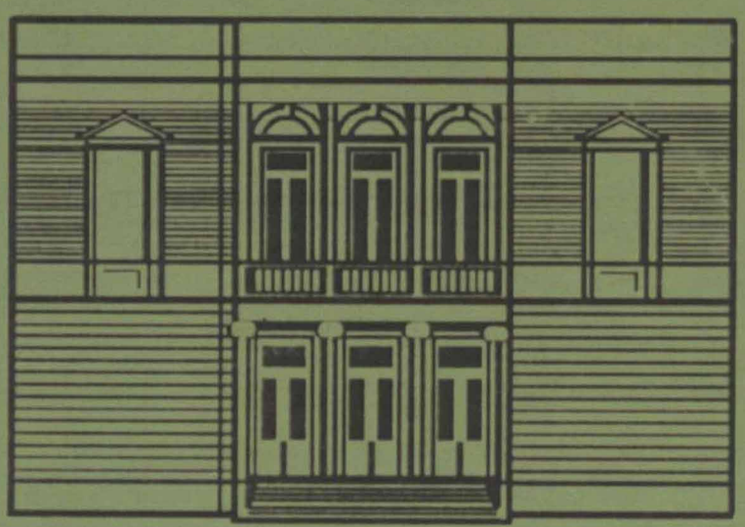
BRVKENTHAL
ACTA MVSEI
XIV. 3



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CONTRIBUTION TO THE KNOWLEDGE OF THE NOCTURNAL LEPIDOPTERA FAUNA FROM THASSOS ISLAND (GREECE)

Levente SZÉKELY*

Abstract. *This work contributes to the knowledge of the Lepidoptera fauna of Thassos Island because it deals mainly with nocturnal species, which were largely unknown in this area, as well as most Greek islands in the Aegean. This situation is in contrast to data regarding the butterflies, which are known and well-studied on these islands (including on Thassos). This study represents a small contribution in this regard because it includes only data gathered at the end of July 2018. Nevertheless, the 170 species listed in this work improve knowledge of the Lepidoptera fauna of this island.*
Keywords*: Insects, Lepidoptera, faunistics, Thassos Island, Greece.*

Rezumat. *Lucrarea aduce contribuții la cunoașterea lepidopterelor din Insula Thassos, deoarece tratează în primul rând speciile nocturne, care în mare parte erau încă necunoscute aici. Nu numai în această insulă, dar și în majoritatea insulelor grecești din Marea Egee. Dacă fauna de fluturi diurni este cunoscută și bine studiată pe aceste insule (la fel și în Thassos), lepidopterele nocturne erau pînă în prezent destul de puțin studiate. Bineînțeles acest articol reprezintă doar o mică contribuție în acest sens, deoarece cuprinde numai datele surprinse la sfârșitul lunii iulie 2018. Totuși cele 170 specii listate în articol aduc un plus la cunoaștrea lepidopterofaunei*
Cuvinte cheie: *Insecte, lepidoptere, faunistică, Insula Thassos, Grecia*

Introduction

The paper makes an important contribution to the knowledge of the fauna of lepidopterans in the northernmost island in the Aegean Sea. Most of the studies on Lepidoptera published regarding Thassos Island, as well as the majority of Greek islands in the Aegean, refer to butterflies (Rebel 1938, Koutsaftikis 1973, 1974 a, 1974 b, Coutsis 1979, Lüttgen 1988, Littler 1991, Holloway 1996, Abadjiev, 2000; Dennis *et al.* 2000, Embacher 2000, Pamperis 2009, Langourov *et al.* 2013). Therefore, this small note, that includes nocturnal macro - and microlepidoptera, represents a contribution to the knowledge of the Lepidoptera fauna.

Material and methods

The data presented in this study are the result of field observations and night collecting using automated light traps. They covered the period 25 July – 1 August 2018. Despite the less than favourable weather conditions, and the presence of a full moon, it was possible to assemble a list of 170 species. All material of nocturnal species originates from the immediate vicinity of Skala Potamia resort (coordinates: 40° 43′ 1.2″ N, 24° 43′ 44.4″ E), where the light traps were deployed, approximately 3 km south of the resort. Besides these records, we also included data about the butterflies observed in this area, as well as those observed during an excursion to Ipsario Mountain.

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Discussions

The paper makes an important contribution to the knowledge of the fauna of lepidopterans in the northernmost island in the Aegean Sea. Although the title of the paper refers to nocturnal species, the diurnal species observed in the short period from the end of July 2018 were included. The diurnal species are not new. They are reported as common species in all the literature regarding this island (mentioned in the introduction). Most of the nocturnal species are common. However, a few are noteworthy, such as: *Pachypasa otus* (Drury, 1773) (Fig.7), *Menophra abruptaria* (Thunberg, 1792) (Fig.12), *Rhoptria asperaria* (Hübner, 1817), *Catocala conjuncta* (Esper, 1787) (Fig.8), *Catephia alchimista* ([Denis & Schiffermüller], 1775) (Fig.9), *Amphypira micans* Lederer, 1857 (Fig.10), *Callopistria latreillei* (Duponchel, 1827) (Fig.11), etc.

Acknowledgements

Many thanks to Lazaros N. Pamperis (Greece) for information and comments regarding the species list. I am also grateful to Csaba Szabóky (Hungary) for helping with the identification of microlepidoptera, to Péter Gyulai (Hungary) for

advice on the identification of certain Noctuidae, and to Balázs Tóth (Hungary) for helping with the identification of some Geometridae. I also thank my colleague Roberth Görbe (Romania) for the help in collecting Lepidoptera.

The list of species in systematic order:

Abbreviations:

SP = Skala Potamia; IPS = Mt. Ipsario; sp. = specimen; Common = 6-29 specimens; Very common = 30-100 specimens.

The systematic list is made by Kristensen, Scoble and Karsholt (Kristensen *et al.* 2007).

Taxon: 170 sp.	**Loc.**	**Observations**
Suprafam. **TINEOIDEA** Latreille, 1810		
Fam. **TINEIDAE** Latreille, 1810		
Tinea trinotella Thunberg, 1794	SP	1 sp.
Reisserita relicinella (Zeller, 1839)	SP	1 sp.
Monopis imella (Hübner, [1813])	SP	1 sp.
Nemapogon sp.	SP	3 sp.
Suprafam. **GRACILLAROIDEA** Stainton, 1854		
Fam. **GRACILLARIDAE** Stainton, 1854		
Acrocercops brongniardella (Fabricius, 1798)	SP	1 sp.
Suprafam. **YPONOMEUTOIDEA** Stephens, 1829		
Fam. **YPSOLOPHIDAE** Latreille, 1796		
Ypsolopha sp.	SP	3 sp.
Fam. **PLUTELLIDAE**		
Plutella xylostella (Linnaeus, 1758)	SP	Very common
Prays oleae (Fabricius, 1794)	SP	3 sp.
Suprafam. **GELECHIOIDEA** Stainton, 1854		
Fam. **BLASTOBASIDAE** Meyrick, 1894		
Blastobasis huemeri Sinev, 1993	SP	8 sp.
Fam. **LECITHOCERIDAE** Le Marchand, 1947		
Lecithocera nigrana (Duponchel, 1836)	SP	1 sp.
Homaloxestis briantiella (Turati, 1879)	SP	9 sp.
Fam. **ELACHISTIDAE** Bruand, 1850		
Depressaria depressana (Fabricius,1775)	SP	1 sp.
Fam. SCYTHRIDIDAE Rebel, 1901		
Scythris vitella (O. G. Costa, 1834)	SP	3 sp.
Fam. **GELECHIIDAE** Stainton, 1854		
Mesophleps salicella (Hübner, [1796])	SP	2 sp.
Stomopteryx geryella (Chrétien, 1915)	SP	1 sp.
Aristotelia decurtella (Hübner, [1813])	SP	Common

Compsolechia scintilella (F. von Röslerstamm, 1839)	SP	5 sp.
Fam. **PSYCHIDAE** Boisduval, 1828		
Eochorica balcanica (Rebel, 1919)	SP	Very common
Suprafam. **TORTRICOIDEA** Latreille, 1803		
Fam. **TORTRICIDAE** Latreille, 1803		
Pelochrista agrestana (Treitschke, 1830)	SP	5 sp.
Clepsis consimilana (Hübner, [1817])	SP	2 sp.
Phalonidia contractana (Zeller, 1847)	SP	3 sp.
Cydia fagiglandana (Zeller, 1841)	SP	Common
Cydia pomonella (Linnaeus, 1758)	SP	1 sp.
Archips podana (Scopoli, 1763)	SP	3 sp.
Bactra bactrana Kennel, 1901	SP	1 sp.
Cochylis hybridella (Hübner, [1813])	SP	1 sp.
Clavigesta sylvestrana (Curtis, 1850)	SP	8 sp.
Suprafam. **COSSOIDEA**, Mosher, 1916		
Fam. **COSSIDAE** Leach,[1815]		
Zeuzera pyrina (Linnaeus, 1761)	SP	Common
Suprafam. **PAPILIONOIDEA** Latreille, [1802]		
Fam. **PAPILIONIDAE** Latreille, [1802]		
Subfam. **Papilioninae** Latreille, [1802]		
Iphiclides podalirius (Linnaeus, 1758)	SP / IPS	Common
Papilio machaon (Linnaeus, 1758)	SP / IPS	4 sp.
Fam. **PIERIDAE** Duponchel, [1835]		
Subfam. **Coliadinae** Swainson, 1827		
Colias croceus (Fourcroy, 1785)	SP / IPS	Common
Subfam. **Pierinae** Duponchel, [1835]		
Pieris napi (Linnaeus, 1758)	SP / IPS	Common
Pieris rapae (Linnaeus, 1758)	SP / IPS	Common
Pieris brassicae (Linnaeus, 1758)	SP	1 sp.
Fam. **LYCAENIDAE** [Leach] [1815]		
Subfam. **Lycaeninae** [Leach] [1815]		
Lycaena phlaeas (Linnaeus, 1761)	IPS	2 sp.
Subfam. **Polyommatinae** Swainson, 1827		
Lampides boeticus (Linnaeus, 1758)	SP / IPS	Common
Leptotes pirithous (Linnaeus, 1758)	SP	Common
Aricia agestis ([Denis & Schiffermüller], 1775)	SP / IPS	Common
Polyommatus icarus (Rottemburg,1775)	SP / IPS	Common

Fam. **NYMPHALIDAE** Swainson, 1827		
Subfam. **Heliconiinae** Swainson, 1827		
Argynnis pandora ([Denis & Schiffermüller], 1775)	SP / IPS	Common
Issoria lathonia (Linnaeus, 1758)	SP / IPS	Common
Subfam. **Nymphalinae** Swainson, 1827		
Melitaea syriaca (Rebel, 1905)	SP / IPS	Common
Polygonia egea (Cramer, 1775)	ALYKI	1 sp.
Vanessa atalanta (Linnaeus, 1758)	SP / IPS	Common
Vanessa cardui (Linnaeus, 1758)	SP / IPS	Common
Subfam. **Limenitinae**		
Limenitis reducta Staudinger, 1901	SP	Common
Subfam. **Satyrinae** Boisduval, [1833]		
Kirinia roxelana (Cramer, 1777)	SP	Common
Coenonympha pamphilus (Linnaeus, 1758)	SP / IPS	Common
Lasiommata megera (Linnaeus, 1758)	SP / IPS	Common
Lasiommata maera (Linnaeus, 1758)	IPS	Common
Maniola jurtina (Linnaeus, 1758)	SP / IPS	Common
Hipparchia syriaca (Staudinger, 1871)	IPS	Common
Suprafam. **PYRALOIDEA** Latreille, 1809		
Fam. **PYRALIDAE** Latreille, 1809		
Pyralis farinalis (Linnaeus, 1758)	SP	6 sp.
Pyralis regalis ([Denis & Schiffermüller], 1775)	SP	Common
Hypsospygia costalis (Fabricius, 1775)	SP	7 sp.
Endotricha flammealis ([Denis & Schiffermüller], 1775)	SP	Very common
Synaphe punctalis (Fabricius, 1775)	SP	2 sp.
Loryma egregialis (Herrich Schaffer, 1838)	SP	6 sp.
Palpita vitrealis (Rossi, 1794)	SP	Common
Dioryctria mendacella (Staudinger, 1859)	SP	5 sp.
Acrobasis tumidana ([Denis & Schiffermüller], 1775)	SP	2 sp.
Acrobasis sp.	SP	8 sp.
Etiella zinckenella (Treitschke, 1832)	SP	V.C.
Homoeosoma sinuella (Fabricius, 1794)	SP	2 sp.
Bradyyrhoa gilveolella (Treitschke, 1833)	SP	1 sp.
Phycita roborella ([Denis & Schiffermüller], 1775)	SP	5 sp.
Phycitodes lacteella (Rotschild, 1915)	SP	Very common
Delplanqueia dilutella ([Denis & Schiffermüller], 1775)	SP	2 sp.
Oxybia transversella (Duponchel, 1836)	SP	2 sp.

Pempelia palumbella ([Denis & Schiffermüller], 1775)	SP	2 sp.
Cadra furcatella (Herrich Schaffer, [1849])	SP	2 sp.
Aphomia sociella (Linnaeus, 1758)	SP	6 sp.
Lamoria anella ([Denis & Schiffermüller], 1775)	SP	3 sp.
Fam. **CRAMBIDAE** Latreille, 1810		
Euchromia bella (Hübner, [1796])	SP	Common
Euchromia sp.	SP	1 sp.
Catoptria pinella (Linnaeus, 1758)	SP	3 sp.
Eudonia centurionalis (Hübner, [1825])	SP	8 sp.
Tegostoma comparalis (Hübner, [1796])	SP	2 sp.
Anarpia incertalis (Duponchel, 1832)	SP	1 sp.
Metasia ophialis (Treitschke, 1829)	SP	7 sp.
Metasia rosealis Ragonot, 1895	SP	1 sp.
Metasia corsicalis (Duponchel, 1833)	SP	1 sp.
Metasia brugnieralis (Duponchel, 1830)	SP	3 sp.
Aporodes floralis (Hübner, 1809)	SP	Common
Pyrausta aurata (Scopoli, 1763)	SP	4 sp.
Pyrausta sanguinalis (Linnaeus, 1767)	SP	1 sp.
Evergestis limbata (Linnaeus, 1767)	SP	1 sp.
Paracorsia repandalis ([Denis & Schiffermüller], 1775)	SP	1 sp.
Udea ferrugalis (Hübner, [1796])	SP	2 sp.
Nomophila noctuella ([Denis & Schiffermüller], 1775)	SP	Common
Suprafam. **LASIOCAMPOIDEA** Harris, 1841		
Fam. **LASIOCAMPIDAE** Harris, 1841		
Pachipasa otus (Drury, 1773)	SP	4 sp.
Fam. DREPANIDAE Meyrick, 1895		
Watsonalla binaria (Hufnagel, 1767)	SP	3 sp.
Suprafam. **BOMBYCOIDEA** Latreille, [1803]		
Fam. **SPHINGIDAE** Latreille, [1802]		
Subfam. **Sphinginae** Latreille, [1802]		
Hyloicus pinastri (Linnaeus, 1758)	SP	Common
Subfam. **Macroglosiinae** Harris, 1839		
Macroglossum stellatarum (Linnaeus, 1758)	SP / IPS	Common
Suprafam. **GEOMETROIDEA** Leach, [1815]		
Fam. **GEOMETRIDAE** Leach, [1815]		
Subfam. **Ennominae** Duponchel, 1845		
Tephrina arenacearia ([Denis &Schiffermüller],1775)	SP	Common

Rhoptria asperaria (Hübner,1817)	SP	1 sp.
Menophra abruptaria (Thunberg, 1792)	SP	2 sp.
Peribatodes rhomboidaria ([Denis &Schiffermüller],1775)	SP	Common
Peribatodes umbraria (Hübner,1809)	SP	3 sp.
Subfam. **Geometrinae** Stephens, 1829		
Tethidia smaragdaria (Fabricius, 1787*)*	SP	5 sp.
Phaiogramma etruscaria (Zeller, 1849)	SP	Common
Microloxia herbaria (Hübner, [1813])	SP	2 sp.
Subfam. **Orthostixinae**		
Orthostixis cribraria (Hübner, [1799])	SP	2 sp.
Subfam. **Sterrhinae** Meyrick, 1892		
Idaea camparia (Herrich-Schaffer, 1851)	SP	5 sp.
Idaea distinctaria (Boisduval, 1840)	SP	6 sp.
Idaea straminata (Borkhausen, 1794)	SP	Common
Idaea filicata (Hübner, 1799)	SP	2 sp.
Idaea obsoletaria (Rambur, 1833)	SP	2 sp.
Idaea aversata (Linnaeus, 1758)	SP	1 sp.
Idaea degeneraria (Hübner,1799)	SP	6 sp.
Scopula submutata (Treitschke, 1828)	SP	6 sp.
Scopula imitaria (Hübner,1799)	SP	Common
Scopula marginepunctata (Goeze, 1781)	SP	Common
Rhodometra sacraria (Linnaeus,1767)	SP	1 sp.
Cyclophora pupillaria (Hübner,1799)	SP	Very common
Timandra comae Schmidt, 1931	SP	R.C
Subfam. **Larentiinae** Duponchel, 1845		
Orthonama obstipata (Fabricius, 1794)	SP	2 sp.
Thera variata ([Denis & Schiffermüller],1775)	SP	Common
Epirrhoe galiata ([Denis & Schiffermüller],1775)	SP	Common
Camptogramma bilineata (Linnaeus, 1758)	SP	Common
Horisme tersata ([Denis & Schiffermüller],1775)	SP	1 sp.
Suprafam. **NOCTUOIDEA** Latreille, 1809		
Fam. **NOTODONTIDAE** Stephens, 1829		
Subfam. **Thaumetopeinae** Aurivillius, 1889		
Thaumetopoea pityocampa ([Denis & Schiffermüller],1775)	SP	Very common
Fam. **EREBIDAE** (Leach, [1815])		
Subfam. **Rivulinae** Grote, 1895		
Zebeeba falsalis (Herrich-Schäffer,1839)	SP	1 sp.

Subfam. **Eublemminae** Forbes, 1954		
Eublemma ostrina (Hübner,1808)	SP	8 sp.
Odice suava (Hübner,1813)	SP	Common
Metachrostis velox (Hübner, [1809–1813])	SP	2 sp.
Subfam. **Hypeninae** Herrich-Schaffer, 1851		
Zekelita antiqualis (Hübner, [1809])	SP	Common
Subfam. **Catocalinae** Boisduval, [1828]		
Catocala conjuncta (Esper, 1787)	SP	2 sp.
Dysgonia algira (Linnaeus, 1767)	SP	Common
Grammodes bifasciata (Petagna, 1787)	SP	1 sp.
Lygephila procax (Hübner, [1809–1813])	SP	Common
Subfam. **Arctiinae** Leach, [1815],		
Eilema rungsi Toulgoet, 1960	SP	Common
Eilema complana (Linnaeus,1758)	SP	Very common
Eilema caniola (Hübner,1808)	SP	Common
Dysauxes punctata (Fabricius, 1781)	SP	Common
Subfam. **Lymantriinae** Hampson, [1893]		
Laelia coenosa (Hübner,1808)	SP	1 sp.
Parocneria terebinthi (Freyer, 1838)	SP	5 sp.
Fam. NOCTUIDAE Latreille, 1809		
Subfam. **Plusiinae** Boisduval, [1828]		
Trichoplusia ni (Hübner,1803)	SP	3 sp.
Autographa gamma (Linnaeus,1758)	SP	Common
Macdunnoughia confusa (Stephens,1850)	SP	2 sp.
Subfam. **Eustrotiinae** Grote, 1882		
Pseudozarba bipartita (Herrich-Schäffer, 1850)	SP	2 sp.
Subfam. **Acontiinae** Guenée, 1841		
Acontia lucida (Hufnagel, 1766)	SP	Common
Acontia trabealis (Scopoli, 1763)	SP	Common
Aedia funesta (Esper, 1787)	SP	Common
Catephia alchimista ([Denis & Schiffermüller], 1775)	SP	1 sp.
Subfam. **Acronictinae** Heinemann, 1859		
Acronicta psi (Linnaeus,1758)	SP	2 sp.
Subfam. **Metoponiinae** Herrich-Schäffer, [1851]		
Tyta luctuosa ([Denis & Schiffermüller], 1775)	SP	Common
Subfam. **Eriopinae** Herrich-Schäffer, 1851		
Callopistria juventina (Stoll, 1782)	SP	4 sp.

Callopistria latreillei (Duponchel, 1827)	SP	Common
Subfam. **Amphipyrinae** Guenée, 1837		
Amphipyra micans Lederer, 1857	SP	1 sp.
Dypterigia scabriuscula (Linnaeus,1758)	SP	2 sp.
Subfam. **Heliothinae** Boisduval, [1828]		
Helicoverpa armigera (Hübner,1808)	SP	Common
Subfam. **Bryophilinae** Guenée, 1852		
Nyctobria amasina (Draudt, 1931)	SP	Common
Nyctobria muralis (Forster, 1771)	SP	2 sp.
Cryphia ochsi Boursin, 1940	SP	Very common
Subfam. **Xyleninae** Guenée, 1837		
Spodoptera exigua (Hübner,1808)	SP	3 sp.
Caradrina clavipalpis (Scopoli,1763	SP	2 sp.
Caradrina aspersa Rambur, 1834	SP	Common
Caradrina morpheus (Hufnagel, 1766)	SP	Common
Athetis hospes (Freyer, 1831)	SP	2 sp.
Cloantha hyperici ([Denis & Schiffermüller],1775)	SP	6 sp.
Subfam. **Hadeninae** Guenée, 1837		
Mythimna albipuncta ([Denis & Schiffermüller],1775)	SP	Common
Mythimna l-album (Linnaeus,1767)	SP	Common
Mythimna ferrago (Fabricius, 1787)	SP	3 sp.
Pseudaletia unipuncta (Haworth, 1809)	SP	1 sp.
Subfam. **Noctuinae** Latreille, 1809		
Peridroma saucia (Hübner, [1808])	SP	1 sp.
Agrotis exclamationis (Linnaeus, 1758)	SP	3 sp.
Agrotis trux (Hübner, 1824)	SP	1 sp.
Epilecta linogrisea ([Denis & Schiffermüller],1775)	SP	2 sp.
Xestia c-nigrum (Linnaeus, 1758)	SP	Common

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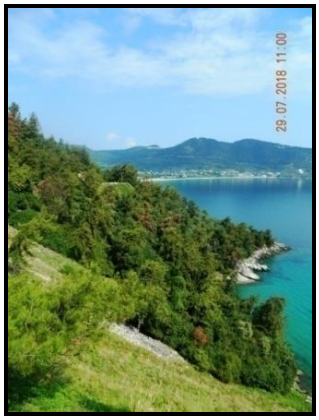

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THE LEPIDOPTERA FAUNA OF "DUMBRAVA VADULUI - POIENILE CU NARCISE" FOREST (ȘERCAIA, BRAȘOV COUNTY, ROMANIA)

Levente SZÉKELY*
Roberth GÖRBE **

Abstract*. This study is a synthesis of the current knowledge regarding the Lepidoptera fauna from "Dumbrava Vadului - Poienile cu Narcise" swamp Forest (Sercaia, Braşov County, Romania), and it is based on the research done in the area since 2000. Furthermore there have been found numerous very local species in the Romanian fauna such as: Lycaena helle (Linnaeus, 1758), Maculinea teleius (Bergstrasser, 1779), Nymphalis xanthomelas (Esper, 1781), Euthrix potatoria (Linnaeus, 1758), Leucodonta bicoloria ([Den & Schiff], 1775). The species protected by Romanian and EU laws are commented. A total of 636 species of Lepidoptera from this area are listed. Also are included other rare and local species such as: Argynnis laodice (Pallas, 1777), Euphydryas aurinia (Rottemburg, 1775), Hyponephele lycaon (Kühn, 1774), Hemaris tityus (Linnaeus, 1758), Proserpinus proserpina (Pallas, 1772), Drymonia velitaris (Hufnagel, 1766), Itame brunneata (Thunberg, 1789), Eilema lutarella (Linnaeus, 1758), Callopistria juventina (Stoll, 1782), Eucarta amethystina ([Den & Schiff], 1775), Mormo maura (Linnaeus, 1758), etc.*
Keywords*: Lepidoptera, Romania, Dumbrava Vadului - Poienile cu Narcise, faunistics, conservation.*

Rezumat. *Acest studiu este o sinteză a cunoașterii curente a faunei de lepidoptere (fluturi) din pădurea mlaștinoasă "Dumbrava Vadului - Poienile cu Narcise" (Șercaia, județul Brașov, România) și se bazează pe cercetările efectuate în zonă începând cu anul 2000. Sunt prezentate numeroase specii foarte localizate în fauna României cum ar fi: Lycaena helle (Linnaeus, 1758), Maculinea teleius (Bergstrasser, 1779), Nymphalis xanthomelas (Esper, 1781), Euthrix potatoria (Linnaeus, 1758), Leucodonta bicoloria (Den & Schiff, 1775). Sunt comentate speciile protejate de legislația din România și din UE. Sunt listate în total 636 de specii de lepidoptere din această zonă. Sunt evidențiate de asemenea și alte specii rare și localizate ca: Argynnis laodice (Pallas, 1777), Euphydryas aurinia (Rottemburg, 1775), Hyponephele lycaon (Kühn, 1774), Hemaris tityus (Linnaeus, 1758), Proserpinus proserpina (Pallas, 1772), Drymonia velitaris (Hufnagel, 1766), Itame brunneata (Thunberg, 1789), Eilema lutarella (Linnaeus, 1758), Callopistria juventina (Stoll, 1782), Eucarta amethystina ([Den & Schiff], 1775), Mormo maura (Linnaeus, 1758) etc.*
Cuvinte cheie: *Lepidoptera, România, Dumbrava Vadului - Poienile cu Narcise, faunistică, protecție și conservare.*

Introduction

Dumbrava Vadului Nature Reserve is known mainly as "Poiana Narciselor". It is the most famous wild daffodil nature reserve in Romania, being located near Vad village, Șercaia commune, in Făgăraș Depression, and corresponding to IUCN category IV (botanical nature reserve) with an area of 395 hectares (Fig.1). It became a nature reserve in 1964, a protected area in 2000 and it overlaps with the site "Natura 2000 – Poienile cu narcise de la Dumbrava Vadului" (Fig. 4, 5). The reserve hosts communities of daffodils with species of *Narcissus poeticus*, *Narcissus stellaris* and *Narcissus radiiflorus*. The flora consists of trees and bushes of *Quercus robur, Carpinus betulus, Fraxinus augustifolia, Fraxinus excelsior, Ulmus minor, Ulmus laevis, Salix rosmarinifolia, Rosa canina, Rubus fruticosus,* etc. The area encompasses numerous plant rarities : *Scorzonera humilis, Spiraea salicifolia, Orchis morio, Lysimachia punctata, Galanthus nivalis, Colchicum autumnale, Leucanthemum vulgare, Eleocharis carniolica, Lysimachia thyrsiflora, Cnidium dubium, Dactylorhiza sambucina, Dactylorhiza maculata, Potentilla reptans, Achillea ptarmica, Hypericum perforatum, Alopecurus pratensis, Listera ovata, Trollius europaeus,*

The fauna is well represented by mammals, birds, reptiles, amphibians, molluscs and insects, among which many protected species.

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Material and methods

The Lepidoptera of this area were completely unknown before year 2000, although "Poiana Narciselor" was a fairly well-known reserve even before that time. Little data was published from nearby, namely from Șinca Veche and especially from Vlădeni, due to the entomologists from Brașov Nicolae Delvig and Mircea Brătășeanu (Ciochia & Barbu, 1980; Székely, 1996; Székely & Cernea, 2007), and later from Șinca Nouă (Rákosy, 2009). As a result of the entomological camp from 8-12 June 2000 and of the collecting done during the same year, 335 species of Lepidoptera and 80 species of Coleoptera (Curculionidae) have been published (Székely *et al.* 2000). After year 2000, and especially after 2012, numerous field trips have been done in the area. Therefore, the number of Lepidoptera currently known from the reserve is of 636 species, among which 532 represent macrolepidoptera and 104 microlepidoptera. The number of microlepidoptera species known is far from being satisfactory and they are still largely unknown. Their real number is somewhere around 500-600 species, but due to difficulties collecting and identifying the material, they are still little studied, as it happens in most parts of Romania. This study also presents a zoogeographic analysis of the Lepidoptera fauna based on the data by Varga Z. (Varga *et al.* 2004), as well as a series of solutions for the protection of the lepidopterans occurring in the area.

Discussion

The 636 species of Lepidoptera recorded represent an area with a high biodiversity, but one should take into account the fact that this number is the result of two decades of collecting. However, as we will see in the chapters "Conclusions" and "Protection and conservation", this fauna is not particularly stable. Due to changes in the natural environment some species have disappeared and many are declining. In conclusion, if we wish to safeguard what still remains of this biodiversity, the recommendations made in this study should be taken into account.

Most species of high faunistic and zoogeographic value were recorded during the entomological camp of year 2000 (*Lycaena helle*, *Maculinea teleius*, *Euphydryas aurinia* etc.), to which a series of species valuable for the area were added later, such as *Nymphalis xanthomelas, Argynnis laodice, Hyponephele lycaon, Endromis versicolora, Euthrix potatoria, Leucodonta bicoloria, Hemaris tityus, Proserpinus proserpina, Drymonia velitaris, Eilema lutarella, Callopistria juventina, Eucarta amethystina, Mormo maura,* etc.

The dominant fauna types (FT) are transpalearctic – 45% (species typically found in deciduous forest of Europe and Asia), westpalearctic – 25% (species associated with westasiatic and Mediterranean peninsulas – Asia Minor, Balkans), boreo-continental (Siberian) – 21% (species typically found in coniferous forests of Europe and Asia), southern continental – 4% (species associated with steppes and forest-steppes of Europe and Asia), extrapalearctic – 3% (migratory tropical and subtropical species, cosmopolitan species occurring around the globe and species introduced by humans) and xeromontane – 2% (species typically found in dry and semidry montane regions) (Varga *et al.* 2004). The fauna types represent various taxa categories assigned to various radiation centres (Fig.2).

The dominant fauna elements (FE) are eurosiberian – 43%, borecontinental – 21%, holomediterranean – 15%, Mediterranean – westasiatic – 4%, pontomediterranean – 3% and others 14% (Varga *et al.* 2004). The fauna elements represent the assignment of taxa (species, subspecies) to various types of fauna (Fig.3).

Among the recorded Lepidoptera, the following deserve comments:

- *Lycaena helle* (Linnaeus, 1758) (Fig.6) – Euro-Siberian element with scattered populations from the Pyrenees to the Amur Region and Korea. In Romania a few populations are present in the north-west (Satu Mare and Maramureș) and in the Făgăraș Valley (Vad forest), which is the southernmost population known in Romania. Species protected in Europe.
- *Maculinea teleius* (Bergstrasser, 1779) (Fig.7) – Eurosiberian species with fragmented distribution from northern France to Mongolia. In Romania there are a few dozen highly isolated populations in Transylvania, Maramureș, Crișana and Bucovina – northern Moldova. Species protected in Europe.
- *Euphydryas aurinia* (Rottemburg, 1775) (Fig.8) – A transpalearctic species with a vast but fragmented range from north-western Africa, across Europe and temperate Asia to Korea. In Romania it is known from Transylvania, Crișana and Banat. Species protected in Europe.
- *Endromis versicolora* (Linnaeus, 1758) (Fig.10) – Species distributed from England and northern Spain to the Amur Region. It can be locally common. A local species in Romania, a

few dozen populations being known especially from Banat and Transylvania.

