (e.g. Jean-Jacques Dussumier, Marie-Jules Dupré), archaeologists (e.g. Susan Bulmer), artists and adventurers (e.g. Johan Ludwig Gerhard Krefft), etc.

In the case of other mammal species, the eponyms of vernacular names refer to the place or to a country, county or village of collection, or to the habitat, and the scientific names are dedicated to a person: Eastern Amazon Climbing Mouse (*Rhipidomys emiliae*); Eastern Gorilla (*Gorilla beringei*); Mindanao Tree-Shrew (*Urogale everetti*); Malagasy Mountain Mouse (*Monticolomys koopmani*); Malayan Tailless Leaf-nose Bat (*Coelops robinsoni*); steppe field mouse (*Apodemus witherbyi*); steppe polecat (*Mustela eversmanni*), or the eponym is a combination between the name of a place and of a person – Phillips' Congo-Shrew (*Congosorex phillipsorum*).

The number of the persons to whom names of mammal species were dedicated is very varied for the 26 letters of the alphabet. Thus, the letter mostly cited (49) is „S”, in the second place being the letter „B” with 46 citations, followed by „M” with 35 citations, and „H” with 31. The rest of 22 letters have less than 30 citations („P” with 28, „C” and „B” with 27 each), reaching „Y” with two citations, and „Q” and „X” with a single citation. Having a heterogeneous distribution of the persons' citations on letters, from the 460 pages, alphabetically ordered, the dictionary includes 9 pages with one citation, 67 with two, 171 with three, 146 with four citations, 56 with five citations and 5 pages with six citations. These differences are due to the data on the persons, wider or limited, according to the available biographical data and the number of the species which were dedicated to them.

The bibliography (probably selective) mentioned by the authors includes paper titles and treatises on mammals, some of them very recent, which deal with the techniques of the molecular biology (e.g. Baker and coll., 2003; Boubliand and coll., 2008; Salari and coll., 2006; Louis and coll., 2006 a). From other cited titles we deduced that there are descriptions of some new species or the validity of others, unknown before, it is pointed out, as in the case of the genus *Lepilemur*. Among the 87 cited titles, collections of some periodicals are included, with several volumes published along some decades: *Journal of Mammalogy* (since 1919 – 2009), *Proceedings of the Zoological Society* (1830 – 1965), *Zoologischer Anzeiger* (1878 – 2009). Besides the papers specialized in mammalogy, also some other papers on

other vertebrate groups were mentioned (*Biographical Key – names of Birds of the World – to Authors and Those Commemorated*) as well as *Dictionary of National Biography*.

Appendix 1 with 52 pages includes 2290 vernacular names of mammals. In our opinion, instead of vernacular names, it should be more appropriate to say English names as it is already mentioned in page IX. Vernacular or popular names should be given by local people. But, in spite of the common sense, observation and knowledge on biology of surrounding beings, some of species are not „baptised”, yet, and others are confused by these local people. On the other hand, in theriological literature most common names are bookish or translated from the scientific names or even many common names are translated from other languages.

Appendix 2, with the same number of pages, includes 2166 scientific names, representing 40.86% from the total number (approx. 5300) of recent mammal species.

Even if the alphabetic order of the two indexes allow the easy finding of the certain names in the text (vernacular and scientific), we consider that it would be better to mention also the pages where they could be found. The more so that some letters have almost 48 person's names on 1 – 6 pages.

The book was carefully prepared with a manuscript repeatedly read and with entries clearly written. Thus we didn't notice more than one mistake (if we can say so) in case of Kolombatavic instead of Kolombatovic (orig. Kolombatović), as it was mentioned on the bottom of the same page. Of course, in a future edition it will be included the omitted names of other persons: Quiroz family from Pernambuco – Brasil who protected the blond capuchin and facilitated to scientists/authors of the n.sp. *Cebus queirozi* Mendes Pontes and Malta, 2006 to look for it in a swampy area; João Moojen for *Oligorhizomys moojeni* Weksler and Bonvicino, 2005 etc.)

These minor observations don't diminish the high value of *The Eponym Dictionary of Mammals* – the book being an absolutely necessary presence in the biologists' libraries (researchers, teachers and students) as well as an important source of information for every one's general culture.

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ALEXANDRU PETCULESCU, DUMITRU MURARIU (eds), 2009 - The first ecological reconstruction of underground environment from Romania. Cioclovina Uscată Cave [Prima reconstrucție ecologică a unui mediu subteran din România – Peștera Cioclovina Uscată]. Edit. Universitară, București, 136 pp., 23 maps, 50 photos, tables, graphs.

14 scientists present a factual, but more than that, a symptomatic event for the years to come, i.e. the protection of the cave fauna is successfully implemented. In Sebeș Mountains, at 16 km far from the patriarchal little town Hațeg, there is Cioclovina Uscată cave, well-known after the discovering of a brain pan of one of the oldest modern man (*Homo sapiens*) from Europe, dated at 29,000 years old. A few people know that, besides this incontestable palaeoanthropologic value, the cave has also a major importance, that of a proper natural roost for some bat colonies

(Chiroptera), which, unfortunately were seriously disturbed along time, because of the industrial exploitation of guano.

This cave, which had a lot to offer to bats and man (and still has!), has an interesting history, as it results from the Chapter II, signed by D. Murariu, Al. Petculescu and C. Petrea. Because the cave accumulated one of the largest *ardealite* deposits (80.000 tons), as a result of the catabolism of some huge chiropteran colonies, and which it is a very good fertilizer, special exploitation works have been done: forest road, railway, an 8 km funicular, and especially a tunnel of 142 m, drilled under the natural entrance level. Between 1912–1918 and then between 1924–1941, guano was put in bags and transported by train. The tunnel became the most injurious element to the environment, which became changeable, resembling enough with the exterior one, leading to its destruction, both for the bat colonies and nurseries, and for the cave invertebrates, bound to the trophic source of guano.

As it is written in the pivot chapter of the book (both due to the page number and, especially, due to the rich documented information of the entire research and activity of ecological reconstruction), signed by V. Gheorghiu, D. Murariu, D. Borda, A. Farcaș and O. Chachula, the humidity loss and the cave vandalizing cave by the tourists and improvised speleologists, who picnicked in the Bivouac Hall, ceased in 2004 and 2005, when the tunnel was blocked by a concrete diaphragm wall and a metallic door, and the natural entrance was blocked by an iron railing, with transversal bars, through which the bats could pass easily.

Interdisciplinary studies were developed by projects financed by the Romanian Academy, by the international project “Cave Bear Project, Romania, 2004”, speleological association „Proteus” from Hunedoara and „Focul Viu” (“Living Fire”) from Bucharest and implemented by “Emil Racoviță” Institute of Speleology of Bucharest. The results of five year studies successfully materialized by the creation and implementation of the first project of an ecological reconstruction of an underground habitat for chiropterans from our country. From 2004, since the anthropic tunnel was blocked, to 2008 when the programme finished, the number of bat increased 100 times, from about 10 individuals reaching 800 individuals of the genera *Myotis*, *Rhinolophus* and *Miniopterus*.

The 8 chapters, edited in English, with substantial abstracts in Romanian, are interesting, even exciting, for the biologists, speleologists, anthropologists, nature protectors, or for those who have this noble hobby, the amateur speleologists.

The book includes tens of maps, photos, tables, sketches, generously presented in a A4 format, proper to a scientific book. The photo represents the installations, equipments and snapshots made during the specialist working and original images of chiropterans in their natural environment.

The article which presents the modern perspective of the brain pan of *Homo sapiens*, not hybridized with *H. neanderhtalienensis*, as those from the western Europe are, offer convincing information that here, in the Southern Carpathians, the species *Homo sapiens sapiens* strongly developed, and spread westwards.

The articles on the biometry and fossilization conditions of the thanatogenesis from Cioclovina Uscată cave, of the species *Ursus spelaeus*, basing on almost 4000 bones, on the rock magnetism, mineralogical structure and the reconstruction of the Palaeoclimatic profile, completed with the presentastion of the management plan of the “Grădiștea Muncelului – Cioclovina” Natural Park (plan which clearly presents what must not happen, for preserving the biotope mosaic where the entomofauna

eaten by bats develops) show that, in fact, we are in front of an academic monograph paper, of a site, of a history and of a social phenomenon.

The book which we recommend to the researchers and readers with noble and elevated hobbies show the evolution of the protection idea in Romania, and we hope it will be auspicious by its scientific and factual example.

DR. CORNELIU PÂRVU

ERRATA

The following corrections should be made to the following two papers:

“Checklist of Romanian Orthoptera (Insecta) and their distribution by eco-regions” by IONUȚ IORGU, ELENA PISICĂ, LAURA PĂIȘ, GABRIEL LUPU, CLAUDIU IUȘAN, which was published in 2008, in *Travaux du Muséum National d'Histoire Naturelle “Grigore Antipa”*, 51: 119-135.

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RESULTS AND DISCUSSION

Chorthippus albomarginatus has been found only in the Oriental Carpathians and Subcarpathians.

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Table 2

The Orthoptera species distribution in the eco-regions from Romania.

Crt. No.	Taxa	Eco-Regions															
		MP	SuP	OC	CMP	DDRS	DoP	DalM	RPS	RPSS	BS	GfBP	GS	MC	GP	BM	BH
148.	<i>Chrysoschraon dispar</i> (Germar 1831)	+	+	+	+	+	.	+	+	+	+	+

“Rove beetles (Coleoptera: Staphylinidae) from Mehedinți Plateau Geological Park (Mehedinți County, Romania)” by MELANIA STAN which was published in 2009, in *Travaux du Muséum National d’Histoire Naturelle “Grigore Antipa”*, 52: 233-247.

The correction and clarification for figures presented in “*DISCUSSIONS*”:

The figure 2 A-F must present the drawings for the species *Ocalea gyorgyi* Assing & Terlluter which in the article was presented in the figure 3 A-F.

The figure 3 A-F must present the drawings for the species *Ocalea puncticeps* Kraatz, which in the article was presented in the figure 2 A-F.

The authors and the editor sincerely apologize for the errors present in the originally published papers.

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“Grigore Antipa” National Museum of Natural History thanks the following people who gave of their time to review manuscripts submitted for publication in volume 53 of *Travaux du Muséum National d’Histoire Naturelle “Grigore Antipa”*. This list also includes reviewers of manuscripts that were not accepted for publication.

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