- *Euthrix potatoria* (Linnaeus, 1758) (Fig.11) – A mezohygrophilous species, very local in Romania, with a few populations in southern Transylvania, Satu Mare and Bucovina – northern Moldova.
- *Itame brunneata* (Thunberg, 1789) – Species occurring mainly in northern Romania. The record from Vad forest is the southernmost known in the country.
- *Drymonia velitaris* (Hufnagel, 1766) (Fig.13) – A mezothermophilous species, very local in Romania, known from a few sites in Transylvania, Banat and northern Moldova.
- *Leucodonta bicoloria* ([Den & Schiff], 1775) (Fig.14) - A mezothermophilous species that is extremely local in Romania, with sporadic records from Banat, Moldova (Cheile Tișiței-Vrancei Mountains, Hârlău – Humosu Forest), Transylvania (Cluj, Baciu), Ariușd (Covasna county), and Vlădeni (Brașov county).
- *Mormo maura* (Linnaeus, 1758) (Fig.15) – Very rare in Romania, most records originating from Transylvania and Banat.
- *Eucarta amethystina* ([Den & Schiff], 1775) (Fig.18) – A thermohygrophilous species, very local in Romania, known mostly from Banat, Satu Mare, south-western Transylvania and a few sites in Moldova and Muntenia (Rákosy, 1996). First record from eastern Transylvania.
- *Callopistria juventina* (Stoll, 1782) (Fig.17) – A mezoxerothermophilous species, local in Romania, known from Banat, Satu Mare and southern Transylvania (Rákosy, 1996). In this part of the country it has not been recorded during the last 100 years (Czekelius, 1897).
- *Cydalima perspectalis* (Walker, 1859) – Moth originating from the Far East, that has recently entered Europe and Romania, being a pest of *Buxus*. Although 5-6 years ago it was present only in the southern parts of the country, after 2017 it has spread massively in almost all regions of Romania, even in mountain areas.

Other rare and local species, with few records in Romania, are: *Dyspessa ululа* (Borkhausen, 1790), *Hemaris tityus* (Linnaeus, 1758), *Proserpinus proserpina* (Pallas, 1772) (Fig.9), *Eilema lutarella* (Linnaeus, 1758) (Fig.16), *Everes (Cupido) decolorata* Staudinger, 1886, *Nymphalis xanthomelas* (Esper, 1781) (Fig.x/xx), *Hyponephele lycaon* (Kühn, 1774). Also noteworthy is the record of a specimen of *Pseudoips prasinana* (Linnaeus, 1758) on 3 November 2018 (Fig.9). Being a species typically on wing in May-June, this record may be a consequence of "global warming".

Conclusions

With 636 species recorded, "Rezervaţia Naturală Dumbrava Vadului" represents an area with high Lepidoptera diversity in Romania. This is also a result of the long-term and fairly active research done in the area. This diversity is caused by a series of natural and anthropic factors, the most important being the following:

- the geographic position that favours the presence of montane-submontane elements typically found in the Carpathians.
- the lack of pollution in the area (industry, agriculture, viticulture, chemicalized pomiculture)
- the minimal impact of vehicle transportation and the overall low level of associated pollution

Protection and conservation

The biological diversity of a protected area consists of all its taxa of flora and fauna. The fauna is formed not only of large animals (mammals, birds), but also of species of invertebrates, many of them being protected at European and national level. Furthermore, the number of protected invertebrates (insects, mollusks, etc.) is much larger compared to the number of vertebrates.

Biodiversity can be maintained in an area (protected or not) only when the diversity of all habitat types is maintained. If everything is left untouched (natural processes), many types of habitats will decrease and will eventually disappear. This can sometimes happen very fast, as in the case of meadows, which can disappear in 10-20 years due to "invasion by woody vegetation". Protecting a species by law is in vain if its habitat will cease to exist. The species will then disappear as well. In this area there is no industry, intensive agriculture or pollution and the impact of vehicle transportation is negligible, thus there are no major risk factors. The greatest threat is represented by the invasion of the meadows by forests.

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Abbrevations

C. = common = 10-20 specimens / day or night; **V.C.** = very common = 20-50 specimens / day or night; **R.C**. = relatively common = oscillating between rare and common / in some years it is common, in other years it is rare; **R.** = rare = 5-10 specimens / day or night;
♂ = male; ♀ = female; **sp.** = specimen
The systematic list is made by Kristensen *et al.* (2007).
F.T. = Fauna types

Ex.pal. = Extrapalearctic – tropical and subtropical species, comprising species that are naturally wandering (cosmopolitan species, spread in the whole world) and species brought by man (adventive)
Tr.pal. = Transpalearctic – typical species for Europe's and Asia's deciduous wooded zone
Bc.sib. = Boreo-continental (Siberian) – typical species for Europe's and Asia's coniferous wooded zone / – boreocontinentale (siberiene)
S.cont. = South-continental – typical species for Europe's and Asia's steppe and wooded steppe zone / – sudcontinentale
W.pal. = West-Palearctic – typical species for west-Asian and Mediterranean peninsulas (Asia Minor, Balkan Peninsula)
Alp. = Alpine – European-alpine and Arctic-alpine species (Spread in the alpine and sub-alpine zone)
X.mont. = Xeromontan – species wich are typical of dry and medium dry highlands

F.E. = Fauna elements
Adr.med. = Adriato-Mediterranean; **A.p.med.** = Adriato-Ponto-Mediterranean; **Atl.med**. = Atlanto-Mediterranean; **Balc.** = Balcanian; **Bo.cont**. = Boreo-Continental; **Bo.cont.s.alp** = Boreo-Continental-subalpin; **B.mt.s.alp** = Boreomontan-subalpin; **C.eur.** = Central European; **Circ.bor.** = circumboreal; **Cosm.** = cosmopolitan; **Dj.eu.e.as.** = European-east-Asian-disjoint; **Dj.mj.pc.pan.=** Madjurian-ponto-caspic-pannon disjoint; **Eur.sib** = Euro-Siberian; **Eur.** = European; **Eu.e.as.** = European-east-Asian; **Eur.alp.** = European-alpin; **Holomed.** = Holomediterranean; **Holopal.** = Holo-Palearctic; **Holarct.** = Holarctic; **H.m.iran** = Holomediterranean-iranian; **Hm.turk**. = Holomediterranean-Turkestanian; **Hm.w.as.** = Holomediterranean west; **M.w.as** = Mediterranean-west-Asian; **Med.x.m.** = Mediterranean-xeromontan; **Nearct.** = Neactic; **Pontomed.** = Ponto-Mediterranean; **Pm.turk.** = Ponto-Mediterranean – Turkestanian; **Pal.trop.** = Paleotropical; **Pan.trop.** = Pantropical; **Ptr.s.trop.** = Paleotropical; **P.c.s.sib.** = Ponto-Caspian-south-Siberian; **Pm.iran** = Ponto-Mediterranean-Iranian; **S.w.sib.** = South-west-Siberian; **S.sib.** = South-Siberian; **Subtrop.** = subtropical.
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Annex 1: Taxoni protejați de lege la nivel european sau național
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Abrevieri:
C. = comune = 10-20 specimene / zi sau noapte; **V.C.** = foarte comune = 20-50 specimene / zi sau noapte; **R.C**. = relativ comune = oscilează între rare și comen / în unii ani este comună, dar în alți ani este rară; **R.** = rară = 5-10 specimene/ zi sau noapte;

♂ = mascul ♀ = femală; **sp.** = specimen
Lista sistematică este redată după Kristensen *et al.* (2007).
F.T. = Tipuri de faună:
Ex.pal. = Extrapalearctice – specii tropicale şi subtropicale care migrează pe cale naturală - specii cosmopolite, (prezente pe tot globul - specii introduse de om (adventive)
Tr.pal. = Transpalearctice - specii caracteristice zonelor pădurilor de foioase din Europa şi Asia
Bc.sib. = Boreocontinentale (siberiene) – specii caracteristice zonelor pădurilor de conifere din Europa şi Asia
S.cont. = Sudcontinentale – specii caracteristice zonelor de stepă şi silvostepă din Europa şi Asia
W.pal. = Vestpalearctice – specii caracteristice peninsulelor vestasiatice şi mediteraneene (Asia Mică, Balcani)
Alp. = Alpine – speciile European-alpine şi arcto-alpine. (Răspândite în zonele alpin-subalpine)
X.mont. = Xeromontane – specii caracteristice regiunilor montane aride şi semiaride

F.E. = Elemente de fauna:
Adr.med. = Adriato-mediteranean; **A.p.med.** = Adriato-ponto-mediteranean; **Atl.med**. = Atlanto-mediteranean; **Balc.** = Balcanic; **Bo.cont**. = Boreocontinental; **Bo.cont.s.alp** = Boreocontinental-subalpin; **B.mt.s.alp** = Boreomontan-subalpin; **C.eur.** = Central European; **Circ.bor.** = Circumboreal; **Cosm.** = Cosmopolit; **Dj.eu.e.as.** = disjunct European-estasiatic; **Dj.mj.pc.pan.=** disjunct Mandjurian-pontocaspic-panonic; **Eur.sib** = Eurosiberian; **Eur.** = European; **Eu.e.as.** = European-estasiatic; **Eur.alp.** = European-alpin; **Holomed.** = Holomediteranean; **Holopal.** = Holopalearctic; **Holarct.** = Holarctic; **H.m.iran** = Holomediteranean-iranian; **Hm.turk**. = Holomediteranean-turkestanian; **Hm.w.as.** = Holomediteranean-vestasiatic; **M.w.as** = Mediteranean-vestasiatic; **Med.x.m.** = Mediteranean-xeromontan; **Nearct.** = Nearctic (orig. America de Nord); **Pontomed.** = Pontomediteranean; **Pm.turk.** = Pontomediteranean-turkestanian; **Pal.trop.** = Paleotropical; **Pan.trop.** = Pantropical; **Ptr.s.trop.** = Paleotropical – subtropical; **P.c.s.sib.** = Pontocaspic-sudsiberian; **Pm.iran** = Pontomediteranean-iranian; **S.w.sib.** = Sudvest-siberian; **S.sib.** = Sudsiberian; **Subtrop.** = Subtropical.

Fig. 1 Localizarea zonei în România
Fig. 2 Tipurile de faună dominante (TF)
Fig. 3 Elementele de faună dominante (EF)
Fig. 4 Vadului
Fig. 5 Dumbrava Vadului
Fig. 6 *Lycaena helle*
Fig. 7. *Maculinea teleius*
Fig. 8 *Euphydryas aurinia*
Fig. 9 *Pseudoips prasinana*
Fig. 10 *Endromis versicolora*
Fig. 11 *Euthrix potatoria*
Fig. 12 *Proserpinus proserpina*
Fig. 13 *Drymonia velitaris*
Fig. 14 *Leucodonta bicoloria*
Fig. 15 *Mormo maura*
Fig. 16 *Eilema lutarella*
Fig. 17 *Callopistria juventina*
Fig. 18 *Eucarta amethystina*

Annex 1: Taxa protected by law at European or national level

- *Euplagia quadripunctaria* (Poda, 1761) – A common species, it is not threatened in this area!
- *Proserpinus proserpina* (Pallas, 1772) - Data deficient, only 2 specimens recorded on 3 May 2018.
- *Parnassius mnemosyne* (Linnaeus, 1758) – The species is declining due to meadow closure by trees and bushes.
- *Lycaena helle* (Linnaeus, 1758) – The species is declining due to meadow closure by trees and bushes.
- *Lycaena dispar rutila* (Werneburg, 1864) – Scattered specimens across the entire area. Inside the reserve it is threatened due to the invasion of the meadows by trees and bushes.
- *Maculinea teleius* (Bergstrasser, 1779) – Declining due to the invasion of meadows by trees and bushes.
- *Maculinea arion* (Linnaeus, 1758) – Declining due to the invasion of meadows by trees and bushes.
- *Maculinea alcon* ([Denis & Schiffermüller], 1775) – Declining due to the invasion of meadows by trees and bushes.
- *Argynnis laodice* (Pallas, 1777) – Declining, following year 2010 less and less specimens have been observed.
- *Euphydryas aurinia* (Rottemburg, 1775) – Declining due to the invasion of meadows by trees and bushes.
- *Nymphalis xanthomelas* (Esper, 1781) – Declining, following year 2010 less and less specimens have been observed.

Annex 2*:* List of Lepidoptera of the "Dumbrava Vadului - Poienile cu Narcise" (Sercaia, Brasov County, Romania) (abbreviations are given in the list of illustrations)

Taxon	**VI. 2000 SLR-camp**	**V-IX. 2000**	**2001 – 2018**	**F.T.**	**F.E.**	**Observations / Observații**
Suprafam**. HEPIALOIDEA** Stephens, 1829						
Fam. **HEPIALIDAE** Stephens, 1828						
Hepialus humuli (Linnaeus,1758)			▼	Tr. pal	Eur. sib	R.C.
Pharmacis lupulinus (Linnaeus,1758)			▼	W. pal	Po. med	R.
Triodia sylvina (Linnaeus,1758)		▼		W. pal	Po. med	V.C.
Suprafam. **COSSOIDEA,** Mosher,1916						
Fam. **COSSIDAE** Leach,[1815]						
Cossus cossus (Linnaeus, 1758)	▼			W. pal	M.w.as	R.C.
Zeuzera pyrina (Linnaeus, 1758)			▼	Tr. pal	Eur. sib	C.
Suprafam. **ZYGAENOIDEA** Latreille, 1809						
Fam. **LIMACODIDAE** Stephens, 1850						
Apoda limacodes (Hufnagel, 1766)		▼		W. pal	M.w.as	C.
Fam. **ZYGAENIDAE** Latreille, 1809						
Adscita statices (Linnaeus,1758)	▼			Tr. pal	Eur. sib	R.C.
Agrumenia carnioloca leonhardi G. Reiss, 1921				W. pal	M.w.as	R.C.
Agrumenia filipendulae (Linnaeus, 1758)				Tr. pal	Eur. sib	R.C.
Zygaena purpuralis (Brünnich, 1763)			▼	W. pal	M.w.as	2sp./5.VII.2010
Zygaena loti ([Den. & Schiff.],1775)				W. pal	M.w.as	C.
Zygaena angelicae Ochsenheimer, 1808	▼			W. pal	M.w.as	C.
Suprafam. **PAPILIONOIDEA** Latreille, [1802]						
Fam. **PAPILIONIDAE** Latreille, [1802]						
Subfam. **Parnassinae** Duponchel, [1835]						
Parnassius mnemosyne (Linnaeus, 1758)		▼		W. pal	Eur.	R.C.
Subfam. **Papilioninae** Latreille, [1802]						
Iphiclides podalirius (Linnaeus, 1758)		▼		W. pal	Po. med	R.C.
Papilio machaon (Linnaeus, 1758)		▼		Tr. pal	Holarct.	R.C.

Fam. **HESPERIIDAE** Latreille, 1809						
Subfam. **Pyrginae** Burmeister, 1878						
Erynnis tages (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Carcharodus alceae (Esper, 1793)			▼	W. pal	Holomed	R.C.
Carcharodus flocciferus Zeller, 1847				W. pal	M.w.as	R.C.
Pyrgus malvae (Linnaeus,1758)	▼			Tr. pal	Eur. sib	R.C.
Pyrgus armoricanus Oberthur,1910			▼	W. pal	Holomed	R.C.
Subfam. **Heteropterinae** Aurivillius, 1925						
Carterocephalus palaemon (Pallas, 1771)			▼	Bc. sib.	Circ.bor	R.
Subfam. **Hesperiinae** Latreille, 1809						
Thymelicus sylvestris (Poda, 1761)	▼			Tr. pal	Eur. sib	R.C.
Thymelicus lineolus (Ochsenheimer, 1808)			▼	Tr. pal	Eur. sib	R.
Hesperia comma (Linnaeus, 1758)		▼		Tr. pal	Eur. sib	R.
Ochlodes sylvanus (Esper, 1793)	▼			Tr. pal	Holopal	R.C.
Fam. **PIERIDAE** Duponchel, [1835]						
Subfam. **Coliadinae** Swainson, 1827						
Colias erate (Esper, 1805)			▼	S.cont	S.w.sib	R.
Colias croceus (Fourcroy, 1785)		▼		Ex.pal	Po.med	R.C
Colias hyale (Linnaeus, 1758)		▼		S.cont	S.w.sib	R.C
Colias alfacariensis Ribbe, 1905			▼	W. pal	Holomed	R.C
Gonepteryx rhamni (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	C.
Subfam. **Dismorphiinae** Schatz, [1886]						
Leptidea sinapis (Linnaeus, 1758)	▼			W. pal	M.w.as	C.
Subfam. **Pierinae** Duponchel, [1835]						
Aporia crataegi (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.
Anthocharis cardamines (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	C.
Pieris brassicae (Linnaeus, 1758)	▼			Tr. pal	Holarct.	R.
Pieris rapae (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	C.
Pieris napi (Linnaeus, 1758)	▼			Tr. pal	Holarct.	C.
Pontia daplidice (Fabricius, 1777)		▼		W. pal	Pm. turk	R.C.
Fam. **RIODINIDAE** Grote, 1895						
Hamearis lucina (Linnaeus, 1758)		▼		W. pal	Holomed	R.
Fam. **LYCAENIDAE** [Leach] [1815]						
Subfam. **Lycaeninae** [Leach] [1815]						
Lycaena phlaeas (Linnaeus, 1761)		▼		Tr. pal	Holarct.	R.C.
Lycaena helle (Linnaeus, 1758)	▼			Bc. sib.	Bo. cont	R.C.
Lycaena dispar rutila (Werneburg, 1864)	▼			Tr. pal	Eur. sib	R.C.
Lycaena tityrus (Poda, 1761)	▼			W. pal	M.w.as	R.C.
Lycaena virgaureae (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.
Subfam. **Theclinae** Swainson, 1831						
Callophrys rubi (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Satyrium spini ([Den.& Schiff.], 1775)			▼	W. pal	Holomed	R.
Satyrium pruni (Linnaeus, 1758)			▼	Tr. pal	Eur. sib	R.
Subfam. **Polyommatinae** Swainson, 1827						
Cupido minimus (Fuessly, 1775)			▼	Tr. pal	Eur. sib	R.
Everes (Cupido) argiades (Pallas, 1771)				Tr. pal	Eur. sib	R.
Celastrina argiolus (Linnaeus, 1758)		▼		Tr. pal	Holarct.	R.C.
Glaucopsyche alexis (Poda, 1761)	▼			W. pal	M.w.as	R.
Cyaniris semiargus (Rottemburg, 1775)				Tr. pal	Eur. sib	R.C.

Maculinea arion (Linnaeus, 1758)			▼	S.cont	Pc.s.sib	R.
Maculinea alcon ([Den.& Schiff.], 1775)		▼		S.cont	S.sib	R.C.
Maculinea teleius (Bergstrasser, 1779)	▼			S.cont	S.sib	R.C.
Plebejus argus (Linnaeus, 1761)		▼		Tr. pal	Eur. sib	R.C
Plebejus idas (Linnaeus, 1758)		▼		Tr. pal	Holarct.	R.
Plebejus argyrognomon (Bergstrasser, 1779)	▼			Tr. pal	Eur. sib	R.C.
Pseudophilotes schiffermülleri Hemming,1792			▼	W. pal	M.w.as	R.
Aricia agestis ([Den. & Schiff.], 1775)	▼			W. pal	M.w.as	C.
Polyommatus icarus (Rottemburg, 1775)	▼			Tr. pal	Eur. sib	C.
Polyommatus thersites (Cantener, 1834)	▼			W. pal	M.w.as	R.C.
Polyommatus bellargus (Rottemburg, 1775)	▼			W. pal	Holomed	R.C.
Fam. **NYMPHALIDAE** Swainson, 1827						
Subfam. **Limenitidinae** Behr, 1864						
Limenitis populi (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.
Subfam. **Heliconiinae** Swainson, 1827						
Argynnis paphia (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Argynnis laodice (Pallas, 1771)		▼		Bc. sib.	Bo. cont	R.
Argynnis aglaja (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Argynnis adippe (Linnaeus, 1758)			▼	Tr. pal	Eur. sib	R.
Argynnis niobe (Linnaeus, 1758)			▼	Tr. pal	Eur. sib	R.C.
Clossiana selene ([Den. & Schiff.], 1775)	▼			B.cont	Bo.co.sib	R.C.
Clossiana euphrosyne (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Clossiana dia (Linnaeus, 1767)	▼			Tr. pal	Eur. sib	C.
Brenthis ino (Rottemburg, 1775)	▼			Bc. sib.	Bo. cont	C.
Issoria lathonia (Linnaeus, 1758)			▼	Tr. pal	Eur. sib	C.
Subfam. **Apaturinae** Boisduval, 1840						
Apatura ilia ([Den. & Schiff.], 1775)	▼			Tr. pal	Dj.e.e.as.	R.C.
Subfam. **Nymphalinae** Swainson, 1827						
Melitaea phoebe ([Den. & Schiff.], 1775)			▼	S.cont	S.w.sib	R.C.
Melitaea athalia (Rottemburg, 1775)			▼	Tr. pal	Eur. sib	R.C.
Melitaea didyma (Esper, 1779)			▼	W. pal	M.w.as	R.C.
Euphydryas aurinia (Rottemburg, 1775)	▼			Tr. pal	Eur. sib	R.C.
Nymphalis polychloros (Linnaeus, 1758)	▼	▼		W. pal	Pm.turk	R.
Nymphalis xanthomelas (Esper, 1781)			▼	S. cont	Sw.sib	R.
Vanessa atalanta (Linnaeus, 1758)	▼			W. pal	Hm.w.as	R.C.
Vanessa cardui (Linnaeus, 1758)	▼			Ext. pal	Cosm.	R.C.
Polygonia c-album (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Araschnia levana (Linnaeus, 1758)			▼	Tr. pal	Eur. sib	R.C.
Aglais io (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Aglais urticae (Linnaeus, 1758)			▼	Tr. pal	Eur. sib	R.
Subfam. **Satyrinae** Boisduval, [1833]						
Lasiommata megera (Linnaeus, 1758)		▼		W. pal	Holomed	R.C.
Lasiommata maera (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Pararge aegeria tircis (Butler, 1867)	▼			W. pal	Holomed	R.C.
Coenonympha glycerion (Borkhausen, 1788)	▼			Tr. pal	Eur. sib	R.C.
Coenonympha arcania (Linnaeus, 1761)	▼			W. pal	Holomed	R.C.
Coenonympha pamphilus (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Aphanthopus hyperanthus (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Hyponephele lycaon (Kühn, 1774)			▼	S.cont	S.w.sib	R.
Maniola jurtina (Linnaeus, 1758)	▼			W. pal	Holomed	C.

Erebia medusa ([Den. & Schiff.], 1775)		▼		Tr. pal	Eur. sib	R.C.
Hipparchia fagi (Scopoli, 1763)	▼			W. pal	Pontomed.	R.
Hipparchia semele (Linnaeus, 1758)			▼	W. pal	P.med.turk.	R.
Melanargia galathea (Linnaeus, 1758)	▼			W. pal	A.p.med	C.
Minois dryas (Scopoli, 1763)	▼			S. cont	S.w.sib	C.
Suprafam. **DREPANOIDEA** Boisduval, 1828						
Fam. **DREPANIDAE** Boisduval, 1828						
Watsonalla binaria (Hufnagel,1767)			▼	W. pal	M.w.as	C.
Watsonalla cultraria (Fabricius, 1775)			▼	W. pal	C. eur	C.
Falcaria lacertinaria (Linnaeus, 1758)			▼	Bc. sib.	Bo. cont	R.C.
Sabra harpagula (Esper,1786)			▼	Tr. pal	Eur. sib	R.C.
Drepana falcataria (Linnaeus, 1758)		▼		Tr. pal	Eur. sib	C.
Cilix glaucata (Scopoli, 1763)	▼			Tr. pal	Holarct.	R.C.
Fam. **THYATIRIDAE** Smith, 1893						
Subfam. **Thyatirinae** Smith, 1893						
Thyatira batis Linnaeus, 1758	▼			Tr. pal	Eur. sib	C.
Habrosyne pyritoides (Hufnagel, 1766)	▼			Tr. pal	Eur. sib	C.
Tethea ocularis (Linnaeus, 1767)	▼			Tr. pal	Eur. sib	C.
Tethea or ([Den. & Schiff.], 1775)	▼			Tr. pal	Eur. sib	R.C.
Tetheella fluctuosa (Hübner, 1803)	▼			Bc. sib.	Bo. cont	R.C.
Ochropacha duplaris (Linnaeus, 1761)			▼	Tr. pal	Eur. sib	R.C.
Subfam. **Polyplocinae** Meyrick, 1895						
Cymatophorima diluta ([Den.& Schiff.],1775)			▼	W. pal	Holomed	R.C.
Suprafam. **LASIOCAMPOIDEA** Harris, 1841						
Fam. **LASIOCAMPIDAE** Harris, 1841						
Poecilocampa populi (Linnaeus, 1758)			▼	Bc. sib.	Bo. cont	R.C.
Trichiura crataegi (Linnaeus, 1758)			▼	W. pal	M.w.as	R.
Lasiocampa quercus (Linnaeus, 1758)		▼		Tr. pal	Eur. sib	R.C.
Lasiocampa trifolii ([Den.&Schiff.],1775)			▼	W. pal	M.w.as	C.
Euthrix potatoria (Linnaeus, 1758)		▼		Bc. sib.	Bo. cont	C.
Malacosoma neustria (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Macrothylacia rubi (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Phyllodesma tremulifolia (Hübner,1810)		▼		W. pal	M.w.as	R.C.
Gastropacha quercifolia ([Den.&Schiff.],1775)		▼		Tr. pal	Eur. sib	C.
Gastropacha populifolia ([Den.&Schiff.],1775)	▼			Tr. pal	Eur. sib	R.
Odonestis pruni (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Suprafam. **BOMBYCOIDEA** Latreille, [1803]						
Fam. **ENDROMIDAE** Boisduval, 1828						
Endromis versicolora (Linnaeus, 1758)			▼	Bc. sib.	Bo. cont	1♂, 25.IV.2008
Fam. **SPHINGIDAE** Latreille, [1802]						
Subfam. **Sphinginae** Latreille, [1802]						
Agrius convolvuli (Linnaeus, 1758)		▼		Ex. pal	Pal.trop	R.C.
Hyloicus pinastri (Linnaeus, 1758))			▼	Tr. pal	Eur. sib	R.
Subfam. **Smerinthinae** Grote & Robinson, 1865						
Smerinthus ocellata (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Mimas tiliae (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	V.C.
Laothoe populi (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	C.
Subfam. **Macroglosiinae** Harris, 1839						
Macroglossum stellatarum (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	C.

Hemaris tityus (Linnaeus, 1758)			▼	S. cont	S.w.sib	R.
Proserpinus proserpina (Pallas, 1772)			▼	Tr. pal	Eur. sib	2♂♂,3.V.2018
Hyles euphorbiae (Linnaeus, 1758)			▼	W. pal	M.w.as	R.C.
Hyles galii (Rottemburg, 1775)			▼	Tr. pal	Eur. sib	R.
Hyles livornica (Esper, 1779)			▼	Ex. pal	Pal.trop	R.
Deilephila elpenor (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	C.
Deilephila porcellus (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	V.C.
Fam. **SATURNIIDAE** Boisduval, [1837] 1834						
Aglia tau (Linnaeus, 1758)			▼	Tr. pal	Eur. sib	R.
Suprafam. **GEOMETROIDEA** Leach, [1815]						
Fam. **GEOMETRIDAE** Leach, [1815]						
Subfam. **Archiearinae** Fletcher, 1953						
Boudinotiana notha (Hübner, 1803)			▼	Bc.sib.	Bo. cont	R.C.
Subfam. **Alsophilinae** Herbulot, 1962						
Alsophila aescularia ([Den & Schiff],1775)			▼	Tr. pal	Eur. sib	R.C.
Alsophila aceraria ([Den & Schiff],1775)			▼	W. pal	Holomed	R.C.
Subfam. **Geometrinae** Stephens, 1829						
Pseudoterpna pruinata (Hufnagel, 1767)		▼		Tr. pal	Eur. sib	R.C.
Geometra papilionaria (Linnaeus, 1758)	▼			Bc. sib.	Bo. cont	R.
Comibaena bajularia ([Den & Schiff],1775)	▼			W. pal	Pontomed.	R.C.
Hemithea aestivaria (Hübner,1799)	▼			Tr. pal	Eur. sib	R.C.
Thetidia smaragdaria (Fabricius,1787)				Tr. pal	Eur. sib	R.C.
Chlorissa viridata (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Chlorissa cloraria (Hübner, 1813)			▼	Tr. pal	Eur. sib	R.C.
Hemistola chrysoprasaria (Esper, 1795)			▼	Tr. pal	Eur. sib	R.C.
Subfam. **Sterrhinae** Meyrick, 1892						
Idaea serpentata (Hufnagel,1767)	▼			Tr. pal	Eur. sib	R.
Idaea ochrata (Scopoli, 1763)			▼	W. pal	Holomed	R.C.
Idaea seriata (Schrank, 1802)	▼			W. pal	Holomed	R.C.
Idaea muricata (Hufnagel,1767)	▼			Bc. sib.	Bo. cont	R.C.
Idaea sylvestraria (Hübner,1799)	▼			Bc. sib.	Bo. cont	R.
Idaea fucovenosa (Goeze, 1781)	▼			W. pal	Holomed	R.C.
Idaea aversata (Linnaeus, 1758)	▼			W. pal	Holomed	V.C.
Scopula nigropunctata (Hufnagel,1767)			▼	Tr. pal	Eur. sib	C.
Scopula virgulata ([Den & Schiff],1775)			▼	Tr. pal	Eur. sib	R.C.
Scopula immorata (Linnaeus, 1758)		▼		Tr. pal	Eur. sib	R.C
Scopula ornata (Scopoli, 1763)	▼			Tr. pal	Eur. sib	C.
Scopula umbelaria (Hübner, 1813)			▼	Tr. pal	Eur. sib	R.C
Scopula decorata ([Den & Schiff],1775)			▼	Tr. pal	Eur. sib	R.C
Scopula rubiginata (Hufnagel,1767)			▼	Tr. pal	Eur. sib	R.C.
Scopula immutata (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	C.
Scopula subpunctaria (Herrich-Schaffer, 1847)	▼			S.cont.	Dj.mj.pc.pan	R.C.
Rhodostrophia vibricaria (Clerck, 1759)	▼			Tr. pal	Eur. sib	V.C.
Timandra comae A. Schmidt, 1931	▼			W. pal	Pontomed	R.C.
Cyclophora pendularia (Clerck,1759)			▼	B. cont	B.con.sib	R.C.
Cyclophora annulata (Schulze, 1775)	▼			W. pal	Holomed	R.C.
Cyclophora albiocellaria (Hübner, 1789)			▼	W. pal	Holomed	R.
Cyclophora porata (Linnaeus, 1767)			▼	W. pal	Holomed	R.C.
Cyclophora quercimontaria (Bastelberger,1897)			▼	W. pal	Holomed	2sp./4.IX.2018
Cyclophora punctaria (Linnaeus, 1758)	▼			W. pal	Holomed	R.C.

Cyclophora linearia (Hübner,1799)			▼	Tr. pal	Eur. sib	R.C.
Lythria purpuraria (Linnaeus, 1758)	▼			W. pal	Holomed	C.
Subfam. **Larentiinae** Duponchel, 1845						
Scotopteryx mucronata (Scopoli, 1763)			▼	Tr. pal	Eur. sib	R.C.
Scotopteryx luridata (Hufnagel, 1767)	▼			Tr. pal	Eur. sib	R.C.
Scotopteryx chenopodiata (Linnaeus, 1758)	▼			W. pal	Holomed	R.C.
Orthonoma obstipata (Fabricius, 1794)			▼	Ex. pal	Subtrop.	R.
Xanthorhoe ferrugata (Clerck, 1759)			▼	Tr. pal	Eur. sib	R.C.
Xanthorhoe quadrifasciata (Clerck, 1759)			▼	Bc .sib.	Bo. cont	R.C.
Xanthorhoe biriviata (Borkhausen, 1794)	▼			Bc. sib.	Bo. cont	C.
Xanthorhoe fluctuata (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	C.
Catarhoe cuculata (Herrich-Schaffer, 1855)	▼			Tr. pal	Eur. sib	R.C.
Epirrhoe tristata (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Epirrhoe alterata (O.F.Müller, 1764)	▼			Tr. pal	Eur. sib	C.
Epirrhoe rivata (Hübner,1813)			▼	W. pal	Holomed	R.C.
Epirrhoe hastulata (Hübner, 1790)	▼			Bc. sib.	Bo. cont	R.
Epirrhoe galiata ([Den & Schiff],1775)			▼	W. pal	Holomed	R.C.
Costaconvexa polygrammata (Borkhausen, 1794)	▼			Tr. pal	Eur. sib	C.
Camtogramma bilineata (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	C.
Eulithis pyraliata ([Den & Schiff],1775)			▼	Tr. pal	Eur. sib	R.C.
Lampropteryx suffumata ([Den & Schiff],1775)			▼	Tr. pal	Eur. sib	R.C.
Cosmorhoe ocellata (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Chloroclysta citrata (Hufnagel, 1767)			▼	Bc. sib	Bo. cont	R.C.
Plemyria rubiginata ([Den & Schiff]1775)	▼			Bc. sib.	Bo. cont	R.
Cidaria fulvata (Forster, 1771)			▼	Tr. pal	Eur. sib	R.
Thera variata ([Den & Schiff],1775)			▼	Bc. sib.	Bo. cont	V.C.
Eustroma reticulata ([Den & Schiff]1775)			▼	Bc. sib.	Bo. cont	R.
Epirrita dilutata ([Den & Schiff],1775)			▼	Bc. sib.	Bo. cont	C.
Epirrita autumnata (Borkhausen, 1794)			▼	Bc. sib.	Bo. cont	2sp./3.XI.2018
Epirrita chistyi (Allen, 1906)			▼	Bc. sib.	Bo. cont	R.
Operopthera brumata (Linnaeus, 1758)			▼	Tr. pal	Eur. sib	R.C.
Perizoma alchemillata (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	C.
Perizoma minorata (Treitschke, 1828)		▼		Bc.sib.	Bo. cont	R.C.
Perizoma lugdunaria (Herrich-Schaffer, 1855)		▼		Bc.sib.	Bo. cont	R.
Perizoma albulata ([Den & Schiff],1775)	▼			Bc. sib.	Bo. cont	R.
Colostygia pectinataria (Knoch, 1781)	▼			Bc. sib.	Bo. cont	R.C.
Colostygia turbata (Hübner,1799)		▼		Alp.salp	Eur.alp.	R.
Eupithecia centaureata ([Den & Schiff],1775)	▼			Tr. pal	Eur. sib	R.C.
Eupithecia intricata (Zetterstedt, 1839)			▼	Bc. sib.	Circ.bor	2sp./7.VIII.2018
Eupithecia denotata (Hübner,1813)			▼	W. pal	Holomed	1sp./3.V.2018
Eupithecia pygmaeata (Hübner,1799)			▼	Bc. sib.	Circ.bor	2sp./3.V.2018
Eupithecia linariata ([Den & Schiff],1775)	▼			W. pal	Holomed	R.
Eupithecia virgaureata Doubleday, 1861	▼			Tr. pal	Eur. sib	R.C.
Chloroclystis v-ata (Haworth, 1809)			▼	Bc. sib.	Bo. cont	R.C.
Rhinophora chloerata (Mabille, 1870)	▼			Tr. pal	Eur. sib	R.C.
Horisme tersata ([Den & Schiff],1775)			▼	Tr. pal	Eur. sib	R.C.
Anticollix sparsata (Treitschke, 1828)	▼			Tr. pal	Eur. sib	R.
Aplocera plagiata (Linnaeus, 1758)	▼			W. pal	Holomed	R.C.
Odezia atrata (Linnaeus, 1758)				Bc.sib.	Bo. cont	R.C.
Lithostege farinata (Hufnagel, 1767)			▼	Tr. pal	Eur. sib	R.C.

Lithostege griseata ([Den & Schiff],1775)			▼	Tr. pal	Eur. sib	R.C.
Hydrelia flammeolaria (Hufnagel, 1767)	▼			Bc.sib.	Bo. cont	C.
Minoa murinata (Scopoli, 1763)			▼	Tr. pal	Eur. sib	C.
Lobophora halterata (Hufnagel, 1769)			▼	Tr. pal	Eur. sib	R.C.
Subfam. **Ennominae** Duponchel, 1845						
Abraxas grossulariata (Linnaeus, 1758)			▼	Tr. Pal	Eur. Sib	R.
Lomaspilis marginata (Linnaeus, 1758)	▼			Tr. Pal	Eur. Sib	V.C.
Stegania cararia (Hübner, 1790)			▼	Tr. Pal	Dj.eu.e.as.	R.
Heliommata glarearia ([Den & Schiff],1775)			▼	W. pal	Holomed	C.
Macaria altenata (Hübner,1809)	▼			Tr. Pal	Eur. Sib	R.C.
Macaria liturata (Clerck,1759)	▼			Bc.sib.	Bo. cont	R.C.
Chiasmia clathrata (Linnaeus, 1758)	▼			Tr. Pal	Eur. Sib	V.C.
Itame brunneata (Thunberg, 1789)			▼	Bc.sib.	Bo. cont	1sp. 16.VII.2010
Plagodis dolabraria (Linnaeus, 1767)	▼			Tr. Pal	Eur. Sib	R.C.
Plagodis pulveraria (Linnaeus, 1758)			▼	Tr. Pal	Eur. Sib	R.C.
Opistographtis luteolata (Linnaeus, 1758)	▼			Tr. Pal	Eur. Sib	R.
Epione repandaria (Hufnagel, 1767)	▼			Tr. Pal	Eur. Sib	R.C.
Pseudopanthera macularia (Linnaeus, 1758)	▼			Tr. Pal	Eur. Sib	C.
Hypoxistis pluviaria (Fabricius, 1787)		▼		Tr. Pal	Eur. Sib	R.C.
Selenia lunularia (Hübner,1768)		▼		W. pal	Holomed	R.C.
Crocallis elinguaria (Linnaeus, 1758)			▼	Tr. Pal	Eur. Sib	R.C.
Colotois pennaria (Linnaeus, 1758)			▼	W. pal	Holomed	C.
Ourapteryx sambucaria (Linnaeus, 1758)			▼	Tr. Pal	Eur. Sib	R.
Angerona prunaria (Linnaeus, 1758)	▼			Tr. Pal	Eur. Sib	R.C.
Apocheima pilosaria ([Den & Schiff],1775)			▼	Tr. Pal	Eur. Sib	R.C.
Lycia hirtaria (Clerck,1759)			▼	Tr. Pal	Eur. Sib	R.C.
Biston betularia (Linnaeus, 1758)	▼			Tr. Pal	Holarct.	R.C.
Biston strataria (Hufnagel, 1767)			▼	W. pal	Holomed	R.C.
Erannis defoliaria (Clerck,1759)			▼	W. pal	Holomed	R.C.
Synopsia sociaria (Hübner,1799)			▼	Tr. Pal	Eur. Sib	R.C.
Peribatodes rhomboidaria ([Den & Schiff],1775)	▼			Tr. Pal	Eur. Sib	R.C.
Hypomecis roboraria ([Den & Schiff],1775)	▼			Tr. Pal	Eur. Sib	C.
Alcis repandata (Linnaeus, 1758)	▼			Tr. Pal	Eur. Sib	R.C.
Cleora cinctaria ([Den & Schiff],1775)			▼	Tr. Pal	Eur. Sib	R.C.
Paradarsia consonaria (Hübner,1799)			▼	Tr. Pal	Eur. Sib	R.C.
Ectropis crepuscularia ([Den & Schiff],1775)	▼			Tr. Pal	Eur. Sib	R.C.
Parectropis similaria (Hufnagel, 1767)	▼			Tr. Pal	Eur. Sib	R.
Aethalura punctulata ([Den & Schiff],1775)			▼	Bc. Sib.	Bo. Cont	R.
Ascotis selenaria ([Den & Schiff],1775)	▼			Tr. Pal	Eur. Sib	C.
Ematurga atomaria (Linnaeus, 1758)	▼			Tr. Pal	Eur. Sib	C.
Cabera pusaria (Linnaeus, 1758)	▼			Tr. Pal	Eur. Sib	C.
Cabera exanthemata (Scopoli, 1763)	▼			Tr. Pal	Eur. Sib	C.
Lomographa bimaculata (Fabricius, 1775)			▼	Tr. Pal	Eur. Sib	R.C.
Lomographa temerata ([Den & Schiff],1775)	▼			Tr. Pal	Eur. Sib	R.C.
Campaea margaritata (Linnaeus, 1767)	▼			W. pal	Holomed	R.C.
Pungeleria capreolaria ([Den & Schiff],1775)			▼	Tr. Pal	Eur. Sib	R.C.
Siona linata (Scopoli, 1763)	▼			Tr. Pal	Eur. Sib	R.C.
Perconia strigillaria (Hübner,1787)	▼			W. pal	Holomed	R.
Suprafam. **NOCTUOIDEA** Latreille, 1809						
Fam. **NOTODONTIDAE** Stephens, 1829						

Subfam. **Dicranurinae** Duponchel, [1845]						
Cerura erminea (Esper, 1783)			▼	Tr. pal	Eur. sib	R.
Cerura vinula (Linnaeus, 1758)			▼	Tr. pal	Eur. sib	R.
Furcula furcula forficula Fischer v. Waldheim, 1820			▼	Tr. pal	Holarct.	R.C.
Stauropus fagi (Linnaeus,1758)	▼			Tr. pal	Eur. sib	C.
Subfam. **Notodontinae** Stephens, 1829						
Notodonta ziczac (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Notodonta tritophus [Den & Schiff],1775)			▼	Tr. pal	Eur. sib	R.
Notodonta dromedarius (Linnaeus, 1758)	▼			B. cont	Bo. cont	R.C.
Notodonta torva (Hübner, 1803)			▼	Bc. sib.	Bo. cont	R.
Drymonia dodonaea ([Den & Schiff],1775)	▼			W. pal	M.w.as	R.C.
Drymonia obliterata (Esper, 1785)	▼			W. pal	M.w.as	R.C.
Drymonia velitaris (Hufnagel, 1767)			▼	W. pal	Holomed	1♂ 10.VII.2016
Leucodonta bicoloria ([Den & Schiff],1775)			▼	Bc. sib.	Bo. cont	4sp. 3.V.2018
Pheosia tremula (Clerck, 1759)	▼			Tr. pal	Eur. sib	R.C.
Pheosia gnoma (Fabricius, 1766)		▼		Bc. sib.	Bo. cont	R.
Pterostoma palpina (Clerck, 1759)	▼			Tr. pal	Eur. sib	R.C.
Ptilodon capucina (Linnaeus, 1758)			▼	Tr. pal	Eur. sib	C.
Ptilodon cucullina ([Den & Schiff],1775)	▼			Tr. pal	Eur. sib	C.
Ptilophora plumigera ([Den & Schiff],1775)			▼	Tr. pal	Eur. sib	C.
Spatalia argentina ([Den & Schiff],1775)	▼			W. pal	M.w.as	C.
Gluphisia crenata (Esper, 1785)	▼			Tr. Pal	Dj.eu.e.as.	R.C.
Subfam. **Phalerinae** Butler, 1886						
Phalera bucephala (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Subfam**. Pygaerinae** Duponchel, [1845]						
Clostera curtula (Linnaeus, 1758)			▼	Tr. pal	Eur. sib	R.C.
Clostera anastomosis (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Clostera anachoreta ([Den & Schiff],1775)			▼	Tr. pal	Eur. sib	R.C.
Clostera pigra (Hufnagel, 1766)		▼		Tr. pal	Eur. sib	R.C.
Subfam. **Thaumetopoeinae** Aurivillius, 1889						
Thaumetopoea processionea (Linnaeus, 1758)			▼	W. pal	M.w.as	R.C.
Fam. **EREBIDAE** (Leach, [1815])						
Subfam. **Rivulinae** Grote, 1895						
Rivula sericealis (Scololi, 1763)	▼			Tr. pal	Eur. sib	C.
Subfam. **Boletobiinae** Grote, 1895						
Parascotia fuliginaria (Linnaeus, 1761)		▼		Tr. pal	Eur. sib	R.
Subfam. **Aventiinae** Tutt, 1896						
Laspeyria flexula ([Den & Schiff],1775)	▼			Bc. sib.	Bo. cont	C.
Subfam. **Herminiinae** Leach, 1815						
Idia calvaria ([Den & Schiff],1775)			▼	Tr. pal	Eur. sib	R.
Paracololax tristalis (Fabricius, 1794)	▼			Tr. pal	Eur. sib	R.C.
Polypogon strigilata (Linnaeus,1758)				Tr. pal	Eur. sib	R.C.
Herminia tarsicrinalis (Knoch, 1782)			▼	Tr. pal	Eur. sib	R.C.
Herminia tarsipennalis (Treitschke, 1835)			▼	Tr. pal	Eur. sib	2sp. 4.IX.2018
Subfam. **Hypeninae** Herrich-Schaffer, 1851						
Hypena proboscidalis (Linnaeus,1758)	▼			Tr. pal	Eur. sib	C.
Hypena rostralis (Linnaeus,1758)			▼	Tr. pal	Eur. sib	R.
Subfam. **Eublemminae** Forbes, 1954						
Eublemma purpurina ([Den & Schiff],1775)			▼	W. pal	Holomed	R.

Subfam. **Phytometrinae** Hampson, 1913						
Phytometra viridaria (Clerck, 1759)			▼	Bc. sib.	Bo. cont	3sp.7.VIII.2018
Colobochyla salicalis ([Den & Schiff],1775)	▼			Tr. pal	Eur. sib	R.C.
Trisateles emortualis ([Den & Schiff],1775)	▼			Bc. sib.	Bo. cont	R.
Subfam. **Calpinae** Boisduval, 1840						
Scoliopteryx libatrix (Linnaeus, 1758)			▼	Tr. pal	Eur. sib	R.
Subfam. **Lymantriinae** Hampson, 1893						
Lymantria dispar (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	C.
Lymantria monacha (Linnaeus, 1758)			▼	Bc. sib.	Bo. cont	R.C.
Calliteara pudibunda (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	C.
Dycallomera fascelina (Linnaeus, 1758)		▼		Tr. pal	Eur. sib	R.C.
Euproctis chrysorrhoea (Linnaeus, 1758)		▼		Tr. pal	Eur. sib	R.
Euproctis similis (Fuessly, 1775)			▼	Tr. pal	Eur. sib	R.C.
Penthophera morio (Linnaeus, 1767)	▼			W. pal	C. eur	R.
Leucoma salicis (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Arctornis l-nigrum (Müller, 1787)	▼			Tr. pal	Eur. sib	R.C.
Subfam. **Arctiinae** Leach, 1815						
Spilarctia lutea (Hufnagel, 1766)	▼			Tr. pal	Eur. sib	C.
Spilosoma lubricipeda (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	C.
Spilosoma urticae (Esper, 1789)		▼		Tr. pal	Eur. sib	R.
Epatolmis luctifera ([Den & Schiff],1775)			▼	Tr. pal	Eur. sib	1♂. 3.V.2018
Arctia caja (Linnaeus, 1758)	▼			Tr. pal	Holarct.	R.C.
Phragmatobia fuliginosa (Linnaeus, 1758)		▼		Tr. pal	Eur. sib	V.C.
Diaphora mendica (Clerck, 1759)			▼	W. pal	Hm. w.as	5sp. 3.V.2018
Hyphantria cunea (Drury, 1773)		▼		Ex. pal	Nearct.	R.
Diacrisia sannio (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.
Euplagia quadripunctaria (Poda, 1781)		▼		W. pal	Hm. w.as	C.
Subfam. **Lithosiinae** Billberg, 1820						
Thumatha senex (Hübner, 1803)	▼			Tr. pal	Eur. sib	R.C.
Pelosia muscerda (Hufnagel, 1767)		▼		Tr. pal	Eur. sib	R.C.
Miltochrista miniata (Forster, 1771)	▼			Tr. pal	Eur. sib	C.
Cybosia mesomella (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Atolmis rubricollis (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	C.
Lithosia quadra (Linnaeus, 1758)	▼			T. pal	E. sib	C.
Eilema griseola (Hübner, [1803])			▼	Bc. sib.	Bo. cont	R.C.
Eilema depressa (Esper, 1787)		▼		W. pal	Holomed	C.
Eilema lurideola (Zincken, 1817)		▼		Tr. pal	Eur. sib	C
Eilema complana (Linnaeus, 1758)	▼			W. pal	Holomed	C.
Eilema caniola (Hübner, [1808])			▼	W. pal	Holomed	R.C.
Eilema lutarella (Linnaeus, 1758)			▼	Tr. pal	Eur. sib	6sp.7.VIII.2018
Wittia sororcula (Hufnagel, 1766)	▼			W. pal	Holomed	V.C.
Subfam. **Ctenuchinae** Kirby, 1837						
Dysauxes ancilla (Linnaeus, 1767)			▼	W. pal	Holomed	R.
Subfam. **Catocalinae** Boisduval, 1828						
Lygephila craccae ([Den & Schiff],1775)			▼	Tr. pal	Eur. sib	C.
Euclidia glyphica (Linnaeus,1758)	▼			Tr. pal	Eur. sib	R.
Euclidia mi (Clerck, 1759)	▼			Tr. pal	Eur. sib	R.
Catephia alchymista ([Den & Schiff],1775)		▼		W. pal	Holomed	R.
Catocala sponsa (Linnaeus,1767)		▼		W. pal	Holomed	R.
Catocala fulminea (Scopoli, 1763)			▼	Tr. pal	Eur. sib	1♂.5.VII.2018

Catocala nupta (Linnaeus,1767)			▼	Tr. pal	Eur. sib	C.
Catocala elocata (Esper, [1787])		▼		Tr. pal	Eur. sib	C.
Subfam. **Nolinae** Bruand, 1846						
Nola cristatula (Hübner, 1793)			▼	Bc. sib.	Bo. cont	R.C.
Nola aerugula (Hübner, 1793)			▼	Tr. pal	Eur. sib	R.C.
Meganola strigula ([Den & Schiff],1775)	▼			W. pal	M.w.as	R.C.
Meganola albula ([Den & Schiff],1775)			▼	Bc. sib.	Bo. cont	R.C.
Bena bicolorana (Fuessly, 1775)	▼			W. pal	Holomed	R.
Pseudoips prasinana (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	C.
Earias clorana (Linnaeus, 1761)		▼		Tr. pal	Eur. sib	R.C.
Nycteola asiatica (Krulikovsky, 1904)			▼	Bc. sib.	Bo. cont	R.
Fam. **NOCTUIDAE** Latreille, 1809						
Subfam. **Plusiinae** Boisduval, 1828						
Abrostola asclepiadis ([Den & Schiff],1775)		▼		Tr. pal	Eur. sib	C.
Abrostola triplasia (Linnaeus, 1758)		▼		Tr. pal	Eur. sib	C.
Macdunnoughia confusa (Stephens, 1850)			▼	Tr. pal	Eur. sib	C.
Lamprotes c-aureum (Knoch, 1781)		▼		W. pal	Holomed	R.
Diachrysia chrysitis (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Diachrysia stenochrysis (Warren, 1913)			▼	Tr. pal	Eur. sib	R.C.
Autographa gamma (Linnaeus, 1758)	▼			Tr. pal	Holopal.	C.
Autographa pulchrina (Haworth, 1809)		▼		Bc. sib.	Bo. cont	C.
Plusia festucae (Linnaeus, 1758)		▼		Tr. pal	Eur. sib	R.C.
Subfam. **Eustrotiinae** Grote, 1882						
Deltote deceptoria (Scopoli, 1763)	▼			Tr. pal	Eur. sib	R.
Deltote uncula (Clerk, 1759)			▼	Bc. sib.	Bo. cont	R.C.
Protodeltote pygarga (Hufnagel, 1766)	▼			Tr. pal	Eur. sib	R.C.
Subfam. **Acontiinae** Guenée, 1841						
Aedia funesta (Esper, 1766)			▼	W. pal	Holomed	R.C.
Acontia lucida (Hufnagel, 1766)			▼	W. pal	Holomed	C.
Acontia trabealis (Scopoli, 1763)	▼			Tr. pal	Eur. sib	C.
Subfam. **Pantheinae** Smith, 1898						
Calocasia coryli (Linnaeus, 1758)	▼		▼	Tr. pal	Eur. sib	C.
Subfam. **Dilobinae** Aurivillius, 1889						
Diloba caeruleocephala (Linnaeus, 1758)			▼	W. pal	H.m. iran	C.
Subfam. **Acronictinae** Heinemann, 1959						
Craniophora ligustri ([Den & Schiff],1775)		▼		Tr. pal	Eur. sib	C.
Moma alpium (Osbeck, 1778)	▼			W. pal	Holomed	C.
Acronicta alni (Linnaeus, 1767)			▼	Bc .sib.	B. cont	R.C.
Acronicta megacephala ([Den & Schiff],1775)	▼			Bc .sib.	B. cont	R.C.
Acronicta leporina (Linnaeus, 1758)			▼	Bc .sib.	B. cont	R.C.
Acronicta rumicis (Linnaeus, 1758)			▼	Tr. pal	Eur. sib	C.
Acronicta tridens ([Den & Schiff],1775)		▼		Tr. pal	Eur. sib	R.C.
Acronicta psi (Linnaeus, 1758)			▼	Tr. pal	Eur. sib	R.C.
Subfam. **Metaponinae** Herrich-Schäffer, 1851						
Tyta luctuosa ([Den & Schiff],1775)	▼			Tr. pal	Eur. sib	C.
Subfam. **Cucullinae** Herrich-Schäffer, 1850						
Cucullia umbratica (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Cucullia campanulae Freyer, 1831			▼	W. pal	Holomed	1♂. 20.VII.2017
Shargacucullia scrophulariae ([Den & Schiff],1775)			▼	Bc .sib.	B. cont	R.

Shargacucullia lychnitis Rambur, 1833				W. pal	Holomed	R.
Subfam. **Oncocnemidinae** Forbes & Franclemont, 1954						
Calophasia lunula (Hufnagel, 1766)			▼	Tr. pal	Eur. sib	R.C.
Callierges ramosa (Esper,1786)			▼	Tr. pal	Eur. sib	R.
Subfam. **Amphipyrinae** Guenée, 1837						
Amphipyra pyramidea (Linnaeus, 1758)		▼		Tr. pal	Eur. sib	R.C.
Amphipyra livida ([Den & Schiff],1775)			▼	Tr. pal	Eur. sib	R.C.
Amphipyra tragopoginis (Clerck, 1759)			▼	Tr. pal	Eur. sib	R.C.
Subfam. **Psaphidinae** Grote, 1896						
Asteroscopus sphinx (Hufnagel, 1788)			▼	W. pal	Holomed	2sp. 3.XI.2018
Brachionycha nubeculosa (Esper,1785)			▼	Bc .sib.	B. cont	C.
Allophies oxyacanthae (Linnaeus, 1758)			▼	W. pal	Po.med	C.
Subfam. **Condicinae** Poole, 1995						
Eucarta amethystina (Hübner, 1803)			▼	S.cont.	Dj.mj.pc.pan	4sp. 20.VII.2017
Subfam. **Eriopinae** Herrich-Schäffer, 1851						
Callopistria juventina (Stoll, 1782)			▼	Tr. Pal	Dj.eu.e.as.	1sp. 10.VII.2016, 2sp. 20.VII.2017
Subfam. **Heliothinae** Boisduval, 1828						
Pyrrhia umbra (Hufnagel, 1766)	▼			Tr. pal	Eur. sib	R.C.
Protoschinia scutosa ([Den & Schiff],1775)		▼		Ex. pal	Pal. trop	R.C.
Heliothis viriplaca (Hufnagel, 1766)		▼		Tr. pal	Eur. sib	R.C.
Heliothis peltigera ([Den & Schiff],1775)		▼		W. pal	Holomed	R.C.
Helicoverpa armigera (Hübner, 1808)			▼	Ex. pal	Pan. trop	R.C.
Subfam. **Bryophilinae** Guenée, 1852						
Cryphia algae (Fabricius, 1775)			▼	Tr. pal	Eur. sib	R.C.
Cryphia raptricula ([Den & Schiff],1775)			▼	W. pal	Holomed	R.
Subfam. **Xyleninae** Guenée, 1837						
Pseudeustrotia candidula ([Den & Schiff],1775)			▼	Bc. sib.	B. cont	R.C.
Elaphria venustula (Hübner, 1790)	▼			Tr. pal	Eur. sib	R.C.
Caradrina clavipalpis (Scopoli, 1763)			▼	Tr. pal	Holarct.	C.
Hoplodrina octogenaria (Goeze, 1781)	▼			W. pal	Holomed	C.
Hoplodrina ambigua ([Den & Schiff],1775)			▼	W. pal	Holomed	C.
Hoplodrina blanda ([Den & Schiff],1775)			▼	W. pal	Holomed	R.C.
Charanyca trigrammica (Hufnagel, 1766)	▼			W. pal	Holomed	C.
Rusina ferruginea (Esper, 1785)			▼	Tr. pal	Eur. sib	R.
Dypterygia scabriuscula (Linnaeus, 1758)			▼	Tr. pal	Eur. sib	R.
Trachea atriplicis (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Mormo maura (Linnaeus, 1758)			▼	Bc. sib.	B. cont	1♂. 5.VII.2010
Polyphaenis sericata Esper, 1787		▼		W. pal	Holomed	R.C.
Thalpophila matura (Hufnagel, 1766)			▼	Tr. pal	Eur. sib	R.C.
Actinotia polyodon (Clerck, 1759)	▼			Bc. sib.	B. cont	R.C.
Cloantha hyperici ([Den & Schiff],1775)			▼	W. pal	Holomed	C.
Phlogophora meticulosa (Linnaeus, 1758)			▼	Tr. pal	Eur. sib	R.C.
Euplexia lucipara (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	C.
Calamia tridens (Hufnagel, 1766)			▼	Tr. pal	Eur. sib	R.C.
Gortyna flavago ([Den & Schiff],1775)		▼		Bc. sib.	B. cont	R.
Amphipoea oculea (Linnaeus, 1761)			▼	Bc. sib.	B. cont	R.C.
Luperina testacea ([Den & Schiff],1775)			▼	W. pal	Holomed	R.C.
Rhizedra lutosa (Hübner, 1803)			▼	Bc. sib.	B. cont	R.C.
Nonagria typhae (Thunberg, 1784)			▼	Bc. sib.	B. cont	R.C.

Photedes minima (Haworth, 1809)	▼			Bc. sib.	B. cont	R.C.
Apamea monoglypha (Hufnagel, 1766)	▼			Tr. pal	Eur. sib	C.
Apamea crenata (Hufnagel, 1766)	▼			Tr. pal	Eur. sib	R.C.
Mesapamea secalis (Esper, 1789)		▼		Bc. sib.	B. cont	R.C.
Oligia strigilis (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	C.
Oligia versicolor (Borkhausen, 1792)	▼			Bc. sib.	B. cont	C.
Ipimorpha retusa (Linnaeus, 1761)		▼		Bc. sib.	B. cont	R.C.
Ipimorpha subtusa ([Den & Schiff],1775)		▼		Bc. sib.	B. cont	R.C.
Cosmia pyralina ([Den & Schiff],1775)			▼	Tr. pal	Eur. sib	R.C.
Cosmia trapezina (Linnaeus, 1758)		▼		Tr. pal	Eur. sib	C.
Cosmia diffinis (Linnaeus, 1767)		▼		W. pal	Holomed	R.C.
Lithophane socia (Hufnagel, 1766)			▼	Bc. sib.	B. cont	2sp. 3.V.2018
Lithophane ornitopus (Hufnagel, 1766)			▼	Tr. pal	Eur. sib	R.C.
Xylena exsoleta (Linnaeus, 1758)			▼	Bc. Sib.	B. cont	R.
Xylena vetusta (Hübner, 1813)			▼	Bc. Sib.	B. cont	R.
Eupsilia transversa (Hufnagel, 1766)			▼	Tr. Pal	Eur. Sib	C.
Conistra vaccinii (Linnaeus, 1761)			▼	Tr. Pal	Eur. Sib	C.
Conistra ligula (Hufnagel, 1766)			▼	W. pal	Holomed	R.C.
Conistra rubiginea ([Den & Schiff],1775)			▼	W. pal	Holomed	R.C.
Agrochola lychnidis ([Den & Schiff],1775)			▼	Tr. Pal	Eur. Sib	R.C.
Anchoscelis nitida ([Den & Schiff],1775)			▼	W. pal	Po.med	R.C.
Anchoscelis litura (Linnaeus, 1758)			▼	W. pal	Holomed	R.C.
Anchoscelis helvola (Linnaeus, 1758)			▼	W. pal	Po.med	R.C.
Leptologia lota (Clerk, 1759)			▼	Tr. Pal	Eur. Sib	R.C.
Leptologia macilenta (Hübner, 1809)			▼	W. pal	Holomed	R.C.
Sunira circellaris (Hufnagel, 1766)			▼	Tr. pal	Eur. sib	R.C.
Xanthia togata (Esper, 1788)			▼	Tr. pal	Eur. sib	R.C.
Cirrhia icteritia (Hufnagel, 1766)			▼	Tr. pal	Eur. sib	R.C.
Cirrhia ocellaris (Borkhausen, 1792)			▼	Tr. pal	Eur. sib	R.C.
Tiliacea aurago ([Den & Schiff],1775)			▼	W. pal	Holomed	R.
Tiliacea citrago (Linnaeus, 1758)			▼	W. pal	Holomed	R.
Brachylomia viminalis (Fabricius, 1777)			▼	Bc. sib.	B. cont	R.C.
Griposia aprilina (Linnaeus, 1758)			▼	W. pal	Holomed	R.C.
Ammoconia caecimacula ([Den & Schiff],1775)			▼	W. pal	Holomed	R.C.
Aporophyla lutulenta ([Den & Schiff],1775)			▼	W. pal	Po.med	R.C.
Enargia paleacea (Esper, 1788)			▼	Bc. sib.	B. cont	R.C.
Blepharia satura ([Den & Schiff],1775)			▼	Tr. pal	Eur. sib	R.C.
Polymixis polymita (Linnaeus, 1761)			▼	W. pal	Holomed	R.
Subfam. **Hadeninae** Guenée, 1837						
Mythimna turca (Linnaeus, 1761)			▼	Bc. sib.	B. cont	R.C.
Mythimna ferrago (Fabricius, 1787)	▼			Tr. pal	Eur. sib	R.C.
Mythimna conigera ([Den & Schiff],1775)	▼			Bc. sib.	B. cont	R.
Mythimna pallens (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Mythimna vitellina (Hübner, 1808)	▼			Tr. pal	Eur. sib	C.
Mythimna albipuncta ([Den & Schiff],1775)	▼			Tr. pal	Eur. sib	C.
Mythimna impura (Hübner, 1808)			▼	Bc. sib.	B. cont	R.
Mythimna pudorina ([Den & Schiff],1775)			▼	Bc. sib.	B. cont	R.C.
Mythimna l-album (Linnaeus, 1767)	▼			Tr. pal	Eur. sib	R.C.
Leucania comma (Linnaeus, 1761)	▼			Bc. sib.	B. cont	R.C.
Leucania obsoleta (Hübner, 1803)	▼			Tr. pal	Eur. sib	R.C.
Hadula trifolii (Hufnagel, 1766)	▼			Tr. pal	Eur. sib	V.C.

Heliophobus reticulata (Goeze, 1781)	▼			S.cont.	P.c.s.sib	R.
Conisania luteago ([Den & Schiff],1775)	▼			W. pal	Holomed	R.C.
Eriopygoides imbecilla (Fabricius, 1794)			▼	Tr. pal	Eur. sib	R.C.
Polia bombycina (Hufnagel, 1766)	▼			Bc. sib.	B. cont	R.C.
Polia nebulosa (Hufnagel, 1766)	▼			Bc. sib.	B. cont	R.C.
Pachetra sagittigera (Hufnagel, 1766)			▼	S.cont.	P.c.s.sib	1♂. 24.V.2018
Mamestra brassicae (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Melanchra persicariae (Linnaeus, 1761)	▼			Bc. sib.	B. cont	C.
Ceramica pisi (Linnaeus, 1758)	▼			Bc. sib.	B. cont	R.
Lacanobia w-latinum (Hufnagel, 1766)		▼		W. pal	Holomed	C.
Lacanobia thalassina (Hufnagel, 1766)	▼			Tr. pal	Eur. sib	C.
Lacanobia splendens (Hübner, 1808)	▼			S.cont.	P.c.s.sib	R.
Lacanobia oleracea (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Lacanobia contigua ([Den & Schiff],1775)	▼			Bc. sib.	B. cont	R.C.
Lacanobia suasa ([Den & Schiff],1775)			▼	Tr. pal	Eur. sib	R.C.
Hadena confusa (Hufnagel, 1766)	▼			Tr. pal	Eur. sib	R.C.
Aetheria bicolorata (Hufnagel, 1766)			▼	Tr. pal	Eur. sib	R.C.
Panolis flammea ([Den & Schiff],1775)			▼	Bc. sib.	B. cont	R.
Orthosia incerta (Hufnagel, 1766)			▼	Tr. pal	Eur. sib	C.
Orthosia cerasi (Fabricius, 1775)			▼	W. pal	Holomed	C.
Orthosia gothica (Linnaeus, 1758)			▼	Tr. pal	Eur. sib	C.
Orthosia gracilis ([Den & Schiff],1775)			▼	W. pal	Holomed	R.
Orthosia cruda ([Den & Schiff],1775)			▼	W. pal	Holomed	C.
Anorthoa munda ([Den & Schiff],1775)			▼	Tr. pal	Eur. sib	R.
Egira conspicillaris (Linnaeus, 1758)			▼	W. pal	Holomed	R.C.
Tholera cespitis ([Den & Schiff],1775)		▼		Bc. sib.	B. cont	V.C.
Tholera decimalis (Poda, 1761)		▼		Bc. sib.	B. cont	V.C.
Cerapteryx graminis (Linnaeus, 1758)		▼		Bc. sib.	B. cont	R.C.
Subfam. **Noctuinae** Latreille, 1809						
Euxoa nigricans (Linnaeus, 1761)		▼		Bc. sib.	B. cont	R.
Euxoa aquilina ([Den & Schiff],1775)			▼	S.cont.	P.c.s.sib	3sp.7.VIII.2018
Agrotis ipsilon (Hufnagel, 1766)	▼			Ex. pal.	Subtrop.	C.
Agrotis segetum ([Den & Schiff],1775)	▼			Tr. pal	Eur. sib	C.
Agrotis cinerea ([Den & Schiff],1775)			▼	W. pal	Holomed	R.C.
Agrotis exclamationis (Linnaeus, 1758)	▼			Tr. pal	Eur. sib	R.C.
Axylia putris (Linnaeus, 1761)	▼			W. pal	Holomed	R.C.
Ochropleura plecta (Linnaeus, 1761)		▼		Tr. pal	Eur. sib	R.C.
Diarsia mendica (Fabricius, 1775)			▼	Bc. sib.	B. cont	R.C.
Diarsia brunnea ([Den & Schiff],1775)	▼			Bc. sib.	B. cont	R.C.
Graphiphora augur (Fabricius, 1775)			▼	Bc. sib.	B. cont	R.
Eugraphe sigma ([Den & Schiff],1775)	▼			Bc. sib.	B. cont	R.C.
Cerastis rubricosa ([Den & Schiff],1775)			▼	Bc. sib.	B. cont	R.C.
Cerastis leucographa ([Den & Schiff],1775)			▼	Bc. sib.	B. cont	R.
Noctua janthina ([Den & Schiff],1775)		▼		W. pal	Holomed	R.C.
Noctua pronuba Linnaeus, 1758		▼		W. pal	Holomed	R.C.
Noctua fimbriata (Schreber, 1759)			▼	W. pal	Holomed	R.C.
Noctua orbona (Hufnagel, 1766)			▼	W. pal	Holomed	R.C.
Xestia c-nigrum (Linnaeus, 1758)			▼	Tr. pal	Eur. sib	R.C.
Xestia baja ([Den & Schiff],1775)			▼	Tr. pal	Eur. sib	R.C.
Xestia ditrapezium ([Den & Schiff],1775)			▼	Bc. sib.	B. cont	R.C.

Xestia triangulum (Hufnagel, 1766)			▼	W. pal	M. w. as	R.C.
Xestia stigmatica (Hübner, 1813)			▼	Bc. sib.	B. cont	R.C.
Naenia typica (Linnaeus, 1758)			▼	Bc. sib.	B. cont	1♂.10.VII.2016

	VI. 2000 SLR- camp	**V-IX. 2000**	**2001 – 2018**	**Observations**
Suprafam. **ADELOIDEA** Bruand, 1850				
Fam. **ADELIDAE** Bruand, 1850				
Nemophora degerella (Linnaeus, 1758)	▼			R.C.
Nemophora metallica (Poda, 1761)			▼	R.
Adela reamurella (Linnaeus, 1758)	▼			R.C.
Nemetopogon swammerdamella (Linnaeus, 1758)	▼			R.C.
Nemetopogon robertella (Clerk, 1759)				R.C.
Suprafam. **TINEOIDEA** Latreille, 1810				
Fam. **TINEIDAE** Latreille, 1810				
Euplocamus anthracinalis (Scopoli, 1763)	▼			R.
Monopis monachella (Hübner, 1796)		▼		1 sp. / 27.VII.2000
Suprafam. **YPONOMEUTOIDEA** Stephens, 1829				
Fam. **YPONOMEUTIDAE** Stephens, 1829				
Yponomeuta evonymella (Linnaeus, 1758)	▼			R.C.
Yponomeuta sedella Treitschke, 1833	▼			R.C.
Fam. **PLUTELLIDAE** Guenée, 1845				
Plutella xylostella (Linnaeus, 1758)	▼			V.C.
Eidophasia mesingiella (Fischer v. Roslerrstamm, 1840)	▼			C.
Fam. **GLYPHIPTERIGIDAE** Stainton, 1854.				
Glyphipterix thrassonella (Scopoli, 1763)			▼	R.C.
Suprafam. **GELECHIOIDEA** Stainton, 1854				
Fam. **LECITHOCERIDAE** Le Marchand, 1947				
Lecithocera nigrana (Duponchel, 1836)			▼	R.C.
Fam. **OECOPHORIDAE** Bruand, 1850				
Carcina quercana (Fabricius, 1775)	▼			C.
Diurnea fagella ([Den.& Schiff.], 1775)			▼	C.
Fam. **ELACHISTIDAE** Bruand, 1850				
Agonopteryx ocellana (Fabricius, 1775)	▼			C.
Agonopteryx putridella ([Den.& Schiff.], 1775)		▼		2 sp. / 27.VII.2000
Ethmia dodocea (Haworth, 1828)			▼	R.C.
Ethmia quadrilella (Goeze, 1783)			▼	R.C.
Hipercallia citrinalis (Scopoli, 1763)			▼	R.C.
Fam. **SCYTHRIDIDAE** Rebel, 1901				
Scythris obscurella (Scopoli, 1763)			▼	R.C.
Fam. **GELECHIIDAE** Stainton, 1854				
Metzneria lapella (Linnaeus, 1758)			▼	R.C.
Acompsia cinerella (Clerk, 1759)			▼	R.C.
Fam. **COLEOPHORIDAE** Hübner, 1825				
Coleophora sp.			▼	C.
Coleophora frischella (Linnaeus, 1758)			▼	R.C.
Suprafam. **ALUCITOIDEA** Leach, 1815				
Fam. **ALUCITIDAE** Leach, 1815				
Alucita hexadactyla (Linnaeus, 1758)			▼	R.
Suprafam. **PTEROPHOROIDEA** Latreille, 1802				

Fam. **PTEROPHORIDAE** Latreille, 1802				
Platyptilia nemoralis Zeller, 1841	▼			R.C.
Merrifieldia tridacyla (Linnaeus, 1758)			▼	R.C.
Hellinsia osteodactylus (Zeller, 1841)			▼	R.C.
Gillmeria tetradactyla (Linnaeus, 1758)		▼		2 sp. / 10.VI.2000
Fam. **SESIIDAE** Boisduval, 1828				
Synanthedon tipuliformis (Clerck, 1759)			▼	R.C.
Chamaesphecia annellata (Zeller, 1847)			▼	R.
Suprafam. **TORTRICOIDEA** Latreille, 1803				
Fam. **TORTRICIDAE** Latreille, 1803				
Tortrix viridana (Linnaeus, 1758)	▼			V.C.
Pandemis cerasana (Hübner, [1786])	▼			V.C.
Pandemis corylana (Fabricius, 1794)	▼			V.C.
Pandemis heparana ([Den.& Schiff.], 1775)	▼			V.C.
Archips crataegana (Hübner, 1799)	▼			V.C.
Archips podana (Scopoli, 1763)			▼	V.C.
Choristoneura hebenstreitella (Müller, 1764)			▼	C.
Ptycholoma lecheana (Linnaeus, 1758)			▼	C.
Grapholita funebrana (Treitschke, 1835)	▼			C.
Agapeta hamana (Linnaeus, 1758)	▼			V.C.
Agapeta zoegana (Linnaeus, 1767)	▼			V.C.
Hedya salicella (Linnaeus, 1758)	▼			C.
Hedya pruniana (Hübner, 1799)	▼			R.C.
Olethreutes arcuella (Clerk, 1759)	▼			R.C.
Eulia ministrana (Linnaeus, 1767)	▼			V.C.
Suprafam. **PYRALOIDEA** Latreille, 1809				
Fam. **PYRALIDAE** Latreille, 1809				
Orthopygia glaucinalis (Linnaeus, 1758)			▼	R.C.
Pyralis regalis ([Den. & Schiff.],1775)	▼			R.C.
Pyralis farinalis (Linnaeus, 1758)	▼			R.
Aglossa pinguinalis (Linnaeus, 1758)			▼	R.C.
Endotricha flammealis ([Den. & Schiff.],1775)			▼	C.
Galleria melonella (Linnaeus, 1758)			▼	R.
Lamoria zelleri Joannis, 1932			▼	R.C.
Sciota adelphella (Fischer von Röslerstamm, 1836)		▼		1 sp. / 9.VI.2000
Oncocera semirubella (Scopoli, 1763)	▼			V.C
Selagia argyrella ([Den. & Schiff.],1775)	▼			V.C
Phycita roborella ([Den. & Schiff.],1775)			▼	2 sp. / 7.VIII.2018
Dioryctria abietella ([Den. & Schiff.], 1775)		▼		R.C.
Etiella zinkenella (Treitschke, 1832)			▼	C.
Ephestia elutella (Hübner, 1796)	▼			R.C.
Fam. **CRAMBIDAE** Latreille, 1810				
Scoparia ambigualis (Treitschke, 1829)			▼	R.C.
Scoparia pyralella ([Den. & Schiff.], 1775)			▼	R.C.
Calamotropha paludella (Hübner, 1824)	▼			V.C.
Chrysoteuchia culmella (Linnaeus, 1758)	▼			C.
Crambus pascuella (Linnaeus, 1758)	▼			C.
Crambus lathoniellus (Zincken, 1817)	▼			C.
Crambus perlella (Scopoli, 1763)	▼			C.
Crambus ericella (Hübner, 1813)			▼	1 sp. / 26.VII.2008

Crambus lathoniellus (Zincken, 1817)			▼	2 sp. / 26.VII.2008
Agriphila tristella ([Den. & Schiff.], 1775)	▼			V.C.
Catoptria permutatella (Herrich-Schaffer, 1848)	▼			C.
Xanthocrambus leceellus (Herrich-Schaffer, 1848)			▼	1 sp. / 21.VI.2018
Thysanotia chrysonuchella (Scopoli, 1763)	▼			C.
Pediasia contaminella (Hübner, 1796)		▼		C.
Pediasia aridella caradjaella Rebel, 1910			▼	2 sp. / 21.VI.2018
Pediasia luteella ([Den. & Schiff.], 1775)			▼	C.
Platytes cerusella ([Den. & Schiff.], 1775)	▼			C.
Cataclysta lemnata (Linnaeus, 1758)	▼			V.C.
Parapoynx stratiotata (Linnaeus, 1758)	▼			V.C.
Aporodes floralis (Hübner, 1809)			▼	C.
Cynaeda dentalis ([Den. & Schiff.], 1775)	▼			R.C.
Evergestis limbata (Linnaeus, 1767)	▼			R.C.
Evergestis politalis ([Den. & Schiff.], 1775)			▼	1 sp. / 7.VIII.2018
Loxostege sticticalis (Linnaeus, 1761)			▼	C.
Paratalanta pandalis (Hübner, 1825)	▼			R.C.
Pyrausta purpuralis (Linnaeus, 1758)	▼			C.
Pyrausta rectefascialis Toll, 1936			▼	1 sp. / 7.VIII.2018
Pyrausta sanguinalis (Linnaeus, 1767)			▼	R.C.
Pyrausta despicata (Scopoli, 1763)			▼	R.C.
Pyrausta falcatalis Guenee, 1854			▼	R.C.
Pyrausta aurata (Scopoli, 1763)			▼	2 sp. / 4.IX.2018
Sitochroa palealis ([Den. & Schiff.], 1775)	▼			R.C.
Ostrinia nubilalis (Hübner, 1796)			▼	C.
Anania hortulata (Linnaeus, 1758)			▼	C.
Phlyctaenia coronata (Hufnagel, 1767)	▼			V.C.
Anania verbascalis ([Den. & Schiff.], 1775)			▼	R.C.
Pleuroptya ruralis (Scopoli, 1763)			▼	R.C.
Udea olivalis (Den. & Schiff., 1775)			▼	R.C.
Agrotera nemoralis (Scopoli, 1763)	▼			R.C.
Diasemia reticularis (Linnaeus, 1761)	▼			C.
Cydalima perspectalis (Walker, 1859)			▼	2 sp. / 4.IX.2018
Nomophila noctuella ([Den.& Schiff.],1775)	▼			V.C.

Fig. 1 Area location in Romania

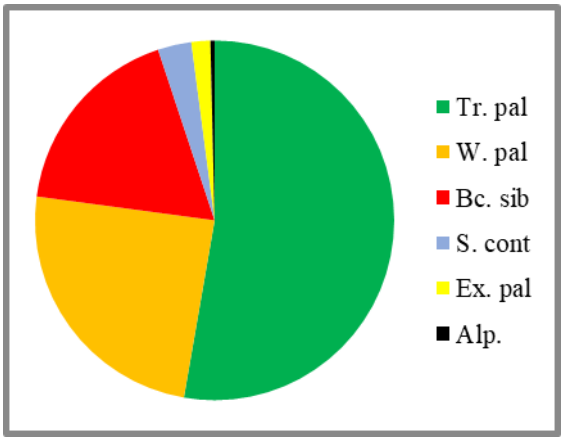

Fig. 2 Dominant Fauna Types (FT)

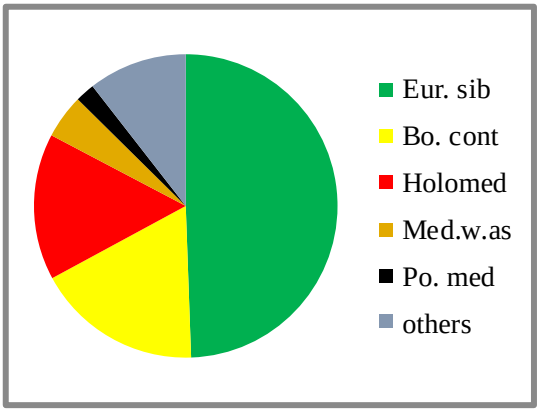

Fig. 3 Dominant Faunal Elements (FE)

Fig. 4

Fig. 5

Fig. 6

Fig.7

Fig. 8

Fig. 9

Fig. 10

Fig. 11

Fig. 12

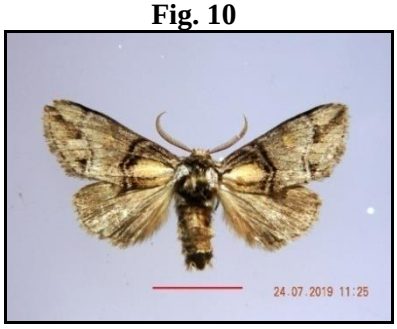

Fig. 13

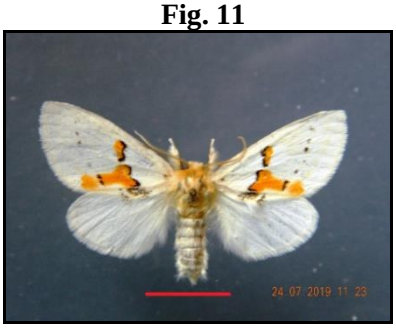

Fig. 14

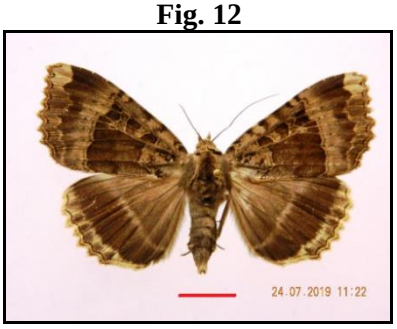

Fig. 15

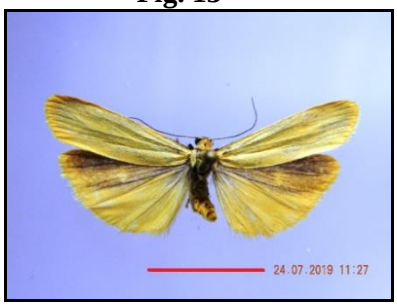

Fig. 16

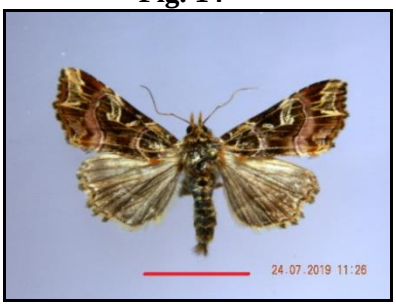

Fig. 17

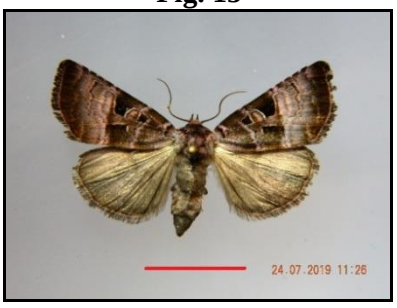

Fig. 18

Fig. 4 – Fig. 18 Photos: L. Székely (red line=1 cm)

IMPACT OF GOLDENROD INVASION (*SOLIDAGO CANADENSIS*) ON ANT ASSEMBLAGES (HYMENOPTERA: FORMICIDAE) FROM URBAN HABITATS IN SOUTHERN TRANSYLVANIA (ROMANIA)

Roxana MIRICĂ*
Ioan TĂUȘAN *

Abstract*. The Canadian goldenrod (Solidago canadensis) is a long-lived perennial plant native to North America but invasive in Europe, Asia, Australia and New Zeeland. The invasion of Solidago canadensis may affect both plants and invertebrates species richness and abundance. Ants are an important component of terrestrial ecosystems because they act as ecosystem engineers. We investigated ant assemblages from open urban habitats near the city of Sibiu (Transylvania, Romania). Sampling was carried out in an open habitat mosaic where Solidago canadensis has invaded the grasslands in August 2018. Altogether, we identified five ant species. The ant fauna is poor and characterized by tolerant species only, except for Formica clara. Results show significant differences between the invaded and non-invaded habitats in terms of species richness. However, the overall image suggests that the effect of Solidago canadensis is so drastic that even the non-invaded sites are impoverished and without suitable management measures, for instance, there will be no sign of recovery.*

Keywords*: community ecology, abundance, diversity, grasslands.*

Rezumat. *Solidago canadensis este o plantă perenă nativă din America de Nord, dar invasivă în Europa, Asia, Australia și Noua Zeelandă. Invazia cu Solidago canadensis poate afecta atât comunitățile de plante, cât și de animale, la nivel de abundență sau diversitate. Comunitățile de furnici sunt o componentă importantă a ecosistemelor terestre, fiind considerate adevărați "ingineri" ai ecosistemelor. Am investigat comunitățile de furnici din pajiști dintr-o zonă urbană, din orașul Sibiu (Transilvania, România). Colectările au fost întreprinse în august 2018, într-o zonă unde există un mozaic de parcele invadate cu Solidago canadensis și parcele neinvadate. În total, au fost identificate 5 specii de furnici. Mirmecofauna este una săracă, iar cu excepția speciei Formica clara, toate speciile au o valență ecologică largă. Rezultatele indică diferențe semnificative între parcelele invadate și neinvadate în ceea ce privește numărul de specii. Imaginea generală sugerează că impactul speciei Solidago canadensis este atât de drastic, încât, fără manangement adecvat, aceste habitate nu se vor mai putea recupera.*
Cuvinte cheie: *ecologia comunităților, abundență, diversitate, pajiști.*

Introduction

Invasive species can induce serious environmental consequences, causing significant damage to ecosystems, which can be impacted up to the complete disappearance of local (indigenous) species (Richardson, Pyšek, 2012).

The Canadian goldenrod (*Solidago canadensis* L.) is a long-lived perennial plant native to North America (Semple, Cook 2006) but a successful invasive species in Europe, Asia, Australia and New Zeeland (Lu *et al.* 2007).

The Canadian goldenrod's success is due to a prolific vegetative propagation (Meyer, Schmid 1999) and the release of chemicals that inhibit the growth, germination and survival of native plants (Abhilasha *et al.* 2008). Moreover, its presence alters the soil composition by diverting nutrients and minerals (Zhang *et al.* 2009).

However, according to Abhilasha *et al.* (2008) *the traits enabling the species to successfully establish in natural ecosystems around the world and dominate the new ecosystems remain unclear*. More recent studies point out that plants - soil biota interactions may enhance the invasion process (Klironomos 2002; Wolfe, Klironomos 2005; Wurst *et al.* 2011).

The invasion of *Solidago canadensis* may affect both plants and invertebrate's species richness and abundance (Gusev 2015).

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Invasive plants are reported to influence the abundance and diversity of smaller, mostly solitary wild bees (Apoidea) of limited dispersal ability (Gathmann, Tscharntke 2002), as well as hoverflies (Syrphidae) and bumblebees, which generally have larger foraging ranges (Greenleaf *et al.* 2007). Therefore, invasive species might threaten biodiversity at the local level, as well as at global scale (Vitousek *et al.* 1996; Hejda *et al.* 2009).

The establishment of invasive plants may influence not only the native flora and the trajectory of its secondary succession but can also have an impact on the related invertebrate communities, such as ants (Kajzer-Bonk *et al.* 2016, Grześ *et al.* 2018, Trigos-Peral e*t al.* 2018).

Ants are an important component of terrestrial ecosystems because they act as ecosystem engineers (Del Torro *et al.* 2012). There are used as reliable faunistic bioindicator group (Majer *et al.* 2007) as they are highly sensitive to environmental changes (Underwood, Fisher 2006; Ślipiński *et al.* 2012; Zmihorski, Ślipiński 2016; Tăușan *et al.* 2017).

Solidago canandensis presence may affect the abundance of ant nests (Kajzer-Bonk *et al.* 2016), the size of the collonies (Grześ *et al.* 2018) and may cause changes in the abundance and species composition through changes of microhabitat characteristics (e.g. decrease of soil moisture (Trigos-Peral e*t al.* 2018). Thus, few data are available on the effect of *Solidago canadensis* on the community level.

In the present paper we aim to give insights on the goldenrod effect on abundance and diversity of ant communities in an urban area.

Study area

We investigated ant assemblages from open urban habitats near the city of Sibiu (Transylvania, Romania) (N lat. 45.784544, E long. 24.129297). Sampling was carried out in open habitats where *Solidago canadensis* has invaded the grasslands. The overall landscape consists in a mosaic of invaded and non-invaded patches of grasslands.

Material and methods

The sampling design consisted of five invaded sites and five non-invaded (Figure 1). The non-invaded sites were characterized by the following most abundant plant species: *Calamagrostis epigejos, Cynodon dactylon, Setaria viridis* and *Festuca pratensis.* In the invaded plots, *Solidago canadensis* had an average coverage of 77.5%.

In all plots, five pitfall traps/plot were installed (200 ml plastic cup filled with glycol and water 1:1). A total of 50 pitfall traps were instaled and checked after two weeks, in one field campaign, in August 2018.

The myrmecological material was identified to species level based on Czechoswki *et al.* (2012) keys. The material is preserved in the personal collection of the last author. For statistical purposes only the worker material was considered.

Stastistical approach

The number of ant species and the Shannon-Wiener diversity index at each plot were used to characterize species diversity ant assemblages.

ANOVA analysis were applied for testing differences in abundance and diversity of ant communities from invaded and non-invaded habitats. All analysis were perfomed using the R software (R Core Team 2016).

Results and discussion

Altogether, we identified five ant species namely: *Formica clara*, *Formica cunicularia*, *Lasius niger*, *Myrmica scabrinodis* and *Tetramorium* cf. *caespitum*. The ant fauna is poor and characterized by tolerant species only, except for *Formica clara.* In terms of abundance, in both types of habitats, *Lasius niger* was the most abundant. Yet, *Tetramorium* cf *caespitum* and *Formica cunicularia* showed similar results in both invaded and non-invaded habitats (Figure 2 and Figure 3). Thus, in terms of abundance there were low variations within the invaded and non-invaded plots (ANOVA p=0.289, F=1.287) (Figure 4).

If no differences were recorded regarding the abundance, the diversity was affected by the presence of *Solidago canadensis.* We recorded significant differences within the invaded and non-invaded plots in terms of species richness (ANOVA p=0.000929, F=2.49, Tukey multiple comparisons of means p adj= 0.0009287) (Figure

5), with *Formica clara* being collected exclusively on the non-invaded plots.

Yet, in the case of the Shannon-Wiener diversity we did not record significant differences (ANOVA p=0.19, F=2.163) (Figure 6).

Previous studies showed that goldenrod-invaded grasslands are not suitable for *Myrmica* ants or can even be considered stressful (Lenda *et al.* 2013; Kajzer-Bonk *et al.* 2016). Our results showed similar patterns, recording a low abundance of *Myrmica scabrinodis*, slightly higher in the invaded plots.

The most abundant species was *Lasius niger*. Our finding agrees with other studies (Kajzer-Bonk et al. 2016) suggesting that this species is quite resilient to environmental changes and it is an opportunistic species (Czechowski *et al.* 2012).

The abundance was higher in the invaded plots probably occupying all the free niches after the decline of other ant species (Kajzer-Bonk et al. 2016).

Results show significant differences between the invaded and non-invaded in terms of species richness and abundance. The overall image suggest that the effect of *Solidago canadensis* is so drastic that even the non-invaded sites are impoverished and without management measures, for instance, there will be no sign of recovery.

Acknowledgments

We would like to thank Dr. Sergiu Török for his usefull comments which improved the manuscript. Finally, we are grateful for the help of MSc Miruna Popa and BSc Corina Boboc who assisted us in the field.

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LIST OF ILLUSTRATIONS

LISTA ILUSTRAȚIILOR

Table 1 List of the ant species collected in the investigated grasslands; with reference to their ecological preference in terms of temperature and humity: P – polytopic, mte – mesothermophile, oli-mte – oligo-mesothermophile, mte-ter – mesothermo-thermophile, EC – Euro-Caucasian, ES – Euro-Siberian, NP – North-Palaearctic, SP – South Palaearctic, based on Czechowski et al.2012)

	Species	Zoogeographi -cal elements	Ecological requirements			
			Plasticity	Humidiy	Temperature	Habitats
	Subfamily Formicinae					
1.	*Formica cunicularia* Latreille, 1798	EC	P	mes-xer	mte-ter	Open habitats
2.	*Formica clara* Forel, 1886	EC	P	mes-xer	mte-ter	Dry grasslands
3.	*Lasius niger* Linnaeus, 1758	NP	P	mes	mte	Open habitats (including anthropogenic)
	Subfamily Myrmicinae					
4.	*Myrmica scabrinodis* Nylander, 1846	ES	P	mes	oli-mte	Humid habitats (both open and forest)
5.	*Teramonium* cf. *caesptium*	SP	P	mes-xer	mte-ter	Dry habitats (both open and forest, including anthropogenic)

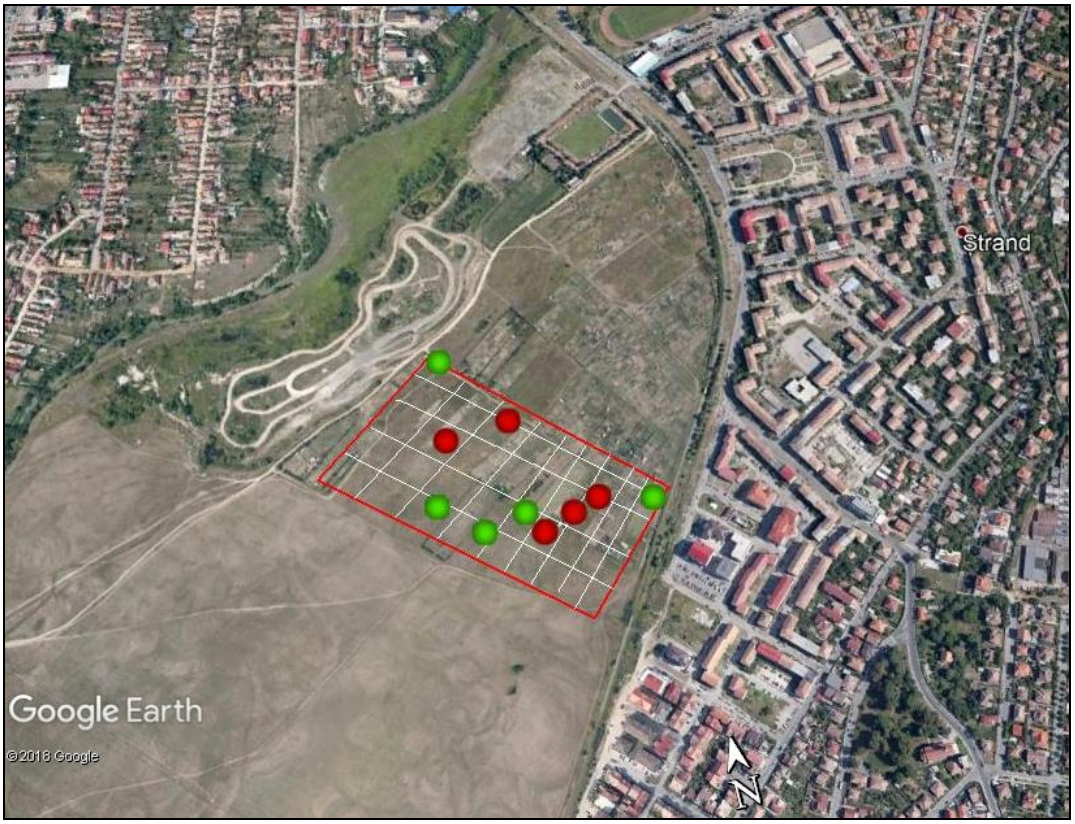

Fig. 2 Map of sampling plots in Sibiu city (green circles – non-invaded plots, red circles – invaded plots) (based on Google Earth)

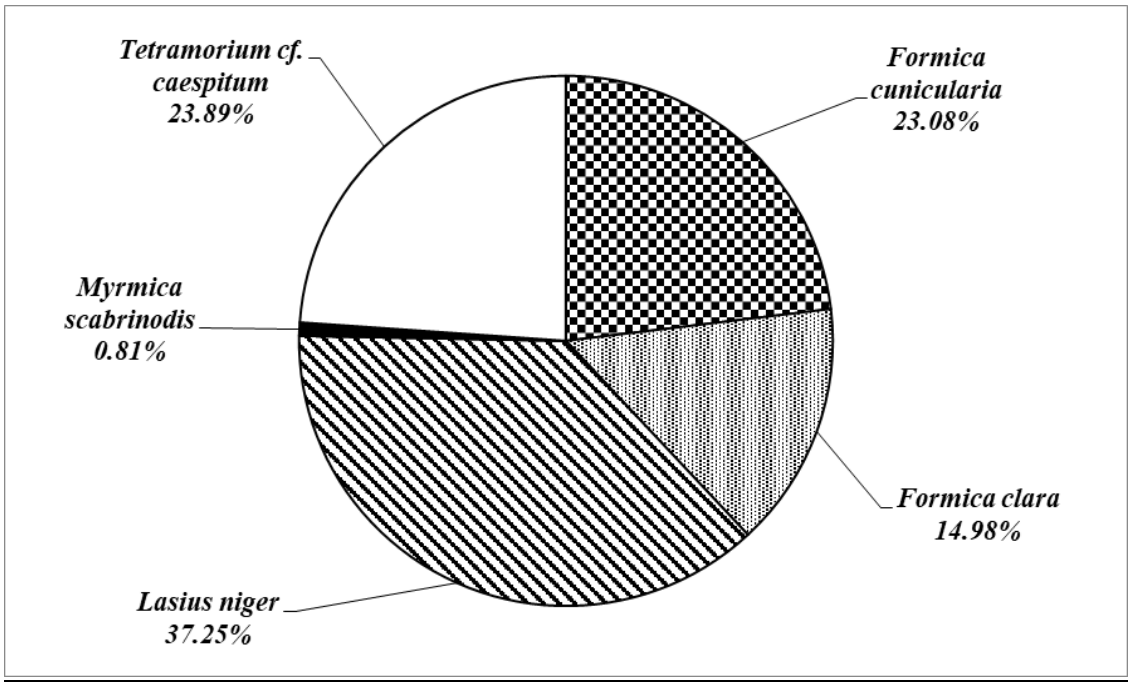

Fig. 3 Ant relative abundance in the non-invaded plots

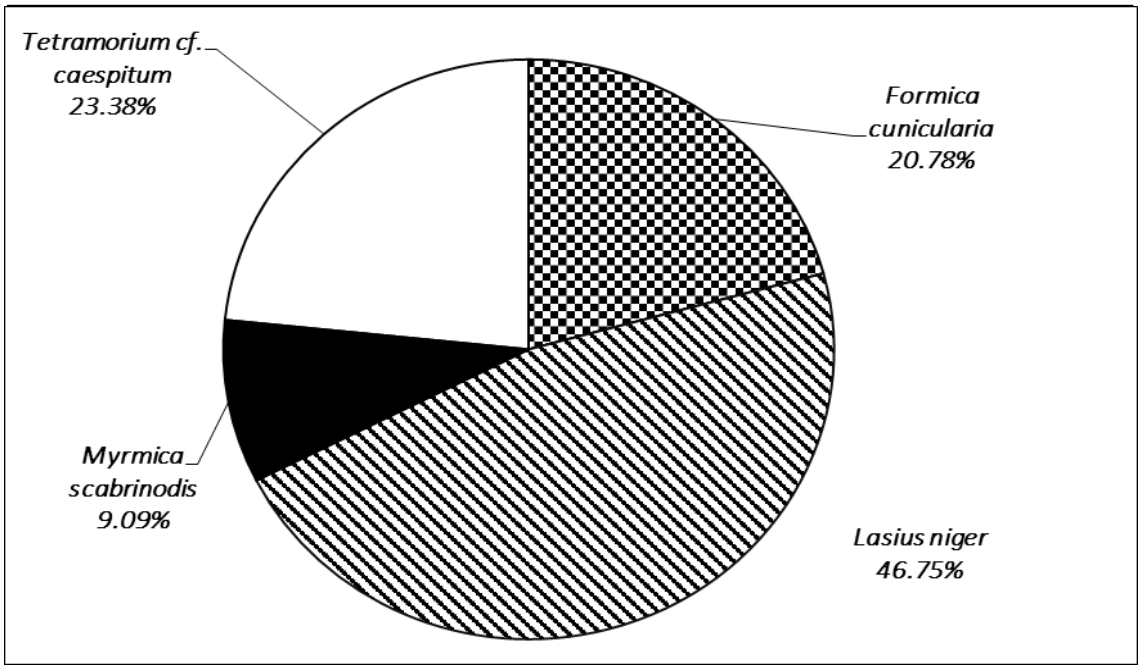

Fig. 4 Ant relative abundance in the invaded plots

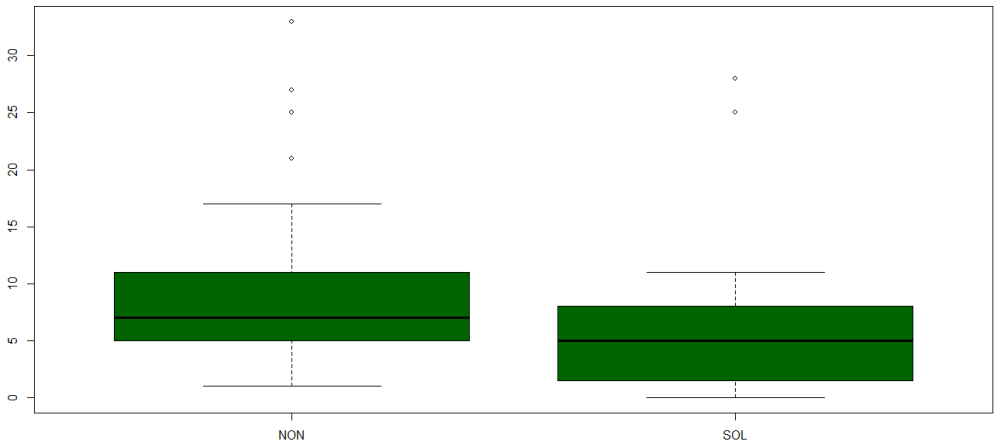

Fig. 5 Box-plot of ant abundance (number of individuals) variation in invaded and non-invaded plots (codes: NON – non-invaded, SOL – invaded with *Solidago canadensis*)

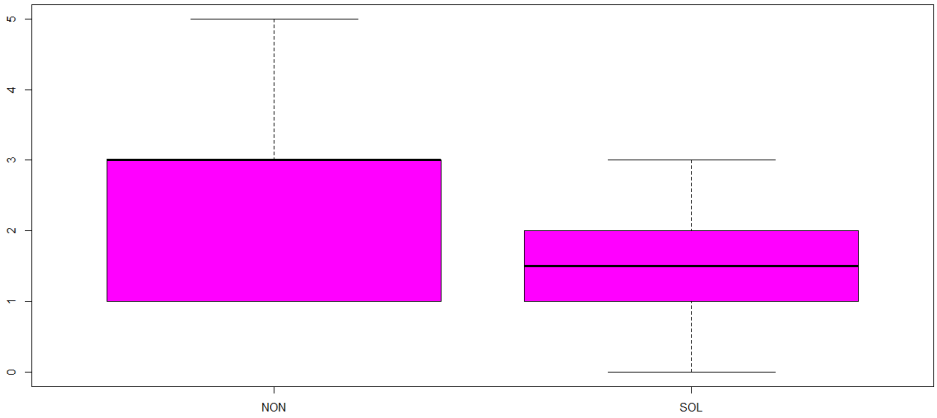

Fig. 6 Box-plot of ant species number variation in invaded and non-invaded plots (codes: NON – non-invaded, SOL – invaded with *Solidago canadensis*)

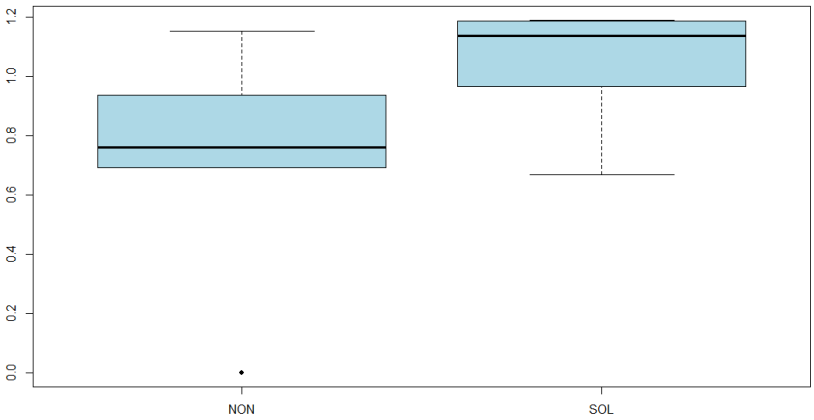

Fig. 7 Box-plot of Shannon-Wiener diversity variation in invaded and non-invaded plots (codes: NON – non-invaded, SOL – invaded with *Solidago canadensis*)

THE CATALOGUE OF THE KIMAKOWICZ MALACOLOGICAL COLLECTION FROM THE NATURAL HISTORY MUSEUM IN SIBIU (PART II)

Ana-Maria PĂPUREANU*

Abstract. *The Natural History Museum in Sibiu celebrated 170 years since the birth of Mauritius von Kimakowicz (1849-1921). The scientific activity of this great naturalist was vast and diversified, demonstrating its encyclopedic character, a personality dedicated to culture in all its aspects. The present paper presents an aspect of the biography and scientific activity of M. von Kimakowicz and comprises part of the catalog of the Kimakowicz Malacological collection, respectively the General Collection, less studied by the specialists in our country.*
Keywords*: Kimakowicz Malacological collections, catalogue, Natural History Museum.*

Rezumat. *Muzeul de Istorie Naturală din Sibiu a comemorat 170 de ani de la nașterea lui Mauritius von Kimakowicz (1849-1921). Activitatea științifică, a acestui mare naturalist, a fost vastă și diversificată, demonstrând caracterul enciclopedic al acestuia, o personalitate dedicată culturii sub toate aspectele ei. Lucrarea de față prezintă aspecte din biografia și activitatea științifică a lui M. von Kimakowicz și cuprinde o parte din catalogul colecției Malacologice Kimakowicz, respectiv Colecția Generală, mai puțin studiată de către specialiștii din țara noastră.*
Cuvinte cheie: *colecţia malacologică Kimakowicz, catalog, Muzeul de Istorie Naturală.*

Introduction

In 2019, the Natural History Museum in Sibiu commemorated 170 years since the birth of Mauritius Hieronymus von Kimakowicz-Winnicki (1849-1921), one of the great naturalists of his time.

Mauritius Hieronymus von Kimakowicz-Winnicki (1849-1921) was born in Klaubuk, Mähren in 1849. After his birth, his father became the accountant of Sibiu. Young Mauritius attended his first years of school in Sibiu. In 1868 he obtained his *Abituriums* diploma after graduating the Vienna Technical School with the aim of pursuing a career as an Engineer. In 1873 he returned to Sibiu as an Engineer. Here, he reconnected and resumed his independent natural sciences research (Jikeli, 1922, 58). The confirmation of his passion came when he became a member of the *Transylvanian Society for Natural Sciences in Sibiu* (*Siebenbürgischer Verein für Naturwissenschaften zu Hermannstadt*).

His time was divided, in the morning he was either in the field or in the laboratory, and he devoted his nights to study. It was he who collected the specimens, determined them and prepared them to be included in his particular collection which, over time, became substantial. Kimakowicz's welcoming home was a place of attraction for his friends but also a youth study environment, a kindly lighted home, cared for by his wife. In the beautifully landscaped garden were the glasshouse and the laboratory. The author recalls how in the laboratory there were always new, interesting things: stuffed animals, skulls and skeletons, alcohol specimens, cockroaches and snails. Also, here Jikeli has witnessed a taxidermy work (Jikeli, 1922, 58, 60).

In 1886, Mauritius von Kimakowicz becomes the custodian of the Zoological Collection of the Natural History Museum established by the Transylvanian Society, except for the Lepidoptera collection. Becoming the custodian of the Museum's Zoological Collection, he also included his private collection in the museum's heritage. As a custodian of the Society's zoological collections, he worked in particular in the collection and to enlarge them:

- in 1899, he donated 300 pieces belonging to 180 taxons;
- he colected for the enthomological collections beetle species from Transylvania;
- von Kimakowicz initiated the Ortopthera Collection including 2600 specimens from Transylvania;

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- with the help of P. L. Strobel from Admont (Austria) M. von Kimakowicz initiated the Diptera Collection starting with 600 specimene from Transylvania;
- together with A. v. Sachsenheim and Dr. D. Czekelius opened a new Adriatic fish collection;
- the museum's amphibian and reptilia collections were enlarged with specimens;
- many of the Ornithology pieces were donated or prepaired by von Kimakowicz (Jikeli, 1922, 59);
- the only elephant skull and narwhal tooth present in the museum collections were donated by him.

His journalistic activity in the field of natural sciences has been characterized in the first years by works dedicated to malacological research that have been published in the journal of the Society *Verhandlungen und Mitteilungen des Siebenbürgischen Vereins für Naturwissenschaften*, but also in journals from abroad mainly from Germany. Mauritius v. Kimacowicz was a correspondent member of the *Senkenberger Nature Research Society* in Frankfurt. He has collaborated and maintained correspondence with numerous scientists from the country and abroad.

He also handled the ethnographic and paleontological collections of the Museum. Kimakowicz's contribution to the Paleontology collection consisted of the steppe bison skeleton *Bison priscus*, dating back to the beginning of the Quaternary, found in Sighisoara in 1900, when digging a home basement. The species disappeared at the end of Pleistocene being replaced in Europe by zimbru or bour. He was dug up and prepared by Mauritius von Kimakowicz, and then joined with Otto Phleps (1868-1928) to describe it in the museum periodical. The skeleton belonged to a female. The skeleton is still exhibited today in the Paleontological Sector of the Museum being the only complete skeleton in Romania belonging to this extinct species.

And his passion for nature sciences did not stop there: the mineralogical-petrographical collection of Mauritius von Kimakowicz counts 1689 pieces. Minerals from the collection come from different regions of Romania and from abroad, especially from Europe (Germany, Austria, Hungary, and Switzerland). Of scientific and documentary interest are the samples of tellurium and native arsenic from Săcărâmb, Baia de Arieş, Sacrimb's silvanite and naghanite samples, the Cavnic tetrahedrith as well as quartz and chalcedony varieties as well as samples of fluorite, calcite, barite. The petrographic elements of the collection were collected and purchased from the country (Apuseni Mountains, Petroşani Basin, Transylvanian Basin, Cibin Mountains, Bucegi Mountains), and from France, Belgium, Sweden and Norway from Europe to the countries of origin of minerals. The petrographic collection includes, in particular, magmatic samples, sedimentary pieces and metamorphic samples (Ciuntu, 1998, 41-42).

In 1907 he became the custodian of the archeological collection of Baron Brukenthal and the treasurer of the Brukenthal Museum, relinquishing his position as the Natural History Museum director and as custodian of the Zoological Collections (Hienz, 2001, 63-64).

He has shown an interest in the study of cultural history, art history and archeology.

Following some sewerage works in Sibiu, at the beginning of the 20th century, M. von Kimakowicz conducted in 1911 local historiography studies completed with the work of *Alt Hermannstadt. Ein entwicklungsgeschichtliche Study*, published in the *Archives des Vereins für Siebenbürgische Landeskunde*, describing the strategic importance of buildings such as the old town hall in Sibiu (Beşliu Munteanu, 2006, 19, 56).

Also, through his work Studien zur Baugesschichte der evangelischen Stadtfarrkirche in Hermannstadt (1913), he partially deciphered Marian inscriptions on the western portal of the Virgin Mary Church in Sibiu, inscriptions dated 1431 (Albu, 2008, 83).

Following complications after an operation, on March 5, 1921 Mauritius von Kimakowicz died in Sibiu, at the age of 72 years.

At the time of his death, according to the obituary:

• the director of the Museum of Natural History;
• director of the Transylvanian Society of Natural Sciences of Sibiu;
• the custodians of the archaeological collection within the Museum of Baron Brukenthal.

The basis of the Kimakowicz Malacological Collection was set in 1887 by Mauritius von Kimakowicz and continued by his son Richard Emanuel (1876-1973). Mauritius von Kimakowicz's research overlapped with that of his son, and they both devoted almost entirely to Clausilia (Alopia). In 1967, the collection consisted of 305,431 shells belonging to different types of mollusks from the country and abroad. The collection exceeded in proportion all the collections that existed at that time in the museum

heritage. The collection was actually included in the museum heritage in 1973.

The General Collection comprises 115,279 specimens, material belonging to 5 classes, 15 orders, 236 families, 831 genuses according to the written inventory register. Of these, 2211 specimens are grouped separately as fossils.

The special Alopia Collection counts 73,321 copies (together with the doubles of 37,190 specimens), largely collected and processed by the two collectors and represents by volume and scientific organization a unique collection in the country.

Also, the large number of doubles, 116,831 copies, which are important and valuable material, can not be neglected.

Rich material included in the collection was the basis for the description of new species and subspecies published by Mauritius and Richard von Kimakowicz, mostly in the Society's periodical.

The Kimakowicz collection also includes a considerable amount of unprocessed material, which will allow for various studies and documentation in the future. This collection can be considered as an international heritage due to the specimens origin areas and the type material.

The catalogue of the Kimakowicz Malacological Collection from the Natural History Museum Sibiu part I presented 113 species belonging to 64 genuses and 11 families. The majority of the species catalogued at that point belonged to the superfamily Muricoidea, family Muricidae (Mesaroș 2013, 469-486).

At present, we list the following inventory numbers continuing the catalogue. The specimens were identified using today's internet resources (databases, online catalogues etc.).

Material

Each specimen has been described, measured and identified according to today's taxonomy. Information included in the original label is presented in this catalogue:

- the new inventory number and written in parenthesis the old inventory number;
- the current scientific name;
- the scientific name of the species as it is written on the original label;
- the number of specimens found under that inventory number;
- the collecting sites.

The species were identified with the help of internet databases (Appeltans *et al.*, 2012; Rosenberg, 2009; Hardy, 2013), confirming also the old scientific names considered today as synonyms. The taxonomic classification follows the World Register of Marine Species (Appeltans *et al.*, 2012).

Class *Gasteropoda*

Order *Neogastropoda*
Superfamily *Muricoidea*
Family *Turbinellidae*

Subfamily *Tudiclinae*

Genus *Tudicla* Röding, 1798
142 (3704) *Tudicla spirillus* (Linnaeus, 1767), Spiral Tudicla, 2 specimens, Est India.

Subfamily *Turbinellinae*

Genus *Turbinella* Lamarck, 1799
760 (3705) *Turbinella pyrum pyrum* (Linnaeus, 1758), Indian Rapa Chank, 1 specimen, Indian Ocean.

Subfamily *Vasinae*

Genus *Vasum* Röding, 1798
761 (3707) *Vasum* Röding, 1798, label *Vasum (Cynodonta) pugillare*, 1 specimen, West Indies;
762 (3706) *Vasum rhinoceros* (Gmelin, 1791), 1 specimen, Batavian Republic, the Kingdom of the Netherlands;
763 (5210) *Vasum* Röding, 1798, label *Vasum (Cynodonta) cornigenatum*, 1 specimen, Ambon Island, part of the Maluku Islands of Indonesia;
764 (3710) *Vasum* Röding, 1798, label *Vasum (Cynodonta) cornigenatum*, 1 specimen, East Indies;
765 (3709) *Vasum* Röding, 1798, label *Vasum (Cynodonta) cornigenatum*, 6 specimens, Massawa, Eritrea, northern Red Sea;
766 (3708) *Vasum* Röding, 1798, label *Vasum (Cynodonta) cornigenatum*, 2 specimens, Dahlak Arhipelago, Red Sea;
767 (3719) *Vasum* Röding, 1798, label *Vasum (Cynodonta) cornigenatum*, 1 specimen, Indian Ocean, Orient.

Family *Costellariidae*

Genus *Vexillum* Röding, 1798:
369 (6150) *Vexillum pharaonis* (Issel, 1869), label *Phos pharaonis*, 7 specimens, Massawa, Eritrea, northern Red Sea.

Family *Babyloniidae*

Genus *Babylonia* Schlüter, 1838:

493 (6227) *Babylonia* Schlüter, 1838, label *Eburna ceylonica*, 1 specimen, Ceylon today the Democratic Socialist Republic of Sri Lanka;
494 (6228) *Babylonia areolata* (Link, 1807), label *Eburna areolata*, 1 specimen, People's Republic of China;
495 (6225) *Babylonia japonica* (Reeve, 1842), label *Eburna japonica* Reeve, 1842, 1 specimen, Japan;
496 (6229) *Babylonia spirata* (Linnaeus, 1758), label *Eburna spirata*, 2 specimens, Ceylon today the Democratic Socialist Republic of Sri Lanka;
497 (6226) *Babylonia lutosa* (Lamarck, 1816), label *Eburna lutosa* Lamarck, 1816, 1 specimen, People's Republic of China;
713 (3684) *Babylonia* Schlüter, 1838, label *Dipsacus glabratus*, 1 specimen, Mexico.

Family *Margineliidae*
Subfamily *Granulininae*

Genus *Granulina* Jousseaume, 1888
507 (6239) *Granulina isseli* (G. Nevill & H. Nevill, 1875), label *Purpura (Thalessa) isseli*, 1 specimen, Dahlak Arhipelago, Red Sea;
509 (6240) *Granulina isseli* (G. Nevill & H. Nevill, 1875), label *Purpura (Thalessa) isseli*, 9 specimens, Massawa, Eritrea, northern Red Sea;
511 (6240) *Granulina isseli* (G. Nevill & H. Nevill, 1875), label *Purpura isseli*, 8 specimens, Massawa, Eritrea, northern Red Sea.

Genus *Volvarina* Hinds, 1844:
890 (3661) *Volvarina lactea* (Kiener, 1841), label *Volvaria alacol*, 2 specimens, Aucey-la-Plain, Franța;
892 (3921) *Volvarina compressa* (Reeve, 1865), label *Volvaria compressa*, 1 specimens, Dahlak Arhipelago, Red Sea;
893 (3663) *Volvarina avena* (Kiener, 1834), label *Volvaria avena*, 2 specimens, St. Ian.

Subfamily *Marginellinae*

Genus *Mesoginella* Laseron, 1957:
891 (3669) *Mesoginella pygmaea* (G.B. Sowerby, 1846), label *Volvaria pygmaea*, 5 specimens, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea.

Family *Volutidae*
Subfamily *Amoriinae*
Tribe *Meloini*
Genus *Cymbiola* Swainson, 1831
768 (3711) *Cymbiola vespertilio* Linnaeus, 1758, label *Voluta (Aulica) vespertilis*, 1 specimen, East Indies;
769 (3504) *Cymbiola vespertilio* Linnaeus, 1758, label *Voluta vespertilio* Linnaeus, 1758, 2 specimens, Phillipine;
770 (3713) *Cymbiola vespertilio* Linnaeus, 1758, label *Voluta vespertilio* Linnaeus, 1758, 4 specimens, Republic of Singapore.
771 (3717) *Cymbiola nobilis* (Lightfoot, 1786), label *Voluta scapha* Gmelin, 1791, 1 specimen, Suez Canal, Red Sea;
772 (6395) *Cymbiola nobilis* (Lightfoot, 1786), label *Voluta scapha* Gmelin, 1791, 1 specimen, Indian Ocean;
777 (3715) *Cymbiola cymbiola* (Gmelin, 1791), label *Voluta corona* Dillwyn, 1817, 1 specimen, Indian Ocean;
778 (9631) *Cymbiola nobilis* (Lightfoot, 1786), label *Voluta (Aulica) scapha*, 1 specimen, Republic of Singapore;
779 (3712) *Cymbiola nobilis* (Lightfoot, 1786), label *Voluta (Aulica) scapha*, 1 specimen, Republic of Singapore;
780 (9629) *Cymbiola nobilis* (Lightfoot, 1786), label *Voluta (Aulica) scapha*, 2 specimens, 1 specimen, Republic of Singapore.

Genus *Melo* Broderip in Sowerby I, 1826:
773 (9630) *Melo amphora* (Lightfoot, 1786), label *Voluta (Yetus) diadema*, 1 specimen, Republic of Singapore.

Tribe *Amoriini*

Genus *Amoria* Gray, 1855:
781 (3716) *Amoria undulata* (Lamarck, 1804), label *Voluta (Scophella) undulate*, 1 specimen, New Hollande.

Subfamily *Volutinae*
Tribe Volutini

Genus *Voluta* Linnaeus, 1758:
774 (6393) *Voluta musica* Linnaeus, 1758, 1 specimen, Indian Ocean;
776 (3718) *Voluta musica* Linnaeus, 1758, 1 specimen, People's Republic of China.

Subfamily *Fulgorariinae*

Genus *Fulgoraria* Schumacher, 1817
Subgenus *Fulgoraria (Fulgoraria)* Schumacher, 1817:
775 (3714) *Fulgoraria (Fulgoraria) rupestris rupestris* (Gmelin, 1791), label *Voluta rupestris* Gmelin, 1791, 1 specimen, West Indies.

Family *Mitridae*

Genus *Mitra* Lamarck, 1798
782 (3589) *Mitra mitr*a (Linnaeus, 1758), label *Mitra episcopalis* (Linnaeus, 1758), 2 specimens, Republic of Singapore;
783 (3590) *Mitra mitra* (Linnaeus, 1758), label *Mitra episcopalis* (Linnaeus, 1758), 2 specimens, Phillipine;
784 (6396) *Mitra mitra* (Linnaeus, 1758), label *Mitra episcopalis* (Linnaeus, 1758), 2 specimens, Pacific Ocean, Port Jackson, Australia;
789 (9634) *Mitra cornea* (Lamarck, 1811), 3 specimens, Adriatic Sea;
791 (9640) *Mitra cornea* (Lamarck, 1811), 1 specimen, Red Sea;
792 (3659) *Mitra* Lamarck, 1798, label *Mitra nebularia striatula*, 1 specimen, Whest Indies;
793 (9633) *Mitra nodulosa* (Gmelin, 1791), label *Mitra granulosa* Lamarck, 1811, 1 specimen, Antilles;
795 (3584) *Mitra aurantia* (Gmelin, 1791), 1 specimen, Indian Ocean, Orient;
797 (5221) *Mitra cucumerina* Lamarck, 1811, label *Mitra cancilla cucumerina*, 2 specimens, Republic of Mauritius;
799 (5225) *Mitra eremitarum* Röding, 1798, label *Mitra adusta* Lamarck, J.B.P.A. de, 1811, 2 specimens, Republic of Mauritius;
800 (5220) *Mitra coffea* Schubert & Wagner, 1829, label *Mitra fulva* Swainson, 1829, 2 specimens, Republic of Mauritius;
801 (3652) *Mitra* Lamarck, 1798, label *Mitra chrysame paeteli*, 1 specimen, South Africa;
802 (3595) *Mitra* Lamarck, 1798, label *Mitra chrysame rotundylirata*, 6 specimens, Massawa, Eritrea, northern Red Sea;
803 (5228) *Mitra rubritincta* Reeve, 1844, label *Mitra (Nebularia) rubritincta* Reeve, 1844, 3 specimens, New Britain Island, Bismarck Arhipelago, Papua New Guinea;
804 (3596) *Mitra rueppellii* Reeve, 1844, label *Mitra chrysame rueppelli*, 11 specimens, Massawa, Eritrea, northern Red Sea;
805 (12254) *Mitra rueppellii* Reeve, 1844, 1 specimen, Massawa, Eritrea, northern Red Sea;
806 (3655) *Mitra* Lamarck, 1798, label *Mitra cgrysame perovii*, 1 specimen, Java Island (Republic of Indonesia);
807 (5216) *Mitra ticaonica* Reeve, 1844, label *Mitra (Nebularia) ticaonica* Reeve, 1844, 2 specimens, Republic of Mauritius;
808 (5953) *Mitra* Lamarck, 1798, label *Mitra* Lamarck, 1798, 1 specimen, Pacific Ocean, Port Jackson, Australia;
809 (6404) *Mitra* Lamarck, 1798, label *Mitra* Lamarck, 1798, 2 specimens, Pacific Ocean, Port Jackson, Australia;
810 (9636) *Mitra* Lamarck, 1798, label *Mitra* Lamarck, 1798, 2 specimens, Pacific Ocean, Port Jackson, Australia;
811 (9635) *Mitra* Lamarck, 1798, label *Mitra* Lamarck, 1798, 1 specimens, Pacific Ocean, Port Jackson, Australia;
812 (9639) *Mitra* Lamarck, 1798, label *Mitra* Lamarck, 1798, 1 specimen, Massawa, Eritrea, Northern Red Sea;
813 (3648) *Mitra acuminata* Swainson, 1824, label *Mitra (Strigatella) acuminata* Swainson, 1824 , 1 specimen, Sandwich Islands today Hawaiian Islands;
814 (52149 *Mitra pellisserpentis* Reeve, 1844, label *Mitra serpentis*, 3 specimens, Republic of Mauritius;
815 (6400) *Mitra auriculoides* Reeve, 1845, 2 specimens, Île Bourbon today Réunion Island (France), Indian Ocean, east of Madagascar, south west of Mauritius Island;
816 (5226) *Mitra paupercula* (Linnaeus, 1758), 4 specimens, New Britain Island, Bismarck Arhipelago, Papua New Guinea;
817 (5218) *Mitra litterata* Lamarck, 1811, label *Mitra (Strigatella) litterata* Lamarck, 1811, 6 specimens,Independent State of Samoa;
818 (5227) *Mitra* Lamarck, 1798, label *Mitra strigella virgata*, 3 specimens, Tokio, Japan;
820 (9637) *Mitra* Lamarck, 1798, label *Mitra* Lamarck, 1798, 1 specimens, Pacific Ocean, Port Jackson, Australia;
821 (6397) *Mitra* Lamarck, 1798, label *Mitra strigella virgata*, 1 specimen, Sandwich Islands today Hawaiian Islands;
828 (6406) *Mitra* Lamarck, 1798, label *Mitra* Lamarck, 1798, 1 specimen, Pacific Ocean, Port Jackson, Australia;
829 (6405) *Mitra* Lamarck, 1798, label *Mitra* Lamarck, 1798, 1 specimen, Pacific Ocean, Port Jackson, Australia;
830 (6408) *Mitra* Lamarck, 1798, label *Mitra* Lamarck, 1798, 2 specimens, Pacific Ocean, Port Jackson, Australia;
831 (6407) *Mitra* Lamarck, 1798, label *Mitra* Lamarck, 1798, 5 specimens, Pacific Ocean, Port Jackson, Australia;
833 (6409) *Mitra* Lamarck, 1798, label *Mitra* Lamarck, 1798, 1 specimen, Pacific Ocean, Port Jackson, Australia;
837 (9638) *Mitra* Lamarck, 1798, label *Mitra* Lamarck, 1798, 1 specimen, Pacific Ocean, Port Jackson, Australia;
846 (5952) *Mitra* Lamarck, 1798, label *Mitra* Lamarck, 1798, 2 specimens, Pacific Ocean, Port Jackson, Australia;

848 (6403) *Mitra* Lamarck, 1798, label *Mitra* Lamarck, 1798, 1 specimen, Pacific Ocean, Port Jackson, Australia;

Genus *Neocancilla* Cernohorsky, 1970:
794 (3594) *Neocancilla pretiosa* (Reeve, 1844), label *Mitra scabricula pretiosa*, 2 specimens, Massawa, Eritrea, northern Red Sea.

Genus *Scabricola* Swainson, 1840:
796 (5213) *Scabricola desetangsii* (Kiener, 1838), label *Mitra variegata* Reeve, 1844, 2 specimens, Republic of Mauritius.

Genus *Domiporta* Cernohorsky, 1970:
798 (5212) *Domiporta praestantissima* (Röding, 1798), label *Mitra filosa* Reeve, L.A., 1844, 2 specimens, Republic of Mauritius.

Genus *Imbricaria* Schumacher, 1817:
852 (3660) *Imbricaria conularis* (Lamarck, 1811), label *Conoelix marmoratus* Swainson, 1821, 1 specimen, Tahiti Island.

Genus *Pterygia* Röding, 1798:
853 (3651) *Pterygia nucea* (Gmelin, 1791), label *Mitra (Cyhindra) nucea*, 1 specimen, New Zeeland.

Family *Costellariidae*

Genus *Vexillum* Röding, 1798:
822 (6397) *Vexillum exasperatum* (Gmelin, 1791), label *Mitra corrugata* Wood, 1828, 1 specimen, Australia;
823 (6399) *Vexillum exasperatum* (Gmelin, 1791), label *Mitra corrugata* Wood, 1828, 1 specimen, Phillipines;
824 (3585) *Vexillum exasperatum* (Gmelin, 1791), label *Mitra corrugata* Wood, 1828, 1 specimen, Maluku Islands;
832 (3591) *Vexillum exasperatum* (Gmelin, 1791), label *Mitra costellaria exasperata*, 1 specimen, Java Island (Republic of Indonesia);
836 (3654) *Vexillum patriarchale* (Gmelin, 1791), label *Mitra pusia patriarchalis*, 2 specimens, Burbon;
825 (3650) *Vexillum vulpecula* (Linnaeus, 1758), label *Mitra melongena* Lamarck, 1811, 1 specimen, Maluku Islands;
827 (3598) *Vexillum vulpecula* (Linnaeus, 1758), label *Mitra vulpecula*, 1 specimen, Philipine.
785 (3586) *Vexillum (Pusia) ebenus* (Lamarck, 1811), label *Voluta mitra ebenus*, 7 specimens, Adriatic Sea, Fiume today Rijeka (Republic of Croatia);
786 (9632) *Vexillum (Pusia) ebenus* (Lamarck, 1811), label *Mitra ebenus*, 3 specimens, Peninsula Istria, Adriatic Sea;
787 (12263) *Vexillum (Pusia) ebenus* (Lamarck, 1811), label *Voluta mitra ebenus*, 7 specimens, Adriatic Sea, Fiume today Rijeka (Republic of Croatia);
788 (3587) *Vexillum (Pusia) ebenus* (Lamarck, 1811), label *Voluta mitra ebenus*, 4 specimens, Adriatic Sea, Ragusa today south region of Republic of Croatia, Dalmatia, Dubrovnik (Republic of Croatia);
790 (1417) *Vexillum (Pusia) ebenus* (Lamarck, 1811), label *Mitra lutescens* Lamarck, 1811, 2 specimens, Toulon, Mediterranean Sea;
819 (6402) *Vexillum (Pusia) ebenus* (Lamarck, 1811), label *Mitra caffra* Scacchi, 1836, 1 specimen, Indian Ocean;
835 (5224) *Vexillum (Pusia) cancellarioides (Anton, 1838)*, label *Mitra pusia nodosa*, 2 specimens, Republic of Mauritius;
838 (3653) *Vexillum (Pusia) pardalis* (Küster, 1840), label *Mitra pusia pardalis*, 2 specimens, Burbon;
839 (6401) *Vexillum (Pusia) cancellarioides (Anton, 1838)*, label *Mitra nodosa*, 1 specimen, Burbon;
840 (3597) *Vexillum (Pusia) luculentum* (Reeve, 1845), *Mitra tricolor* Montrouzier, 1861, 2 specimens, Adriatic Sea, Fiume today Rijeka (Republic of Croatia);
841 (3656) *Vexillum (Pusia) luculentum* (Reeve, 1845), *Mitra tricolor* Montrouzier, 1861, 2 specimens, Adriatic Sea;
842 (6410) *Vexillum (Pusia) luculentum* (Reeve, 1845), *Mitra tricolor* Montrouzier, 1861, 9 specimens, Adriatic Sea;
847 (5215) *Vexillum (Pusia) unifasciale* (Lamarck, 1811), label *Mitra pusia venustula*, 2 specimens, Republic of Mauritius;
851 (5222) *Vexillum (Pusia) crocatum* (Lamarck, 1811), label *Mitra (Pusia) crocata*, 2 specimens Republic of Mauritius.
834 (5223) *Vexillum (Costellaria) modestum* (Reeve, 1845), label *Mitra costellaria compta*, 2 specimens, Republic of Mauritius.
845 (3649) *Vexillum (Costellaria) cadaverosum* (Reeve, L.A., 1844), label *Mitra costellaria cadaverosa*, 1 specimen, Republic of Fiji;
849 (5219) *Vexillum (Costellaria) unifasciatum* (Wood, 1828), label *Costellaria clathrata*, 2 specimens, Republic of Mauritius;
850 (3645) *Vexillum (Costellaria)* Swainson, 1840, label *Mitra (Turricula) callithea*, 6 specimens, Massawa, Eritrea, northern Red Sea;

843 (1418) *Vexillum (Pusiolina) savignyi* (Payraudeau, 1826), label *Mitra savignyi*, 3 specimens, Mediterranean Sea, Provence;
844 (3657) *Vexillum (Pusiolina) savignyi* (Payraudeau, 1826), label *Mitra savignyi*, 3 specimens, Adriatic Sea, Zara today Zadar (Republic of Croatia).
826 (3692) *Vexillum (Vexillum) plicarium* (Linnaeus, 1758), label *Mitra plicaria*, 1 specimen, Indian Ocean.

Family *Marginellidae*
Subfamily *Marginellinae*

Genus *Marginella* Lamarck, 1799:
854 (3665) *Marginella glabella* (Linnaeus, 1758), 1 specimen, Republic of Senegal;
863 (3602) *Marginella* Lamarck, 1799, label *Marginella corneatur*, 2 specimens, Republic of Senegal;
865 (1421) *Marginella* Lamarck, 1799, label *Marginella (Claudestina) sp*., 5 specimens, Mediterranean Sea, Provence;
866 (6413) *Marginella* Lamarck, 1799, label *Marginella (Claudestina) sp*., 1 specimen, Adriatic Sea;
882 (3608) *Marginella* Lamarck, 1799, label *Marginella* Lamarck, 1799, 4 specimens, Indian Ocean (Orient);
885 (6412) *Marginella* Lamarck, 1799, label *Marginella* Lamarck, 1799, 1 specimen, Pacific Ocean, Port Jackson, Australia;
886 (6411) *Marginella* Lamarck, 1799, label *Marginella* Lamarck, 1799, 1 specimen, Pacific Ocean, Port Jackson, Australia.

Genus *Prunum* Herrmannsen, 1852:
856 (3604) *Prunum apicinum* (Menke, 1828), label *Marginella prunum conoides*, 3 specimens, Republic of Cuba;
857 (5231) *Prunum apicinum* (Menke, 1828), label *Marginella prunum conoides*, 4 specimens, Florida (S.U.A);
858 (3666) *Prunum curtum* (G.B. Sowerby I, 1832), label *Marginella curta* G. B. Sowerby I, 1832, Java Island (Republic of Indonesia);
859 (3600) *Prunum* Herrmannsen, 1852, label *Marginella (Prunum)* H. Adams & A. Adams, 1853, 3 specimens, Republic of Panama;
860 (5230) *Prunum prunum* (Gmelin, 1791), label *Marginella caerulescens* Lamarck, 1822, 4 specimens, Puerto Rico;
867 (5229) *Prunum apicinum* (Menke, 1828), label *Marginella (Gibberula) flavida*, 7 specimens, St. Thomas U.S. Virgin Islands;
868 (9520) *Prunum pellucidum* (Pfeiffer, 1840), label *Marginella (Giberula) diaphana*, 3 specimens, West Indies;
870 (3610) *Prunum monile* (Linnaeus, 1758), label *Marginella monilis* Linnaeus, 1758, 13 specimens, Dahlak Arhipelago, Red Sea;
871 (3611) *Prunum monile* (Linnaeus, 1758), label *Marginella monilis* Linnaeus, 1758, 4 specimens, Massawa, Eritrea, northern Red Sea;
874 (9641) *Prunum monile* (Linnaeus, 1758), label *Marginella monilis* Linnaeus, 1758, 2 specimens, African Coastline.

Genus *Dentimargo* Cossmann, 1899:
855 (3662) *Dentimargo fusiformis* (Hinds, 1844), label *Marginella fusiformis* Hinds, 1844, 1 specimen, Burbon.

Genus *Cryptospira* Hinds, 1844:
861 (3601) *Cryptospira ventricosa* (Fischer von Waldheim, 1807), label *Marginella quinqueplicata* Lamarck, 1822, 1 specimen, Republic of Singapore.

Family *Cystiscidae*
Subfamily *Persiculinae*

Genus *Persicula* Schumacher, 1817:
862 (3603) *Persicula cingulata* (Dillwyn, 1817), label *Marginella cingulata*, 2 specimens, Republic of Senegal;
864 (3605) *Persicula interruptolineata* (Mühlfeld, 1816), label *Persicula (Marginella) interrupta*, 6 specimens, Indian Ocean;
869 (3664) *Persicula persicula* (Linnaeus, 1758), label *Marginella persicula* (Linnaeus, 1758), 1 specimen, Republic of Cape Verde;
883 (3607) *Persicula persicula* (Linnaeus, 1758), label *Marginella persicula* (Linnaeus, 1758), 1 specimen, Indian Ocean;
884 (3606) *Persicula persicula* (Linnaeus, 1758), label *Marginella persicula* (Linnaeus, 1758), 6 specimens, Indian Ocean.

Genus *Gibberula* Swainson, 1840:
872 (3609) *Gibberula miliaria* (Linnaeus, 1758), label *Marginella miliaris* (Linnaeus, 1758), 3 specimens, Adriatic Sea, Zara today Zadar (Republic of Croatia);
873 (1419) *Gibberula miliaria* (Linnaeus, 1758), label *Marginella miliaris* (Linnaeus, 1758), 10 specimens, Mediterranean Sea, Provence;
875 (6414) *Gibberula miliaria* (Linnaeus, 1758), label *Marginella miliaris* (Linnaeus, 1758), 5 specimens, Adriatic Sea, Spalato today Split (Republic of Croatia);

876 (1420) *Gibberula lavalleeana* (d'Orbigny, 1842), label *Marginella minuta* Pfeiffer, 1840, 15 specimens, Mediterranean Sea, Provence;
877 (3910) *Gibberula sueziensis* (Issel, 1869), label *Volvaria sueziensis*, 2 specimens, Massawa, Eritrea, northern Red Sea;
878 (3928) *Gibberula savignyi* (Issel, 1869), label *Volvaria savignyi sueziensis*, 4 specimens, Dahlak Arhipelago, Red Sea;
879 (12261) *Gibberula* Swainson, 1840, label *Volvaria* Lamarck, 1801, 2 specimens, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea;
880 (3911) *Gibberula sueziensis* (Issel, 1869), label *Volvaria sueziensis*, 1 specimen, Massawa, Eritrea, northern Red Sea;
881 (6415) *Gibberula lavalleeana* (d'Orbigny, 1842), label *Marginella minuta* Pfeiffer, 1840, 1 specimen, Adriatic Sea, Spalato today Split (Republic of Croatia).

Family *Harpidae*
Subfamily *Herpinae*

Genus *Harpa* Röding, 1798:
994 (3720) *Harpa major* Röding, 1798, label *Harpa conoidalis* Lamarck, 1822, 1 specimen, Mauritius Island (Republic of Mauritius).
995 (3721) *Harpa cabriti* Lamarck, 1816, label *Harpa ventricosa* Lamarck, 1816, 2 specimens, Indian Ocean;
996 (5232) *Harpa harpa* (Linnaeus, 1758), label *Harpa nobilis* Lamarck, 1822, 2 specimens, Ambon Island, part of the Maluku Islanda of Indonesia;
998 (3722) *Harpa amouretta* Röding, 1798, label *Harpa minor* Lamarck, 1822, 1 specimen, Indian Ocean.

Order *Neogastropoda*
Superfamily *Buccinoidea*
Family *Melongenidae*

Genus *Melongena* Schumacher, 1817:
125 (4034) *Melongena melongena* (Linnaeus, 1758), label *Pyrula melongena* (Linnaeus, 1758), 1 specimen, Antilles;
126 (4035) *Melongena melongena* (Linnaeus, 1758), label *Pyrula melongena* (Linnaeus, 1758), 1 specimen, Atlantic Ocean.

Genus *Hemifusus* Swainson, 1840:
120 (4032) *Hemifusus ternatanus* (Gmelin, 1791), label *Pyrula ternatana*, 2 specimens, Republic of Singapore;
121 (10574) *Hemifusus ternatanus* (Gmelin, 1791), label *Pyrula (Hemifusus) ternatana*, 3 specimens, Republic of Singapore;
122 (4033) *Hemifusus tuba* (Gmelin, 1791), label *Pyrula tuba*, 1 specimen, People's Republic of China;
123 (9104) *Hemifusus* Swainson 1840, label *Pyrula* Lamarck, 1799, 3 specimens, Republic of Singapore.

Genus *Pugilina* Schumacher, 1817:
119 (4031) *Pugilina cochlidium* (Linnaeus, 1758)**,** label *Pyrula vespertilio*, 1 specimen, Indian Ocean, Japan;
124 (5172) *Pugilina morio* (Linnaeus, 1758), label *Pyrula morio* (Linnaeus, 1758), 1 specimen, Republic of Senegal.

Genus *Volema* Röding, 1798:
127 (4036) *Volema myristica* Röding, 1798, label *Pyrula galeodes* Lamarck, 1822, 3 specimens, People 's Republic of China;
128 (4037) *Volema pyrum* (Gmelin, 1791), label *Pyrula paradisiaca* Reeve, 1847, 3 specimens, Red Sea, Snakin;
129 (4038) *Volema pyrum* (Gmelin, 1791), label *Pyrula paradisiaca* Reeve, 1847, Massawa, Eritrea, northern Red Sea;
130 (4039) *Volema pyrum* (Gmelin, 1791), label *Pyrula paradisiaca* Reeve, 1847, 4 specimens, Red Sea;
131 (4040) *Volema pyrum* (Gmelin, 1791), label *Pyrula paradisiaca* Reeve, 1847, 4 specimens, Red Sea;
132 (4041) *Volema pyrum* (Gmelin, 1791), label *Pyrula paradisiaca* Reeve, 1847, 1 specimen, Suez Canal, Red Sea.

Family *Buccinidae*

Genus *Busycotypus* Wenz, 1943:
133 (4043) *Busycotypus canaliculatus* (Linnaeus, 1758), 1 specimen, North Sea.

Genus *Busycon* Röding, 1798:
134 (4042) *Busycon perversum* (Linnaeus, 1758), 1 specimen, Atlantic Ocean.

Genus *Neptunea* Röding, 1798 :
135 (3490) *Neptunea antiqua* (Linnaeus, 1758), 1 specimen, Britain ;
136 (3489) *Neptunea antiqua* (Linnaeus, 1758), 1 specimen, Britain ;
137 (2266) *Neptunea antiqua* (Linnaeus, 1758), 1 specimen, Britain ;

138 (2264) *Neptunea antiqua* (Linnaeus, 1758), 1 specimen, Britain ;
139 (4044) *Neptunea despecta* (Linnaeus, 1758), 1 specimen, North Sea ;
140 (10575) *Neptunea despecta* (Linnaeus, 1758), 1 Specimen, North Sea.

Genus *Pyrulofusus* Mörch, 1857:
141 (6082) *Pyrulofusus deformis* (Reeve, 1847), label *Neptunea sachsenheimi* Kimakowicz, 1896, 2 specimens, collected by Dr. Arthur von Sachenheim, Spitsbergen Island, Svalbard Arhipelago, Norway. The species is mentioned by Moritz von Kimakowicz in his paper *Dr. med. Arthur von Sachsenheim's Molluscen – Ausbeute im nördlichen Eismeer an der West – und Nordküste Spitzbergens* and he considered it to be a new species for science (Kimakowicz, 1896, 75)

Genus *Pisania* Bivona-Bernardi, 1832:
143 (2265) *Pisania gracilis* (G.B. Sowerby, 1859), label *Sipha gracilis*, 5 specimens, Norfolk County, East of England;
144 (4045) *Pisania gracilis* (G.B. Sowerby, 1859), label *Sipha gracilis*, 1 specimen, Essex County, East of England;
145 (4047) *Pisania striata* (Gmelin, 1791), label *Pisania maculosa* Lamarck, 1822, 1 specimen, Adriatic Sea, Pola, Republic of Croatia;
146 (4048) *Pisania striata* (Gmelin, 1791), label *Pisania maculosa* Lamarck, 1822, 20 specimens, Adriatic Sea, Ragusa today south region of Republic of Croatia, Dalmatia, Dubrovnik (Republic of Croatia);
147 (8065) *Pisania striata* (Gmelin, 1791), label *Pisania maculosa* Lamarck, 1822, 3 specimens, Adriatic Sea;
148 (5173) *Pisania pusio* (Linnaeus, 1758), label *Pisania pennata* Mörch, 1852, 4 specimens, Saint Thomas Island, Caribbean Sea;
149 (4046) *Pisania pusio* (Linnaeus, 1758), label *Pisania pusio articulata*, 1 specimen, Est India.

Genus *Gemophos* Olsson & Harbison, 1953:
154 (6144) *Gemophos viverratus* (Kiener, 1834), label *Pollia (Tritonidea) proteus*, 1 specimen, Est Indian Ocean.

Genus *Pollia* Gray, 1834:
155 (4050) *Pollia rubiginosa* (Reeve, 1846), label *Pollia (Tritonidea) rubiginosa*, 16 specimens, Massawa, Eritrea, northern Red Sea;
156 (6084) *Pollia rubiginosa* (Reeve, 1846), 8 specimens, Dahlak Arhipelago, Red Sea;
157 (4050) *Pollia rubiginosa* (Reeve, 1846), label *Pollia (Tritonidea) rubiginosa*, 8 specimens, Massawa, Eritrea, northern Red Sea;
160 (4081) *Pollia dorbignyi* (Payraudeau, 1826), 4 specimens, Adriatic Sea, Ragusa today south region of Republic of Croatia and Dubrovnik (Republic of Croatia);
161 (4082) *Pollia dorbignyi* (Payraudeau, 1826), 4 specimens, Adriatic Sea, Ragusa today south region of Republic of Croatia and Dubrovnik (Republic of Croatia);
163 (1404) *Pollia dorbignyi* (Payraudeau, 1826), label *Fusus dorbiguyi*, 3 specimens, Mediterranean Sea, Provence;
164 (4052) *Pollia undosa* (Linnaeus, 1758), 1 specimen, Málaga (Spain).
Genus *Enginella* Monterosato, 1917:
158 (9103) *Enginella leucozona* (Philippi, 1843), label *Pollia leucozona*, 4 specimens, Adriatic Sea, Split, Republic of Croatia;
159 (4079) *Enginella leucozona* (Philippi, 1843), label *Pollia leucozona*, 5 specimens, Adriatic Sea, Ragusa today south region of Republic of Croatia and Dubrovnik (Republic of Croatia);
162 (4080) *Enginella leucozona* (Philippi, 1843), label *Pollia leucozona*, 4 specimens, Adriatic Sea, Fiume today Rijeka (Republic of Croatia).

Genus *Euthria* Gray, 1850:
165 (4053) *Euthria cornea* (Linnaeus, 1758), 1 specimen, Adriatic Sea, Ragusa today south region of Republic of Croatia and Dubrovnik (Republic of Croatia);
166 (4054) *Euthria cornea* (Linnaeus, 1758), 1 specimen, Adriatic Sea, Zara today Zadar (Republic of Croatia);
167 (4055) *Euthria cornea* (Linnaeus, 1758), 1 specimen, Mediterranean Sea, Sicily;
168 (4051) *Euthria* Gray, 1850, label *Euthria duris*, 1 specimen, California (U.S.A.).

Genus *Turrisipho* Dautzenberg & H. Fischer, 1912:
197 (1405) *Turrisipho lachesis* (Mørch, 1869), label *Pleurotoma lachesis*, 4 specimens, Mediterranean Sea, Alger.

Genus *Buccinum* Linnaeus, 1758:
350 (2267) *Buccinum* Linnaeus, 1758, 3 specimens, Brixham, south-west England;
351 (6134) *Buccinum* Linnaeus, 1758, 2 specimens, Folkestone, Shepway District of Kent, England;
352 (6135) *Buccinum finmarkianum* Verkrüzen, 1875, 1 specimen, Arctic Ocean;

353 (6133) *Buccinum undatum* Linnaeus, 1758, 1 specimen, Great Britain;
354 (6143) *Buccinum costatum* Golikov, 1980, 1 specimen, Australia;
355 (6136) *Buccinum finmarkianum* Verkrüzen, 1875, 2 specimens, Spitzbergen Island, Svalbard Archipelago, Norway;
357 (6137) *Buccinum glaciale* Linnaeus, 1761, 4 specimens, Spitzbergen Island, Svalbard Archipelago, Norway;
358 (6138) *Buccinum glaciale* Linnaeus, 1761, 2 specimens, Spitzbergen Island, Svalbard Archipelago, Norway;
359 (6139) *Buccinum glaciale* Linnaeus, 1761, Label Buccinum glaciale var. regalis, 2 specimens, Spitzbergen Island, Svalbard Archipelago, Norway;
360 (6140) *Buccinum glaciale* Linnaeus, 1761, Label Buccinum glaciale var. regalis, 2 specimens, Spitzbergen Island, Svalbard Archipelago, Norway;
361 (6141) *Buccinum glaciale* Linnaeus, 1761, Label Buccinum glaciale var. regalis – Egg, 1 specimen, Spitzbergen Island, Svalbard Archipelago, Norway.
The inventory numbers 355 (6136), 357 (6137), 358 (6138), 359 (6139), 360 (6140), 361 (6141) were collected by Dr. Arthur von Sachenheim (Kimakowicz, 1896, 74), this is not mentioned on the original label.

Genus *Burnupena* Iredale, 1918:
356 (6142) *Burnupena papyracea* (Bruguière, 1789), label *Buccinum papyraceum* Bruguière, 1789, 1 specimen, M. Boreal.

Genus *Phos* Montfort, 1810:
368 (6151) *Phos senticosus* (Linnaeus, 1758), 1 specimen, New Holland.

Genus *Engina* Gray, 1839:
965 (3619) *Engina mendicaria* (Linnaeus, 1758), label *Columbella mendicaria* (Linnaeus, 1758), 6 specimens, Massawa, Eritrea, northern Red Sea;
966 (3620) *Engina mendicaria* (Linnaeus, 1758), label *Columbella mendicaria* (Linnaeus, 1758), 9 specimens, Dahlak Arhipelago, Red Sea;
967 (6416) *Engina mendicaria* (Linnaeus, 1758), label *Columbella mendicaria* (Linnaeus, 1758), 2 specimens, Pacific Ocean, Port Jackson, Australia;
968 (10595) *Engina mendicaria* (Linnaeus, 1758), label *Columbella mendicaria* (Linnaeus, 1758), 5 specimens, Andaman Islands, Indian Ocean.

Family *Nassaridae*

Genus *Bullia* Gray, 1833:
362 (6146) *Bullia digitalis* (Dillwyn, 1817), label *Bullia achatina*, 1 specimen, Natal (South Africa);
363 (6147) *Bullia digitalis* (Dillwyn, 1817), label *Bullia achatina*, 2 specimens, the Cape of Good Hope (South Africa);
364 (10565) *Bullia digitalis* (Dillwyn, 1817), label *Bullia achatina*, 1 specimen, the collecting sites is not specified;
365 (6148) *Bullia rhodostoma* Reeve, 1847, 1 specimen, the Cape of Good Hope (South Africa);
366 (6145) *Bullia annulata* (Lamarck, 1816), 1 specimen, Natal (South Africa);
367 (6149) *Bullia vittata* (Linnaeus, 1767), label *Bullia (Leiodomus) vittata*, 2 specimens, East Indies today known as Southeastern Asia.

Genus *Nassarius* Duméril, 1805:
370 (6152) *Nassarius mutabilis* (Linnaeus, 1758), 2 specimens, Adriatic Sea, Fiume today Rijeka (Republic of Croatia);
371 (6153) *Nassarius mutabilis* (Linnaeus, 1758), 1 specimen, Adriatic Sea, Brevilaqua today Privlaka (Republic of Croatia);
372 (6154) *Nassarius mutabilis* (Linnaeus, 1758), 2 specimens, Bari (Italy);
373 (6155) *Nassarius mutabilis* (Linnaeus, 1758), 2 specimens, Mediterranean Sea;
374 (6156) *Nassarius coronatus* (Bruguière, 1789), label *Nassa coronata* (Bruguière, 1798), 2 specimens, East Indies;
375 (6157) *Nassarius coronatus* (Bruguière, 1789), label *Nassa coronata* (Bruguière, 1798), 2 specimens, the Republic of Madagascar;
376 (6158) *Nassarius coronatus* (Bruguière, 1789), label *Nassa coronata* (Bruguière, 1798), 3 specimens, Massawa, Eritrea, northern Red Sea;
377 (6159) *Nassarius arcularia arcularia* (Linnaeus, 1758), label *Nassa arcularia* Lamarck, 1816, 1 specimen, East Indies today known as Southeastern Asia;
378 (6160) *Nassarius arcularia arcularia* (Linnaeus, 1758), label *Nassa arcularia* Lamarck, 1816, 3 specimens, East Indies today known as Southeastern Asia;
379 (6161) *Nassarius arcularia arcularia* (Linnaeus, 1758), label *Nassa arcularia* Lamarck, 1816, 15 specimens, Pacific Ocean, Port Jackson, Australia;
380 (6162) *Nassarius pullus* (Linnaeus, 1758), label *Nassa pullus*, 13 specimens, Massawa, Eritrea, northern Red Sea;

381 (6162) *Nassarius pullus* (Linnaeus, 1758), label *Nassa pullus*, 6 specimens, Massawa, Eritrea, northern Red Sea;
382 (6163) *Nassarius pullus* (Linnaeus, 1758), label *Nassa pullus*, 5 specimens, Massawa, Eritrea, northern Red Sea;
383 (6164) *Nassarius pullus* (Linnaeus, 1758), label *Nassa pullus*, 12 specimens, Dahlak Arhipelago, Red Sea;
384 (6165) *Nassarius pullus* (Linnaeus, 1758), label *Nassa pullus*, 2 specimens, Massawa, Eritrea, northern Red Sea;
385 (6169) *Nassarius arcularia plicatus* (Röding, 1798), label *Nassa rumphii* Hombron & Jacquinot, 1938, 2 specimens, Massawa, Eritrea, northern Red Sea;
386 (6168) *Nassarius arcularia plicatus* (Röding, 1798), label *Nassa rumphii* Hombron & Jacquinot, 1938, 3 specimens, Massawa, Eritrea, northern Red Sea;
387 (6168) *Nassarius arcularia plicatus* (Röding, 1798), label *Nassa rumphii* Hombron & Jacquinot, 1938, 4 specimens, Massawa, Eritrea, northern Red Sea;
388 (6166) *Nassarius arcularia arcularia* (Linnaeus, 1758), label *Nassa pullus*, 1 specimen, Burbon;
389 (6171) *Nassarius albescens* (Dunker, 1846), label *Nassa albescens* (Dunker, 1853), 12 specimens, Massawa, Eritrea, northern Red Sea;
390 (6170) *Nassarius albescens* (Dunker, 1846), label *Nassa albescens* (Dunker, 1853), 9 specimens, Dahlak Arhipelago, Red Sea;
391 (6172) *Nassarius albescens* (Dunker, 1846), label *Nassa albescens* (Dunker, 1853), 13 specimens, Dahlak Arhipelago, Red Sea;
392 (6167) *Nassarius livescens* (Philippi, 1849), label *Nassa kieneri* Deshayes, 1863, 7 specimens, Massawa, Eritrea, northern Red Sea;
393 (3924) *Nassarius fretorum* (Melvill & Standen, 1899), label *Nassa pusio* A. Adams, 1852, 1 specimen, Massawa, Eritrea, northern Red Sea;
394 (9564) *Nassarius* Duméril, 1805, label *Nassa ambigua*, 4 specimens, Flroida (S.U.A.);
395 (10551) *Nassarius albescens* (Dunker, 1846), label *Nassa albescens* (Dunker, 1853), 3 specimens, Lifou, Loyalty Islanda, Pacific Ocean;
396 (6173) *Nassarius graniferus* (Kiener, 1834), label *Nassa granifera* (Kiener, 1834), 3 specimens, Adriatic Sea, Brevilaqua today Privlaka (Republic of Croatia);
397 (3922) *Nassarius livescens* (Philippi, 1849), label *Nassa kieneri* Deshayes, 1863, 3 specimens, Dahlak Arhipelago, Red Sea;
398 (6177) *Nassarius pullus* (Linnaeus, 1758), label *Nassa (Arcularia) thersites*, 3 specimens, Phillipines;
399 (6176) *Nassarius pullus* (Linnaeus, 1758), Label *Nassa (Arcularia) thersites*, 4 specimens, People's Republic of China;
400 (6178) *Nassarius striatus* (C. B. Adams, 1852), label *Nassa (Acularia) tegula*, 1 specimen, Gulf of California;
401 (10557) *Nassarius pullus* (Linnaeus, 1758), label *Nassa (Thersites) sp.*, 3 specimens, Phillipines;
402 (9107) *Nassarius globosus* (Quoy & Gaimard, 1833), label *Nassa (Acicularia) globosa* (Quoy & Gaimard, 1833), 7 specimens, East Indies today known as Southeastern Asia;
403 (5184) *Nassarius globosus* (Quoy & Gaimard, 1833), label *Nassa (Acicularia) globosa* (Quoy & Gaimard, 1833), 6 specimens, New Britain Island, Bismarck Arhipelago, Papua New Guinea;
404 (6179) *Nassarius globosus* (Quoy & Gaimard, 1833), label *Nassa (Acicularia) globosa* (Quoy & Gaimard, 1833), 1 specimen, People's Republic of China;
405 (10552) *Nassarius globosus* (Quoy & Gaimard, 1833), label *Nassa (Acicularia) globosa* (Quoy & Gaimard, 1833), 3 specimens, Singapore;
406 (5945) *Nassarius* Duméril, 1805, label *Nassa* Lamarck, 1799, 5 specimens, Pacific Ocean, Port Jackson, Australia;
407 (10533) *Nassarius kraussianus* (Dunker, 1846), label *Nassa kraussiana* (Dunker, 1846), 3 specimens, London, South Africa;
408 (6180) *Nassarius gibbosulus* (Linnaeus, 1758), label *Nassa (Acularia) gibbosula*, 1 specimen, Mediterranean Sea;
409 (6181) *Nassarius kraussianus* (Dunker, 1846), label *Nassa kraussiana* (Dunker, 1846), 2 specimens, Cap – Français, today known as Cap-Haitien;
410 (6182) *Nassarius glans* (Linnaeus, 1758), label *Nassa (Alectrion) glans* (Linnaeus, 1758), 1 specimen, Indian Ocean;
411 (6187) *Nassarius* Duméril, 1805, label *Nassa (Telasco)* H. Adams & A. Adams, 1853 , 1 specimen, Île Bourbon today Réunion Island (France), Indian Ocean, east of Madagascar, south west of Mauritius Island;
412 (6183) *Nassarius papillosus* (Linnaeus, 1758), label *Nassa (Alectrion) papillosa*, 1 specimen, Phillipines;
413 (6196) *Nassarius vibex* (Say, 1822), label *Nassa antillarum* d'Orbigny, 1843, 1 specimen, Ile Saint-Jean today Prince Edward Island (Canada);

414 (5183) *Nassarius haldemani* (Dunker, 1847) , label *Nassa (Zeuxis) sertula* A. Adams, 1852, 3 specimens, Republic of Mauritius;
415 (5186) *Nassarius vibex* (Say, 1822), label *Nassa antillarum* d'Orbigny, 1843, 6 specimens, Florida;
416 (6206) *Nassarius cuvierii* (Payraudeau, 1826), label *Nassa cuvieri*, 1 specimen, Mediterranean Sea;
417 (6185) *Nassarius olivaceus (Bruguière, 1789)*, label *Nassa (Zeuxis) olivacea* (Bruguière, 1789), 2 specimens, Antilles;
418 (6194) *Nassarius corniculum* (Olivi, 1792), label *Nassa cornicula*, 2 specimens, Adriatic Sea, Zara today Zadar (Republic of Croatia) ;
419 (6193) *Nassarius corniculum* (Olivi, 1792), label *Nassa cornicula*, 1 specimen, Adriatic Sea, Calapago ;
420 (6195) *Nassarius corniculum* (Olivi, 1792), label *Nassa cornicula*, 2 specimens, Adriatic Sea, Zara today Zadar (Republic of Croatia) ;
421 (6216) *Nassarius semistriatus* (Brocchi, 1814), label *Nassa semistriata* (Brocchi, 1814), fossil, 4 specimens, Adriatic Sea, Ragusa today south region of Republic of Croatia ;
422 (6189) *Nassarius cuvierii* (Payraudeau, 1826), label *Nassa costulata* Brocchi, 1814, 1 specimen, Adriatic Sea ;
423 (6208) *Nassarius sinarum* (Philippi, 1851), label *Nassa semiplicata* A. Adams, 1852, 2 specimens, Adriatic Sea, Brevilaqua today Privlaka (Republic of Croatia) ;
424 (6186) *Nassarius reeveanus* (Dunker, 1847), label *Nassa (Telasco) luctuosa*, 1 specimen, Île Bourbon today Réunion Island (France), Indian Ocean, east of Madagascar, south west of Mauritius Island ;
425 (1411) *Nassarius* Duméril, 1805, label *Nassa variabilis*, 12 specimens, Medietrranean Sea, Provence;
426 (1412) *Nassarius* Duméril, 1805, label *Nassa variabilis*, 3 specimens, Medietrranean Sea, Provence;
427 (6188) *Nassarius* Duméril, 1805, label *Nassa (Telasco) vairabilis*, 2 specimens, Adriatic Sea, Spalato today Split (Republic of Croatia);
428 (5185) *Nassarius vibex* (Say, 1822), label *Nassa vibex* Say, 1822, 4 specimens, New Britain Island, Bismarck Arhipelago, Papua New Guinea;
431 (6197) *Nassarius scabriusculus* (Powys, 1835), label *Nassa collaria* C.B. Adams, 1852, 2 specimens, Mazatlán, Mexico;
432 (6200) *Nassarius kochianus* (Dunker, 1846), label *Nassa coccinea* G. B. Sowerby III, 1886, 2 specimens, East Indies;
433 (6199) *Nassarius capensis* (Dunker, 1846), label *Nassa capensis* (Dunker, 1846), 2 specimens, Cap – Français, today known as Cap-Haitien;
434 (10555) *Nassarius stolatus* (Gmelin, 1791), label *Nassa fasciata* Chemnitz, 1780, 4 specimens, Victoria Australia;
435 (6184) *Nassarius concinnus* (Powys, 1835), label *Nassa (Hima) concinna* Powys, 1835, 2 specimens, Massawa, Eritrea, northern Red Sea;
436 (10454) *Nassarius capensis* (Dunker, 1846), label *Nassa capensis* (Dunker, 1846), 5 specimens, Algoa Bay, South Africa;
437 (6198) *Nassarius stolatus* (Gmelin, 1791), label *Nassa fasciata* Chemnitz, 1780, 2 specimens, New Holland;
438 (6202) *Nassarius kochianus* (Dunker, 1846), label *Nassa alacologi* Sowerby, 1900, 16 specimens, Adriatic Sea, Ragusa today south region of Republic of Croatia;
439 (10562) *Nassarius kochianus* (Dunker, 1846), label *Nassa incrassata* Sowerby, 1900, 1 specimen, Adriatic Sea, Lovrano;
440 (6205) *Nassarius kochianus* (Dunker, 1846), label *Nassa incrassata* Sowerby, 1900, 13 specimens, Madeira, Atlantic Ocean;
441 (6203) *Nassarius kochianus* (Dunker, 1846), label *Nassa incrassata* Sowerby, 1900, 8 specimens, Adriatic Sea, Spalato today Split (Republic of Croatia);
442 (1414) *Nassarius kochianus* (Dunker, 1846), label *Nassa incrassata* Sowerby, 1900, 8 specimens, Medietrranean Sea, Provence;
443 (6204) *Nassarius kochianus* (Dunker, 1846), label Nassa *incrassata* Sowerby, 1900, 1 specimen, Adriatic Sea, Fiume today Rijeka (Republic of Croatia);
444 (6201) *Nassarius* Duméril, 1805, label *Nassa inassanensis*, 8 specimens, Massawa, Eritrea, northern Red Sea;
445 (3925) *Nassarius* Duméril, 1805, label *Nassa massanensis*, 5 specimens, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea;
446 (3923) *Nassarius* Duméril, 1805, label *Nassa massanensis*, 6 specimens, Dahlak Arhipelago, Red Sea;
447 (12269) *Nassarius madiunensis* (K. Martin, 1895), label *Nassa massanensis*, 3 specimens, Massawa, Eritrea, northern Red Sea;
448 (1415) *Nassarius pygmaeus* (Lamarck, 1822), label *Nassa (Tritonella) pygmaea* (Lamarck, 1822), 4 specimens, Mediterranean Sea, Provence;
449 (6190) *Nassarius versicolor* (C.B. Adams, 1852), label *Nassa versicolor* C.B. Adams, 1852, 2 specimens, California Bay;

450 (6175) *Nassarius stolatus* (Gmelin, 1791), label *Nassa ornata* (Kiener, 1834), 2 specimens, Dahlak Arhipelago, Red Sea;
451 (6174) *Nassarius stolatus* (Gmelin, 1791), label *Nassa (Phrontis) ornata*, 10 specimens, Massawa, Eritrea, northern Red Sea;
452 (6217) *Nassarius fossae* (Preston, 1915), label *Nassa (Tritia) fossata*, 1 specimen, California Bay;
453 (6218) *Nassarius reticulatus* (Linnaeus, 1758), label *Nassa (Tritia) reticulata*, 2 specimens, Mediterranean Sea, Syracuse, Sicily Region (Italy);
454 (6219) *Nassarius alacologic* (Linnaeus, 1758), label *Nassa (Tritia) alacologi*, 10 specimens, Adriatic Sea, Fiume today Rijeka (Republic of Croatia);
455 (6220) *Nassarius alacologic* (Linnaeus, 1758), label *Nassa (Tritia) alacologi*, 1 specimen, Adriatic Sea, Zara today Zadar (Republic of Croatia);
456 (6221) *Nassarius alacologic* (Linnaeus, 1758), label *Nassa (Tritia) alacologi*, 5 specimens, Adriatic Sea, Calopago;
457 (6222) *Nassarius alacologic* (Linnaeus, 1758), label *Nassa (Tritia) alacologi*, 6 specimens, Adriatic Sea, Trieste (Italy);
458 (6223) *Nassarius alacologic* (Linnaeus, 1758), label *Nassa (Tritia) alacologi*, 1 specimen, England;
459 (6224) *Nassarius alacologic* (Linnaeus, 1758), label *Nassa (Tritia) alacologi*, 1 specimen, Great Britain, North Sea Coast;
460 (9110) *Nassarius alacologic* (Linnaeus, 1758), label *Nassa alacologi*, 2 specimens, Pacific Ocean, Port Jackson, Australia;
461 (9109) *Nassarius alacologic* (Linnaeus, 1758), label *Nassa alacologi*,1 specimen, Adriatic Sea, Ragusa today south region of Republic of Croatia, Dalmatia, Dubrovnik (Republic of Croatia);
462 (9108) *Nassarius alacologic* (Linnaeus, 1758), label *Nassa alacologi*,3 specimens, Adriatic Sea, Lovran, Istria Peninsula;
463 (1413) *Nassarius lima* (Dillwyn, 1817), label *Nassa (Tritia) limata*, 1 specimen, Mediterranean Sea, Provence;
464 (6209) *Nassarius mendicus* (Gould, 1850), label *Nassa cooperi* Forbes, 1852, 1 specimen, California Bay;
467 (10556) *Nassarius graniferus* (Kiener, 1834), label *Nassa granifera* (Kiener, 1834), 3 specimens, Pacific Ocean, Gambier Islands (or Mangreva Islands), French Polynesia;
468 (10558) *Nassarius distortus* (A. Adams, 1852), label *Nassa (Alectrion) monilis* (Kiener, 1853), 2 specimens, Pacific Ocean, Loyalty Islands, New Caledonia;
469 (10561) *Nassarius camelus* (Martens, 1897), label *Nassa immersa*, 1 specimen, Philipine;
470 (3491) *Nassarius capensis* (Dunker, 1846), label *Nassa pulchella* A. Adams, 1852, 2 specimens, Algoa Bay, South Africa;
472 (10559) *Nassarius perpinguis* (Hinds, 1844), label *Nassa perpinguis* Hinds, 1844, 2 specimens, San Pedro;
473 (6191) *Nassarius* Duméril, 1805, label *Nassa* Lamarck, 1799, 1 specimen, Algoa Bay, South Africa;
474 (6215) *Nassarius* Duméril, 1805, label *Nassa* Lamarck, 1799, 3 specimens, Dahlak Arhipelago, Red Sea;
475 (6212) *Nassarius* Duméril, 1805, label *Nassa* Lamarck, 1799, 4 specimens, Pacific Ocean, Port Jackson, Australia;
476 (6211) *Nassarius* Duméril, 1805, label *Nassa* Lamarck, 1799, 1 specimen, Pacific Ocean, Port Jackson, Australia;
477 (6214) *Nassarius* Duméril, 1805, label *Nassa* Lamarck, 1799, 1 specimen, Massawa, Eritrea, northern Red Sea;
478 (6383) *Nassarius* Duméril, 1805, label *Nassa* Lamarck, 1799, 1 specimen, Cape Verde, Porto Grande;
479 (9113) *Nassarius* Duméril, 1805, label *Nassa* Lamarck, 1799, 1 specimen, Australia;
480 (9111) *Nassarius* Duméril, 1805, label *Nassa* Lamarck, 1799, 1 specimen, Pacific Ocean, Port Jackson, Australia;
481 (9112) *Nassarius* Duméril, 1805, label *Nassa* Lamarck, 1799, 2 specimens, Pacific Ocean, Port Jackson, Australia;
482 (9114) *Nassarius* Duméril, 1805, label *Nassa* Lamarck, 1799, 2 specimens, the collecting sites is not mentioned;
483 (9115) *Nassarius* Duméril, 1805, label *Nassa* Lamarck, 1799, 1 specimen, the collecting sites is not mentioned;
484 (9116) *Nassarius* Duméril, 1805, label *Nassa* Lamarck, 1799, 1 specimen, Pacific Ocean, Port Jackson, Australia;
485 (12240) *Nassarius* Duméril, 1805, label *Nassa* Lamarck, 1799, 20 specimens, Black Sea, Reui;
486 (5946) *Nassarius* Duméril, 1805, label *Nassa* Lamarck, 1799, 1 specimen, Pacific Ocean, Port Jackson, Australia;
487 (5944) *Nassarius* Duméril, 1805, label *Nassa* Lamarck, 1799, 3 specimens, Pacific Ocean, Port Jackson, Australia;

488 (10564) *Nassarius* Duméril, 1805, label *Nassa* Lamarck, 1799, 1 specimen, Pacific Ocean, Port Jackson, Australia;
489 (6213) *Nassarius* Duméril, 1805, label *Nassa* Lamarck, 1799, 5 specimens, Singapore;
490 (5963) *Nassarius* Duméril, 1805, label *Nassa* Lamarck, 1799, 1 specimen, Pacific Ocean, Port Jackson, Australia;
491 (5964) *Nassarius* Duméril, 1805, label *Nassa* Lamarck, 1799, 1 specimen, Pacific Ocean, Port Jackson, Australia;
492 (10563) *Nassarius* Duméril, 1805, label *Nassa* Lamarck, 1799, 3 specimens, Indian Ocean.

Genus *Hebra* H. Adams & A. Adams, 1853:
429 (6192) *Hebra horrida* (Dunker, 1847), label *Nassa muricata* (Quoy & Gaimard, 1833), 1 specimen, Île Bourbon today Réunion Island (France), Indian Ocean, east of Madagascar, south west of Mauritius Island;
430 (6210) *Hebra horrida* (Dunker, 1847), label *Nassa muricata* (Quoy & Gaimard, 1833), 1 specimen, Pacific Ocean, Port Jackson, Australia;
471 (10560) *Hebra subspinosa* (Lamarck, 1822), label *Nassa subspinosa* (Lamarck, 1822), 2 specimens, Fiji Islands.

Genus *Ilyanassa* Stimpson, 1865:
465 (5187) *Ilyanassa obsoleta* (Say, 1822), label *Nassa obsoleta* Say, 1822, 4 specimens, Carolina.

Genus *Cyclope* Risso, 1826:
498 (6233) *Cyclope neritea* (Linnaeus, 1758), label *Cyclops neriteus*, 4 specimens, Adriatic Sea, Baticelli near Split, Republic of Croatia;
499 (6234) *Cyclope pellucida* Risso, 1826, label *Cyclops pellucidus*, 12 specimens, Mediterranean Sea, Sicily;
500 (6231) *Cyclope neritea* (Linnaeus, 1758), label *Cyclops neriteus*, 20 specimens, Adriatic Sea, Spalato today Split (Republic of Croatia);
501 (6232) *Cyclope neritea* (Linnaeus, 1758), label *Cyclops neriteus*, 4 specimens, Adriatic Sea, Fiume today Rijeka (Republic of Croatia);
502 (6230) *Cyclope neritea* (Linnaeus, 1758), label *Cyclops neriteus*, 9 specimens, there are two collecting sites on the label the Mediterranean Sea and Varna (Bulgaria), Black Sea.

Family *Fasciolariidae*
Subfamily *Fusininae*

Genus *Fusinus* Rafinesque, 1815:
150 (4049) namen dubium *Fusus pictus* (Turton, 1825), label *Pisania (Purpura) picta*, 1 specimen, Taranto, Southern Italy;
151 (5611) namen dubium *Fusus pictus* (Turton, 1825), label *Pisania (Purpura) picta*, 1 specimen, not mentioned;
182 (10576) *Fusinus* Rafinesque, 1815, label *Fusus* Bruguière, 1789, 1 specimen, Pacific Ocean, Port Jackson, Australia;
169 (4059) *Fusinus forceps* (Perry, 1811), label *Fusus (Turriculus) forceps*, 1 specimen, People's Republic of China;
170 (4060) *Fusinus forceps* (Perry, 1811), 1 specimen, People's Republic of China;
171 (4063) *Fusinus ansatus* (Gmelin, 1791), label *Fusus distans* Lamarck, 1822, 1 specimen, Republic of the Philippines;
172 (4065) *Fusinus australis* (Quoy & Gaimard, 1833), label *Fusus australis* Quoy & Gaimard, 1833, 2 specimens, 2 specimens, Red Sea;
173 (4066) *Fusinus australis* (Quoy & Gaimard, 1833), label *Fusus australis* Quoy & Gaimard, 1833, 2 specimens, Suez Canal, Red Sea;
174 (4064) *Fusinus australis* (Quoy, Gaimard, 1833), label *Fusus crebriliratus* Reeve, 1847, 1 specimen, Japan;
175 (4062) *Fusinus rostratus* (Olivi, 1792), label *Fusus rostratus*, 1 specimen, Adriatic Sea, Split, Republic of Croatia;
176 (4057) *Fusinus rostratus* (Olivi, 1792), label *Fusus rostratus*, 1 specimen, Mediterranean Sea;
177 (4058) *Fusinus rostratus* (Olivi, 1792), label *Fusus rostratus*, 1 specimen, Mediterranean Sea;
180 (6085) *Fusinus rostratus* (Olivi, 1792), label *Fusus rostratus*, 1 specimen, Adriatic Sea, Pola, Republic of Croatia;
178 (4061) *Fusinus syracusanus* (Linnaeus, 1758), label *Fusus syracusanus* (Linnaeus, 1758), 1 specimen, Mediterranean Sea;
179 (1403) *Fusinus pulchellus* (Philippi, 1844), label *Fusus pulchellus*, 3 specimens, Medietrranean Sea, Provence;
181 (4056) *Fusinus pulchellus* (Philippi, 1844), label *Fusus pulchellus*, 1 specimen, Adriatic Sea.

Family *Fasciolariidae*
Subfamily *Fasciolariinae*

Genus *Cinctura* Hollister, 1957:
732 (3695) *Cinctura lilium* (Fischer von Waldheim, 1807), label *Fasciolaria lilium* Fischer von Waldheim, 1807, label Fasciolaria distans auct., 1 specimen, Egmont Key, Florida (U.S.A.).

Genus *Fasciolaria* Lamarck, 1799:

733 (3694) *Fasciolaria tulipa* (Linnaeus, 1758), 1 specimen, East Indies;
734 (9565) *Fasciolaria tulipa* (Linnaeus, 1758), 1 specimen, Antilles.

Genus *Filifusus* Snyder, Vermeij & Lyons, 2012:
735 (3696) *Filifusus inermis* (Jonas, 1846), label *Fasciolaria inermis* Jonas, 1846, 3 specimens, Dahlak Arhipelago, Red Sea;
736 (3696) *Filifusus inermis* (Jonas, 1846), label *Fasciolaria inermis* Jonas, 1846, 2 specimens, Dahlak Arhipelago, Red Sea;
741 (3702) *Filifusus filamentosus* (Röding, 1798), label *Fasciolaria filamentosa* (Röding, 1798), 1 specimen, East Indies.

Genus *Pleuroploca* P. Fischer, 1884:
737 (3697) *Pleuroploca audouini* (Jonas, 1846), label *Fasciolaria audouini* Jonas, 1846, 1 specimen, Dahlak Arhipelago, Red Sea;
738 (3701) *Pleuroploca trapezium* (Linnaeus, 1758), label *Fasciolaria trapezium* (Linnaeus, 1758), 1 specimen, Phillipine;
739 (3700) *Pleuroploca trapezium* (Linnaeus, 1758), label *Fasciolaria trapezium* (Linnaeus, 1758), 1 specimen, East Indies;
740 (3698) *Pleuroploca trapezium* (Linnaeus, 1758), label *Fasciolaria trapezium* (Linnaeus, 1758), 3 specimens, Massawa, Eritrea, northern Red Sea.

Family *Fasciolariidae*
Subfamily *Peristerniinae*

Genus *Tarantinaea* Monterosato, 1917:
742 (3703) *Tarantinaea lignarius* (Linnaeus, 1758), label *Fasciolaria lignaria* (Linnaeus, 1758), 2 specimens, Adriatic Sea, Ragusa today south region of Republic of Croatia;
743 (1416) *Tarantinaea lignarius* (Linnaeus, 1758), label *Fasciolaria lignaria* (Linnaeus, 1758), 3 specimens, Toulon, Mediterranean Sea.

Genus *Peristernia* Mörch, 1852:
753 (6388) *Peristernia forskalii* (Tapparone-Canefri, 1875), label *Latirus forskalii* Tapparone-Canefri, 1875, 13 specimens, Massawa, Eritrea, northern Red Sea;
754 (12267) *Peristernia forskalii* (Tapparone-Canefri, 1875), label *Latirus forskalii* Tapparone-Canefri, 1875, 9 specimens, Massawa, Eritrea, northern Red Sea;
755 (5209) *Peristernia nassatula* (Lamarck, 1822), label *Latirus nassatula* (Lamarck, 1822), 2 specimens, Upolu, Samoa.

Genus *Latirus* Montfort, 1810:
744 (3682) *Latirus polygonus* (Gmelin, 1791), 2 specimens, Massawa, Eritrea, northern Red Sea;
745 (3683) *Latirus polygonus* (Gmelin, 1791), 2 specimens, Dahlak Arhipelago, Red Sea;
748 (3678) *Latirus gemmatus* (Reeve, 1847), 2 specimens, Île Bourbon today Réunion Island (France), Indian Ocean, east of Madagascar, south west of Mauritius Island;
749 (9566) *Latirus* Montfort, 1810, 1 specimen, Pacific Ocean, Port Jackson, Australia;
750 (9567) *Latirus* Montfort, 1810, 1 specimen, Pacific Ocean, Port Jackson, Australia;
756 (3680) *Latirus iris* (Lightfoot, 1786), label *Latirus prismaticus*, 1 specimen, Sandwich Islands today Hawaiian Islands;

Genus *Turrilatirus* Vermeij & M.A. Snyder, 2006 :
746 (3681) *Turrilatirus turritus* (Gmelin, 1791), label *Latirus turritus* (Gmelin, 1791), 1 specimen, Île Bourbon today Réunion Island (France), Indian Ocean, east of Madagascar, south west of Mauritius Island;
747 (3679) *Turrilatirus craticulatus* (Linnaeus, 1758), label *Latirus craticulatus* (Linnaeus, 1758), 1 specimen, Red Sea;
751 (6386) *Turrilatirus turritus* (Gmelin, 1791), label *Latirus turritus* (Gmelin, 1791), 4 specimens, Massawa, Eritrea, northern Red Sea;
752 (6387) *Turrilatirus turritus* (Gmelin, 1791), label *Latirus turritus* (Gmelin, 1791), 3 specimens, Dahlak Arhipelago, Red Sea.

Genus *Latirolagena* Harris, 1897:
759 (6391) *Latirolagena smaragdula* (Linnaeus, 1758), label *Latirus smaragdulus*, 1 specimen, East Indies.

Family *Fasciolariidae*
Subfamily *Fasciolariinae*

Genus *Leucozonia* Gray, 1847 :
757 (6389) *Leucozonia nassa* (Gmelin, 1791), label *Latirus cinguliferus* Cristofori & Jan, 1832, 2 specimens, East Indies;
758 (6390) *Leucozonia nassa* (Gmelin, 1791), label *Latirus cinguliferus* Cristofori & Jan, 1832, 1 specimen, East Indies.

Order *Neogastropoda*
Superfamily *Conoidea*
Family *Turridae*

Genus *Turris* Batsch, 1789:
185 (8067) *Turris* Batsch, 1789, label *Pleurotoma (Turris)*, 2 specimens, Pacific Ocean, Port Jackson, Australia ;
186 (10577) *Turris* Batsch, 1789, label *Pleurotoma (Turris)*, 1 specimen, not mentioned;
187 (8066) *Turris* Batsch, 1789, label *Pleurotoma (Turris)*, 2 specimens, Pacific Ocean, Port Jackson, Australia;
188 (5942) *Turris* Batsch, 1789, label *Pleurotoma (Turris)*, 1 specimen, Pacific Ocean, Port Jackson, Australia;
184 (4070) *Turris babylonia* (Linnaeus, 1758), label *Pleurotoma babylonia* Linnaeus, 1758, 1 specimen, Maluku Islands, Southeast Asia;
192 (4068) *Turris crispa* (Lamarck, 1816), label *Pleurotoma (Turris) crispa*, 1 specimen, People's Republic of China;
195 (4069) *Turris nodifera* (Lamarck, 1822), label *Pleurotoma nodifera* Lamarck, 1822, 1 specimen, Mediterranean Sea.

Genus *Xenuroturris* Iredale, 1929:
189 (4025) *Xenuroturris cingulifera* (Lamarck, 1822), label *Pleurotoma erythraea* Weinkauff, 1875, 2 specimens, Massawa, Eritrea, northern Red Sea ;
190 (4024) *Xenuroturris cingulifera* (Lamarck, 1822), label *Pleurotoma cingulifera* Lamarck, 1822, 2 specimens, Massawa, Eritrea, northern Red Sea.

Genus Turridrupa Hedley, 1922:
194 (5174) *Turridrupa bijubata* (Reeve, 1843), label *Pleurotoma (Surcula) bijubata*, 2 specimens, Mauritius Island (Republic of Mauritius).

Family *Pseudomelatomidae*

Genus *Pseudomelatoma* Dall, 1918:
191 (4074) *Pseudomelatoma penicillata* (Carpenter, 1865), label *Pleurotoma (Drilla) penicillata*, 1 specimen, California, U.S.A.

Genus *Crassispira* Swainson, 1840:
202 (4072) *Crassispira turricula* (G. B. Sowerby I, 1834), label *Pleurotoma turricula* G. B. Sowerby I, 1834, 1 specimen, Great Britain.

Family *Cochlespiridae*

Genus *Nihonia* McNeil, 1961:
193 (4067) *Nihonia australis* (Roissy, 1805), label *Pleurotoma australis* Roissy, 1805, 2 specimens, People's Republic of China.

Family *Driliidae*

Genus *Tylotiella* Habe, 1958:
196 (4071) *Tylotiella japonica* (Lischke, 1869), label *Pleurotoma (Drilla) japonica*, 1 specimen, Red Sea.

Genus *Clavus* Montfort, 1810:
198 (4077) *Clavus* Montfort, 1810, label *Pleurotoma (Clavus)*, 1 specimen, Red Sea.

Genus *Drillia* Gray, 1838:
200 (8068) *Drillia sinuosa* (Montagu, 1803, label *Pleurotoma sinuosa*, 1 specimen, Cap-Français today Cap-Haïtien (Haiti).

Family *Clavatulidae*

Genus *Clavatula* Lamarck, 1801:
199 (4076) *Clavatula sacerdos* (Reeve, 1845), label *Pleurotoma (Clavatula) sacerdos*, 1 specimen, Republic of Senegal.

Genus *Pusionella* Gray, 1847:
201 (6490) *Pusionella nifat* (Bruguière, 1789), 1 specimen, Red Sea.

Family *Mangeliidae*

Genus *Curtitoma* Bartsch, 1941:
203 (4078) *Curtitoma violacea* (Mighels & C.B Adams, 1842), label *Pleurotoma violacea* Mighels & Adams, 1842, 2 specimens, North Sea;
216 (3901) *Curtitoma violacea* (Mighels & C.B Adams, 1842), label *Defrancia violacea*, 3 specimens, Massawa, Eritrea, northern Red Sea.

Genus *Propebela* Iredale, 1918:
206 (4084) *Propebela exarata* (Møller, 1842), label *Defrancia exarata* Moller, 1842, 2 specimens, Great Britain;
219 (4104) *Propebela scalaris* (Møller, 1842), label *Defrancia scalaris* Moller, 1842, 1 specimen, Île Bourbon today Réunion Island (France), Indian Ocean, east of Madagascar, south west of Mauritius Island.

Genus *Mangelia* Risso, 1826:
220 (4096) *Mangelia costulata* Risso, 1826, label *Daphnella costulata*, 1 specimen, Adriatic Sea;
222 (4092) *Mangelia attenuata* (Montagu, 1803), label *Daphnella attenuata*, 1 specimen, Malm, Nord-Trøndelag county Norway;
223 (4097) *Mangelia costulata* Risso, 1826, label *Daphnella costulata*, 1 specimen, Adriatic Sea, Brevilaqua today Privlaka (Republic of Croatia);

224 (4108) *Mangelia vauquelini* (Payraudeau, 1826), label *Daphnella (Mangilia) vauquelini*, 1 specimen, Mediterranean Sea;
225 (4095) *Mangelia costata* (Pennant, 1777), label *Daphnella (Mangilia) costata*, 1 specimen, Malm, Nord-Trøndelag county Norway;
227 (4106) *Mangelia taeniata* (Deshayes, 1835), 1 specimen, Mediterranean Sea;
228 (4103) *Mangelia sandrii* (Brusina, 1865), label *Daphnella (Mangilia) sandrii var. castanea*, 2 specimens, Adriatic Sea;
229 (4001) *Mangelia unifasciata* (Deshayes, 1835), label *Daphnella (Mangilia) rugulosa*, 1 specimen, Mediterranean Sea;
230 (4102) *Mangelia sandrii* (Brusina, 1865), label *Daphnella (Mangilia) sandrii var. castanea*, 1 specimen, Adriatic Sea, Zara today Zadar (Republic of Croatia);
231 (4105) *Mangelia taeniata* (Deshayes, 1835), 1 specimen, Adriatic Sea, Zara today Zadar (Republic of Croatia);
234 (4107) *Mangelia vauquelini* (Payraudeau, 1826), label *Daphnella (Mangilia) vauquelini*, 2 specimens, Adriatic Sea, Brevilaqua today Privlaka (Republic of Croatia);
237 (3896) *Mangelia* Risso, 1826, label *Daphnella (Mangilia)*, 25 specimens, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea;
238 (3885) *Mangelia* Risso, 1826, label *Daphnella (Mangilia)*, 1 specimen, Massawa, Eritrea, northern Red Sea;
240 (3897) *Mangelia* Risso, 1826, label *Daphnella (Mangilia)*, 7 specimens, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea;
241 (3891) *Mangelia* Risso, 1826, label *Daphnella (Mangilia)*, 1 specimen, Dahlak Arhipelago, Red Sea;
244 (3888) *Mangelia* Risso, 1826, label *Daphnella (Mangilia)*, 23 specimens, Massawa, Eritrea, northern Red Sea;
245 (3894) *Mangelia* Risso, 1826, label *Daphnella (Mangilia)*, 10 specimens, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea.

Genus *Bela* Gray, 1847:
221 (4093) *Bela brachystoma* (Philippi, 1844), label *Daphnella brachiostoma*, 1 specimen, Malm, Nord-Trøndelag county Norway;
232 (4099) *Bela nebula* (Montagu, 1803), label *Daphnella (Mangilia) nebula*, 1 specimen, Adriatic Sea, Ragusa today south region of Republic of Croatia;
233 (4100) *Bela nebula* (Montagu, 1803), label *Daphnella (Mangilia) nebula*, 2 specimen, Adriatic Sea, Brevilaqua today Privlaka (Republic of Croatia).

Genus *Cytharella* Monterosato, 1875 accepted as *Mangelia* Risso, 1826:
226 (3899) *Cytharella hexagona* (Gabb, 1865), label *Daphnella (Mangilia) hexagonalis*, 12 specimens, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea.

Genus *Leiocithara* Hedley, 1922:
235 (8761) *Leiocithara angulata* (Reeve, 1846), label Daphnella (Mangilia) angulosa, 1 specimen, Adriatic Sea, Zara today Zadar (Republic of Croatia).

Genus *Cythara* Schumacher, 1817:
246 (3523) *Cythara* Schumacher, 1817, label *Daphnella (Cythara)*, 1 specimen, Mauritius Island (Republic of Mauritius);
249 (3894) *Cythara* Schumacher, 1817, label *Daphnella (Cythara)*, 6 specimens, Dahlak Arhipelago, Red Sea;
250 (3890) *Cythara* Schumacher, 1817, label *Daphnella (Cythara)*, 3 specimens, Dahlak Arhipelago, Red Sea;
251 (3898) *Cythara* Schumacher, 1817, label *Daphnella (Cythara)*, 2 specimens, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea;
252 (3895) *Cythara* Schumacher, 1817, label *Daphnella (Cythara)*, 31 specimens, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea.

Family *Brosoniidae*

Genus *Phenatoma* Finlay, 1924:
204 (4075) *Phenatoma rosea* (Quoy & Gaimard, 1833), label *Pleurotoma rosea* Quoy & Gaimard, 1833, 1 specimen, North Sea.

Family *Pseudomelatomidea*

Genus *Crassispira* Swainson, 1840:
205 (4073) *Crassispira harpularia* (Desmoulins, 1842), label *Pleurotoma harpularia* Desmoulins, 1842, 1 specimen, North Sea.

Family *Raphitomidae*

Genus *Raphitoma* Bellardi, 1847:

207 (4090) *Raphitoma purpurea* (Montagu, 1803), label *Defrancia purpurea* (Montagu) (Chambers, 2008, 144), 2 specimens, Mediterranean Sea;
218 (1406) *Raphitoma purpurea* (Montagu, 1803), label *Defrancia purpuracea*, 2 specimens, Mediterranean Sea, Provence;
208 (4091) *Raphitoma echinata* (Brocchi, 1814), label *Defrancia reticulate* (Renier) (Chambers, 2008, 143), 1 specimen, Adriatic Sea.
210 (4089) *Raphitoma echinata* (Brocchi, 1814), label *Defrancia reticulata* (Renier), 1 specimen, Adriatic Sea;
212 (4085) *Raphitoma* Bellardi, 1847, label *Cyrillia* Kobelt, 1905, *Defrancia cyrilli alacol*, 1 specimen, Zara today Zadar (Republic of Croatia);
213 (4088) *Raphitoma philberti* (Michaud, 1829), label *Defrancia philberti*, 1 specimen, Mediterranean Sea;
214 (4087) *Raphitoma philberti* (Michaud, 1829), label *Defrancia philberti*, 2 specimens, Adriatic Sea, Brevilaqua today Privlaka (Republic of Croatia);
215 (4086) *Raphitoma linearis* (Montagu, 1803), label *Defrancia linearis*, 1 specimen, Adriatic Sea, Brevilaqua today Privlaka (Republic of Croatia);
258 (3889) *Raphitoma sp.* Bellardi, 1847, 1 specimen, Suez Canal, Red Sea;
259 (3538) *Raphitoma sp*. Bellardi, 1847, 1 specimen, South Africa;
260 (3537) *Raphitoma sp.* Bellardi, 1847, 1 specimen, South Africa;
261 (3887) *Raphitoma sp.* Bellardi, 1847, 11 specimens, Massawa, Eritrea, northern Red Sea;
262 (3887) *Raphitoma sp.* Bellardi, 1847, 3 specimens, Massawa, Eritrea, northern Red Sea;
263 (3900) *Raphitoma purpurea* (Montagu, 1803), label *Homotoma purpura*, 1 specimen, Massawa, Eritrea, northern Red Sea;
264 (4013) *Raphitoma sp.* Bellardi, 1847, label *Homotoma* Bellardi, 1875, 2 specimens, Massawa, Eritrea, northern Red Sea;
265 (4012) *Raphitoma sp.* Bellardi, 1847, label *Homotom*a Bellardi, 1875 juvenile, 1 specimen, Massawa, Eritrea, northern Red Sea;
266 (4011) *Raphitoma sp*. Bellardi, 1847, label *Homotoma* Bellardi, 1875 juvenile, 12 specimens, Massawa, Eritrea, northern Red Sea;
267 (4010) *Raphitoma sp*. Bellardi, 1847, label *Homotoma* Bellardi, 1875 juvenile, 4 specimens, Massawa, Eritrea, northern Red Sea.
268 (11779) *Raphitoma sp.* Bellardi, 1847, 5 specimens, Pacific Ocean, Port Jackson, Australia;
269 (11792) *Raphitoma sp.* Bellardi, 1847, 14 specimens, Pacific Ocean, Port Jackson, Australia;
270 (11779) *Raphitoma sp.* Bellardi, 1847, 1 specimen, Mauritius Island (Republic of Mauritius);
271 (3524) *Raphitoma sp.* Bellardi, 1847, 4 specimens, Mauritius Island (Republic of Mauritius);
272 (3896) *Raphitoma sp*. Bellardi, 1847, 4 specimens, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea;
273 (3898) *Raphitoma sp.* Bellardi, 1847, 1 specimen, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea;
274 (11782) *Raphitoma sp.* Bellardi, 1847, 1 specimen, Adriatic Sea, Spalato today Split (Republic of Croatia);
275 (11789) *Raphitoma sp*. Bellardi, 1847, 3 specimens, Adriatic Sea, Spalato today Split (Republic of Croatia);
276 (11787) *Raphitoma sp.* Bellardi, 1847, 1 specimen, Adriatic Sea, Spalato today Split (Republic of Croatia);
277 (11783) *Raphitoma sp.* Bellardi, 1847, 1 specimen, Adriatic Sea, Spalato today Split (Republic of Croatia);
278 (11784) *Raphitoma sp.* Bellardi, 1847, 1 specimen, Adriatic Sea, Spalato today Split (Republic of Croatia);
279 (11786) *Raphitoma sp.* Bellardi, 1847, 1 specimen, Adriatic Sea, Spalato today Split (Republic of Croatia);
280 (11785) *Raphitoma sp.* Bellardi, 1847, 1 specimen, Adriatic Sea, Spalato today Split (Republic of Croatia);
281 (11781) *Raphitoma sp.* Bellardi, 1847, 1 specimen, Adriatic Sea, Spalato today Split (Republic of Croatia);
282 (11790) *Raphitoma sp.* Bellardi, 1847, 2 specimens, Adriatic Sea, Spalato today Split (Republic of Croatia);
283 (11788) *Raphitoma sp.* Bellardi, 1847, 1 specimen, Adriatic Sea, Spalato today Split (Republic of Croatia);
284 (11780) *Raphitoma sp.* Bellardi, 1847, 1 specimen, Adriatic Sea, Spalato today Split (Republic of Croatia);
285 (11793) *Raphitoma sp.* Bellardi, 1847, 2 specimens, Massawa, Eritrea, northern Red Sea;
286 (11794) *Raphitoma sp.* Bellardi, 1847, 2 specimens, Massawa, Eritrea, northern Red Sea.

Genus *Kermia* W. R. B. Oliver, 1915:
209 (4094) *Kermia pumila* (Mighels, 1845), label *Pleurotoma clandestina* Deshayes, 1863, 1 specimen, Île Bourbon today Réunion Island (France), Indian Ocean, east of Madagascar, south west of Mauritius Island.

Family *Conoidea*

Genus *Pleurotomoides* Bronn, 1831:
211 (3903) *Pleurotomoides* Bronn, 1831, label *Defrancia* Millet, 1826, 1 specimen, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea;
Genus *Pseudodaphnella* Boettger, 1895:
217 (3902) *Pseudodaphnella tincta* (Reeve, 1846), label *Defrancia sp.*, 4 specimens, Massawa, Eritrea, northern Red Sea.

Genus *Daphnella* Hinds, 1844:
236 (3525) *Daphnella* sp. Hinds, 1844, 9 specimens, Mauritius Island (Republic of Mauritius);
239 (3894) *Daphnella sp.* Hinds, 1844, 5 specimens, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea;
242 (3897) *Daphnella* sp. Hinds, 1844, 3 specimens, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea;
243 (3888) *Daphnella sp.* Hinds, 1844, 3 specimens, Massawa, Eritrea, northern Red Sea;
247 (3895) *Daphnella sp.* Hinds, 1844, 7 specimens, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea;
248 (3893) *Daphnella sp.* Hinds, 1844, 1 specimen, Dahlak Arhipelago, Red Sea;
253 (4098) *Daphnella gemmulifera* McLean & Poorman, 1971, label *Daphnella (Cythara) gemmulata*, 1 specimen, Île Bourbon today Réunion Island (France), Indian Ocean, east of Madagascar, south west of Mauritius Island.

Family *Clathurellidae*

Genus *Clathurella* Carpenter, 1857:
254 (4009) *Clathurella sp.* Carpenter, 1857, 1 specimen, Massawa, Eritrea, northern Red Sea;
255 (3892) *Clathurella sp.* Carpenter, 1857, 1 specimen, Dahlak Arhipelago, Red Sea;
256 (3543) *Clathurella sp.* Carpenter, 1857, 7 specimens, South Africa;
257 (3886) *Clathurella sp.* Carpenter, 1857, 1 specimen, Massawa, Eritrea, northern Red Sea.

Family *Columbeliidae*

Genus *Pictocolumbella* Habe, 1945:
894 (9644) *Pictocolumbella ocellata* (Link, 1807), label *Columbella fulgurans* Lamarck, 1822, 8 specimens, Indian Ocean, Orient;
895 (3618) *Pictocolumbella ocellata* (Link, 1807), label *Columbella fulgurans* Lamarck, 1822, 6 specimens, Indian Ocean;
896 (10592) *Pictocolumbella ocellata* (Link, 1807), label *Columbella fulgurans* Lamarck, 1822, 4 specimens, Jamaica.

Genus *Columbella* Lamarck, 1799:
897 (3613) *Columbella fuscata* G.B. Sowerby I, 1832, 1 specimen, Republic of Panama;
898 (9645) *Columbella fuscata* G.B. Sowerby I, 1832, 1 specimen, Republic of Panama;
899 (3614) *Columbella mercatoria* (Linnaeus, 1758), 5 specimens, Indian Ocean;
911 (9653) *Columbella mercatoria* (Linnaeus, 1758), label *Columbella rudis* G.B. Sowerby I, 1844, 1 specimen, Republic of Cape Verde;
914 (3626) *Columbella rustica* (Linnaeus, 1758), 7 specimens, Adriatic Sea, Ragusa today south region of Republic of Croatia;
915 (9654) *Columbella rustica* (Linnaeus, 1758), 5 specimens, Adriatic Sea;
916 (3629) *Columbella rustica* (Linnaeus, 1758), 1 specimen, Massawa, Eritrea, northern Red Sea;
917 (3628) *Columbella rustica* (Linnaeus, 1758), 6 specimens, Adriatic Sea, Fiume today Rijeka (Republic of Croatia);
918 (3627) *Columbella rustica* (Linnaeus, 1758), 1 specimen, South America;
919 (10587) *Columbella rustica* (Linnaeus, 1758), 1 specimen, Mediterranean Sea;
920 (3637) *Columbella rustica* (Linnaeus, 1758), 1 specimen, Mediterranean Sea;
921 (6421) *Columbella sp.* Lamarck, 1799, 1 specimen, Mediterranean Sea;
922 (3612) *Columbella strombiformis* Lamarck, 1822, 1 specimen, State of California;
937 (3658) *Columbella gewillei*, 2 specimens, Jamaica;
939 (9651) *Columbella samperiane*, 1 specimen, Guadalupe, State of Piaui, Brazil.
945 (3631) *Columbella sp.* Lamarck, 1799, 3 specimens, Jordan River;
957 (3633) *Columbella sp.* Lamarck, 1799, label *Columbella erythraea*, 1 specimen, Massawa, Eritrea, northern Red Sea.
958 (10594) *Columbella sp.* Lamarck, 1799, 4 specimens, Sydney, Australia;
969 (6998) *Columbella sp.* Lamarck, 1799, 3 specimens, Pacific Ocean, Port Jackson, Australia;
970 (9057) *Columbella sp.* Lamarck, 1799, 1 specimen, Pacific Ocean, Port Jackson, Australia;
971 (6418) *Columbella sp.* Lamarck, 1799, 1 specimen, Pacific Ocean, Port Jackson, Australia;
972 (9658) *Columbella sp.* Lamarck, 1799, 1 specimen, Pacific Ocean, Port Jackson, Australia;

973 (6417) *Columbella sp.* Lamarck, 1799, 1 specimen, Pacific Ocean, Port Jackson, Australia;
974 (5955) *Columbella sp.* Lamarck, 1799, 14 specimens, Pacific Ocean, Port Jackson, Australia;
975 (9659) *Columbella sp.* Lamarck, 1799, 3 specimens, Pacific Ocean, Port Jackson, Australia;
976 (5956) *Columbella sp.* Lamarck, 1799, 1 specimen, Pacific Ocean, Port Jackson, Australia;
977 (9661) *Columbella sp.* Lamarck, 1799, 1 specimen, Pacific Ocean, Port Jackson, Australia;
978 (5957) *Columbella sp*. Lamarck, 1799, 7 specimens, Pacific Ocean, Port Jackson, Australia;
979 (6431) *Columbella sp.* Lamarck, 1799, 10 specimens, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea;
980 (6430) *Columbella sp.* Lamarck, 1799, 1 specimen, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea;
981 (6425) *Columbella sp.* Lamarck, 1799, 4 specimens, Massawa, Eritrea, northern Red Sea;
982 (6428) *Columbella sp.* Lamarck, 1799, 2 specimens, Massawa, Eritrea, northern Red Sea;
983 (6424) *Columbella sp.* Lamarck, 1799, 1 specimen, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea;
984 (6422) *Columbella sp.* Lamarck, 1799, 2 specimens, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea;
985 (3634) *Columbella sp.* Lamarck, 1799, 4 specimens, Red Sea;
986 (3535) *Columbella sp.* Lamarck, 1799, 7 specimen, West Indian Ocean;
987 (3542) *Columbella sp.* Lamarck, 1799, 1 specimen, South Africa;
988 (3541) *Columbella sp.* Lamarck, 1799, 2 specimens, South Africa;
989 (3539) *Columbella sp.* Lamarck, 1799, 3 specimens, South Africa;
990 (12253) *Columbella sp.* Lamarck, 1799, 34 specimens, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea;
991 (3540) *Columbella sp.* Lamarck, 1799, 1 specimen, South Africa;
992 (12223) *Columbella sp.* Lamarck, 1799, 8 specimens, Pacific Ocean, Port Jackson, Australia;
993 (12224) *Columbella sp.* Lamarck, 1799, 8 specimens, Pacific Ocean, Port Jackson, Australia.

Genus *Steironepion* Pilsbry & H. N. Lowe, 1932:
910 (9656) *Steironepion tinctum* (Carpenter, 1864), label *Columbella tincta*, 5 specimens, State of Florida;
913 (9656) *Steironepion tinctum* (Carpenter, 1864), label *Columbella tincta*, 5 specimens, State of Florida.

Genus *Euplica* Dall, 1889:
900 (3647) *Euplica varians* (Sowerby I, 1832), label *Columbella poecila* G.B. Sowerby I, 1844, 6 specimens, Dahlak Arhipelago, Red Sea;
901 (3646) *Euplica varians* (Sowerby I, 1832), label *Columbella poecila* G.B. Sowerby I, 1844, 7 specimens, Dahlak Arhipelago, Red Sea;
902 (9652) *Euplica varians* (Sowerby I, 1832), label *Columbella pallida* Deshayes, 1844, 1 specimen, Mazatlán, Mexico;
903 (3625) *Euplica varians* (Sowerby I, 1832), label *Columbella poecila* G.B. Sowerby I, 1844, 4 specimens, Massawa, Eritrea, northern Red Sea;
904 (9648) *Euplica varians* (Sowerby I, 1832), label *Columbella poecila* G.B. Sowerby I, 1844, 12 specimens, Massawa, Eritrea, northern Red Sea;
905 (3624) *Euplica varians* (Sowerby I, 1832), label *Columbella poecila* G.B. Sowerby I, 1844, 12 specimens, Dahlak Arhipelago, Red Sea;
906 (9650) *Euplica varians* (Sowerby I, 1832), label *Columbella poecila* G.B. Sowerby I, 1844, 4 specimens, Red Sea, Snakin;
907 (9649) *Euplica varians* (Sowerby I, 1832), label *Columbella poecila* G.B. Sowerby I, 1844, 16 specimens, Dahlak Arhipelago, Red Sea;
908 (9647) *Euplica varians* (Sowerby I, 1832), label *Columbella poecila* G.B. Sowerby I, 1844, 8 specimens, Massawa, Eritrea, northern Red Sea;
909 (9646) *Euplica varians* (Sowerby I, 1832), label *Columbella poecila* G.B. Sowerby I, 1844, 8 specimens, Massawa, Eritrea, northern Red Sea;
912 (3670) *Euplica varians* (Sowerby I, 1832), label *Columbella varians*, 2 specimens, Île Bourbon today Réunion Island (France), Indian Ocean, east of Madagascar, south west of Mauritius Island;
931 (1423) *Euplica scripta* (Lamarck, 1822), label *Columbella scripta*, 4 specimens, Mediterranean Sea, Provence;
932 (3630) *Euplica scripta* (Lamarck, 1822), label *Columbella scripta*, 4 specimens, Adriatic Sea, Ragusa today south region of Republic of Croatia;

934 (9660) *Euplica scripta* (Lamarck, 1822), label *Columbella scripta*, 5 specimens, Pacific Ocean, Port Jackson, Australia;
936 (6419) *Euplica scripta* (Lamarck, 1822), label *Columbella scripta*, 2 specimens, Suez Canal, Red Sea.

Genus *Zafrona* Iredale, 1916:
923 (3672) *Zafrona pulchella* (Blainville, 1829), label *Columbella pulchella*, 1 specimen, West Indian Ocean.

Genus *Alia* H. Adams & A. Adams, 1853:
924 (10597) *Alia unifasciata* (G.B. Sowerby I, 1832), label *Columbella unifasciata* G.B. Sowerby I, 1832, 7 specimens, Valparaiso, Chile.

Genus *Mitrella* Risso, 1826:
925 (3615) *Mitrella albina* (Kiener, 1841), label *Columbella albina* Kiener, 1841, 1 specimen, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea;
926 (9642) *Mitrella avena* (Reeve, 1859), label *Columbella avena* Reeve, 1859, 1 specimen, Atlantic Ocean, Madeira, Portugal;
927 (3674) *Mitrella avena* (Reeve, 1859), label *Columbella avena* Reeve, 1859, 1 specimen, Commonwealth of Massachusetts;
933 (3616) *Mitrella gervillii* (Payraudeau, 1826), label *Columbella sp*., 3 specimens,
Adriatic Sea, Brevilaqua today Privlaka (Republic of Croatia);
935 (1424) *Mitrella gervillii* (Payraudeau, 1826), label *Columbella sp*., 3 specimens, Mediterranean Sea, Provence;
940 (3622) *Mitrella minor* (Scacchi, 1836), label *Columbella minor* Scacchi, 1836, 1 specimen, Massawa, Eritrea, northern Red Sea.

Genus *Anachis* H. Adams & A. Adams, 1853:
928 (3545) *Anachis kraussii* (Sowerby I, 1844), label *Columbella cerealis* Reeve, 1859, 15 specimens, South Africa;
952 (3640) *Anachis lentiginosa* (Hinds, 1844), label *Columbella sp*., 4 specimens, Massawa, Eritrea, northern Red Sea;
963 (3638) *Anachis stricta* (Watson, 1882), label *Columbella stricta* Watson, 1882, 3 specimens, Dahlak Arhipelago, Red Sea;
964 (3639) *Anachis stricta* (Watson, 1882), label *Columbella stricta* Watson, 1882, 5 specimens, Massawa, Eritrea, northern Red Sea.

Genus *Nitidella* Swainson, 1840:
929 (10596) *Nitidella nitida* (Lamarck, 1822), label *Columbella nitida* Lamarck, 1822, 14 specimens, Jamaica;
930 (3623) *Nitidella nitida* (Lamarck, 1822), label *Columbella nitida* Lamarck, 1822, 5 specimens, Indian Ocean;
954 (3676) *Nitidella nitida* (Lamarck, 1822), label *Columbella tringa* (Schroeter, 1783), 1 specimen, Mediterranean Sea;
955 (3644) *Nitidella nitida* (Lamarck, 1822), label *Columbella tringa* (Schroeter, 1783), 3 specimens, Dahlak Arhipelago, Red Sea;
956 (3641) *Nitidella nitida* (Lamarck, 1822), label *Columbella tringa* (Schroeter, 1783), 3 specimens, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea.

Genus *Zafra* A. Adams, 1860:
938 (1425) *Zafra exilis* (Philippi, 1849), label *Columbella exilis* Philippi, 1849, 2 specimens, Mediterranean Sea, Provence.
944 (3677) *Zafra exilis* (Philippi, 1849), label *Columbella exilis* Philippi, 1849, 1 specimen, Red Sea.

Genus *Conella* Swainson, 1840
941 (3671) *Conella ovulata* (Lamarck, 1822), label *Colombella ovulata* Lamarck, 1822, 1 specimen, Sandwich Islands today Hawaiian Islands.

Genus *Metanachis* Thiele, 1924:
942 (6420) *Metanachis jaspidea* (G.B. Sowerby I, 1844), label *Columbella lineolata* Gould, 1860, 1 specimen, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea;
943 (10588) *Metanachis jaspidea* (G.B. Sowerby I, 1844), label *Columbella lineolata* Gould, 1860, 3 specimens, Djedda today Jeddah (Makkah Province, Saudi Arabia), Red Sea;
962 (3632) *Metanachis marquesa* (Gaskoin, 1851), label *Columbella trifaciata*, 3 specimens, Massawa, Eritrea, northern Red Sea.

Genus *Pyrene* Röding, 1798:
946 (3636) *Pyrene punctata* (Bruguière, 1789), label *Columbella semipunctata* Lamarck, 1822, 4 specimens, Dahlak Arhipelago, Red Sea;
947 (3655) *Pyrene punctata* (Bruguière, 1789), label *Columbella semipunctata* Lamarck, 1822, 6 specimens, Massawa, Eritrea, northern Red Sea;
948 (3642) *Pyrene punctata* (Bruguière, 1789), label *Columbella semipunctata* Lamarck, 1822, 1 specimen, Massawa, Eritrea, northern Red Sea;
949 (3635) *Pyrene punctata* (Bruguière, 1789), label *Columbella semipunctata* Lamarck, 1822, 3 specimens, Massawa, Eritrea, northern Red Sea;
950 (3673) *Pyrene punctata* (Bruguière, 1789), label *Columbella semipunctata* Lamarck, 1822, 1

specimen, Île Bourbon today Réunion Island (France), Indian Ocean, east of Madagascar, south west of Mauritius Island;
951 (10593) *Pyrene punctata* (Bruguière, 1789), label *Columbella semipunctata* Lamarck, 1822, 18 specimens, Whest Indian Ocean.

Genus *Rhombinella* Radwin, 1968:
953 (3640) *Rhombinella laevigata* (Linnaeus, 1758), label *Columbella levigata* Duclos, 1848, 6 specimens, Massawa, Eritrea, northern Red Sea.

Genus *Strombina* Mörch, 1852:
959 (3617) *Strombina elegans* (G.B. Sowerby I, 1832), label *Columbella elegans* G.B. Sowerby I, 1832, 4 specimens, Massawa, Eritrea, northern Red Sea.

Genus *Seminella* Pease, 1868
960 (9643) *Seminella peasei* (Martens & Langkavel, 1871), label *Columbella fassciolata*, 2 specimens, Massawa, Eritrea, northern Red Sea.

Genus *Astyris* H. Adams & A. Adams, 1853
961 (3675) *Astyris rosacea* (Gould, 1840), label *Columbella holbolli*, 1 specimen, Greenland.

Superfamily *Olivoidea*
Family *Olividae*

Genus *Olivancillaria* d'Orbigny, 1840:
622 (6315) *Olivancillaria auricularia* (Lamarck, 1811), Ear Ancilla,1 specimen, Brazil;
623 (5199) *Olivancillaria urceus* (Röding, 1798), label *Olivancillaria brasiliensis* "Chemnitz" Mörch, 1850, Bear Ancilla, 2 specimens, Rio de Janeiro (Brazil), collected by Schneider, in 1884.

Genus *Agaronia* Gray, 1839:
624 (6316) *Agaronia (Anazola) gibbosa* (Born, 1778), label *Olivancillaria gibbosa* Born, Gibbous Olive, 2 specimens, Phillipine;
625 (6317) *Agaronia gibbosa* (Born, 1778), label *Olivancillaria utriculus* Lmk., 1 specimen, East Indian Ocean, given by Bielz, in 1884;
626 (6318) *Agaronia acuminata* (Lamarck, 1811), 1 specimen, African east coast;
627 (6319) *Agaronia sp.* Gray, 1839, 1 specimen, the collecting sites is not mentioned;
673 (6359) *Agaronia plicaria* Lamarck, 1811, label *Oliva ispidula* (Linnaeus, 1758), 10 specimens, Phillipine;
674 (6360) *Agaronia plicaria* Lamarck, 1811, label *Oliva ispidula* (Linnaeus, 1758), 2 specimens, People's Republic of China;
675 (6361) *Agaronia plicaria* Lamarck, 1811, label *Oliva ispidula* (Linnaeus, 1758), 1 specimen, East Indies;
676 (6362) *Agaronia plicaria* Lamarck, 1811, label *Oliva ispidula* (Linnaeus, 1758), 2 specimens, East Indies.

Genus *Belloliva* Peile, 1922:
628 (6320) *Belloliva tubulata* (Dall, 1889), label *Agaronia tubulata*, 1 specimen, New Holland.

Genus *Oliva* Bruguière, 1789:
629 (12255) *Oliva bulbosa* (Röding, 1798), label *Oliva fabagina* Lamarck, 1811, 2 specimens, Massawa, Eritrea, northern Red Sea;
630 (6331) *Oliva porphyria* (Linnaeus, 1758), 1 specimen, coastline Republic of Panama;
631 (6322) *Oliva bulbosa* (Röding, 1798), label *Oliva (Dactylus) fabagina*, 5 specimens, Massawa, Eritrea, northern Red Sea;
632 (6323) *Oliva bulbosa* (Röding, 1798), label *Oliva (Dactylus) fabagina*, 8 specimens, Massawa, Eritrea, northern Red Sea;
633 (6323) *Oliva bulbosa* (Röding, 1798), label *Oliva fabagina* Lamarck, 1811, 2 specimens, Massawa, Eritrea, northern Red Sea;
634 (6324) *Oliva bulbosa* (Röding, 1798), label *Oliva fabagina* Lamarck, 1811, 3 specimens, Massawa, Eritrea, northern Red Sea;
635 (6325) *Oliva bulbosa* (Röding, 1798), label *Oliva fabagina* Lamarck, 1811, 4 specimens, Massawa, Eritrea, northern Red Sea;
636 (6327) *Oliva bulbosa* (Röding, 1798), label *Oliva fabagina* Lamarck, 1811, 3 specimens, Massawa, Eritrea, northern Red Sea;
637 (6328) *Oliva bulbosa* (Röding, 1798), label *Oliva fabagina* Lamarck, 1811, 3 specimens, Dahlak Arhipelago, Red Sea;
638 (6333) *Oliva peruviana* Lamarck, 1811, 1 specimen, Republic of Peru;
639 (6332) *Oliva peruviana* Lamarck, 1811, 1 specimen, South America;
640 (6321) Oliva bulbosa (Röding, 1798), label *Oliva (Dactylus) fabagina*, 1 specimen, Red Sea;
641 (5205) *Oliva caerulea* (Röding, 1798), label *Oliva episcopalis* Lamarck, 1810, 2 specimens, Ambon Island, part of the Maluku Islands of Indonesia.
642 (6345) *Oliva amethystina guttata* Lamarck, 1811, label *Oliva guttata* Lamarck, 1811, 2 specimens, Java Island (Republic of Indonesia);
643 (6326) *Oliva bulbosa* (Röding, 1798), label *Oliva fabagina* Lamarck, 1811, 2 specimens, Massawa, Eritrea, northern Red Sea;

644 (6329) *Oliva bulbosa* (Röding, 1798), label *Oliva fabagina* Lamarck, 1811, 2 specimens, Annesley Bay, Eritrean coastline on the Red Sea, also written label Tyerman;
645 (9563) *Oliva vidua* (Röding, 1798), label *Oliva fulminans* Lamarck, 1811, label *Oliva (Dactylus) fulminans*, 1 specimen, Indian Ocean, Orient;
646 (6358) *Oliva sp.* Bruguière, 1789, 1 specimen, Republic of Fiji;
647 (6344) *Oliva tigrina* Lamarck, 1811, 1 specimen, Île Bourbon today Réunion Island (France), Indian Ocean, east of Madagascar, south west of Mauritius Island;
648 (6347) *Oliva sp.* Bruguière, 1789, 1 specimen, East Indies;
649 (6354) *Oliva glandiformis* Lamarck, 1811, 1 specimen, coastline Republic of Panama;
650 (6353) *Oliva elegans* Lamarck, 1811, 1 specimen, East Indies;
651 (6356) *Oliva mustelina* Lamarck, 1811, label *Oliva mustellius*, 3 specimens, People's Republic of China;
652 (6357) *Oliva neostina* Duclos, 1840, 2 specimens, New Holland;
653 (5203) *Oliva vidua* (Röding, 1798), label *Oliva maura* Lamarck, 1810, 2 specimens, Ambon Island, part of the Maluku Islands of Indonesia;
654 (6335) *Oliva vidua* (Röding, 1798), label *Oliva maura* Lamarck, 1810, 1 specimen, East Indies;
655 (5207) Oliva reticulata (Röding, 1798), label *Oliva sanguinolenta* Lamarck, 1811, 2 specimens, Ambon Island, part of the Maluku Islands of Indonesia;
656 (9562) *Oliva sp.* Bruguière, 1789, label *Oliva (Strepbona) sp.*, 2 specimens, Indian Ocean, Orient;
657 (6337) *Oliva tricolor* Lamarck, 1811, 2 specimens, Java Island (Republic of Indonesia);
658 (6336) *Oliva tricolor* Lamarck, 1811, 2 specimens, East Indies;
659 (5201) *Oliva irisans* Lamarck, 1811, 2 specimens, Republic of Mauritius;
660 (5208) *Oliva sp.*, label *Oliva ceylonica*?, 2 specimens, Ceylon today Democratic Socialist Republic of Sri Lanka;
661 (6343) *Oliva sp.*, label *Oliva ceylonica*?, 1 specimen, Île Bourbon today Réunion Island (France), Indian Ocean, east of Madagascar, south west of Mauritius Island;
662 (5202) *Oliva ponderosa* Duclos, 1840, 1 specimen, Republic of Mauritius;
663 (6334) *Oliva sericea* (Röding, 1798), label *Oliva textilina* Lamarck, 1811, 1 specimen, East Indies;
664 (5200) *Oliva miniacea tremulina* Lamarck, 1811, *Oliva olympiadina* Duclos, 1835, 3 specimens, Republic of Mauritius;
665 (6340) *Oliva miniacea* (Röding, 1798), label *Oliva erythrostoma* Lamarck, 1811, 1 specimen, Australia;
666 (6341) *Oliva miniacea* (Röding, 1798), label *Oliva erythrostoma* Lamarck, 1811, 1 specimen, East Indies;
667 (6342) *Oliva tremulina* Lamarck, 1811, 2 specimens, Indian Ocean;
668 (6339) *Oliva sp.* label *Oliva camingi*?, 1 specimen, California (U.S.A.);
669 (6351) *Oliva venulata* Lamarck, 1811, 1 specimen, Indian Ocean, Orient;
670 (6349) *Oliva sayana* Ravenel, 1834, label *Oliva litterata* Lamarck, 1811, 3 specimens, East Indian Ocean;
671 (6350) *Oliva reticularis* Lamarck, 1811, 1 specimen, East Indies;
672 (6330) *Oliva sp.* Bruguière, 1789, 1 specimen, Pacific Ocean, Port Jackson, Australia;
677 (6346) *Oliva oliva* (Linnaeus, 1758), label *Oliva oriola* Lamarck, 1811, 1 specimen, Phillipine;
678 (6348) *Oliva oliva* (Linnaeus, 1758), label *Oliva candida* Lamarck, 1811, 1 specimen, Port Capilo;
679 (6363) *Oliva carneola* (Gmelin, 1791), 1 specimen, Maluku Islands of Indonesia;
680 (5204) *Oliva carneola* (Gmelin, 1791), 1 specimen, Ambon Island, part of the Maluku Islands of Indonesia;
681 (6355) *Oliva leucostoma* Duclos, 1835, 3 specimens, East Indies;
682 (5206) *Oliva dactyliola* Duclos, 1840, label *Oliva labradorensis* (Röding, 1798), 1 specimen, Republic of Singapore;
683 (10583) *Oliva sp.* Bruguière, 1789, 3 specimen, Pacific Ocean, Port Jackson, Australia;
684 (6364) *Oliva sp.* Bruguière, 1789, 2 specimen, Pacific Ocean, Port Jackson, Australia;
685 (5970) *Oliva sp.* Bruguière, 1789, 1 specimen, Pacific Ocean, Port Jackson, Australia;
686 (5971) *Oliva sp.* Bruguière, 1789, 4 specimen, Pacific Ocean, Port Jackson, Australia;
689 (6352) *Oliva sp.* Bruguière, 1789, 1 specimen, Pacific Ocean, Port Jackson, Australia;
690 (6365) *Oliva undatella* Lamarck, 1811, 1 specimen, East Indies;
691 (6385) *Oliva sp.* Bruguière, 1789, 1 specimen, Ceylon today Democratic Socialist Republic of Sri Lanka;

692 (6378) *Oliva sp.* Bruguière, 1789, 1 specimen, East Indies;
696 (3492) *Oliva oliva* (Linnaeus, 1758) , label *Oliva dealbata* Röding, 1758, 2 specimens, South Sea;
700 (5972) *Oliva sp.* Bruguière, 1789, 1 specimen, Pacific Ocean, Port Jackson, Australia;
701 (10584) *Oliva sp*. Bruguière, 1789, 2 specimen, Pacific Ocean, Port Jackson, Australia;
702 (5973) *Oliva sp.* Bruguière, 1789, 1 specimen, Pacific Ocean, Port Jackson, Australia;
703 (5974) *Oliva sp.* Bruguière, 1789, 1 specimen, Pacific Ocean, Port Jackson, Australia;
704 (5975) *Oliva sp.* Bruguière, 1789, 1 specimen, Pacific Ocean, Port Jackson, Australia;
705 (6366) *Oliva sp.* Bruguière, 1789, 7 specimens, Atlantic Ocean, America;
706 (6367) *Oliva sp.* Bruguière, 1789, 9 specimens, Atlantic Ocean, America;
707 (6368) *Oliva sp.* Bruguière, 1789, 3 specimens, Atlantic Ocean, America;
708 (6371) *Oliva sp.* Bruguière, 1789, 12 specimens, Atlantic Ocean, America;
709 (6369) *Oliva sp.* Bruguière, 1789, 1 specimen, Atlantic Ocean, America;
710 (6372) *Oliva sp*. Bruguière, 1789, 1 specimen, Atlantic Ocean, America;
711 (6370) *Oliva sp.* Bruguière, 1789, 1 specimen, Atlantic Ocean, America;
712 (6373) *Oliva sp*. Bruguière, 1789, 2 specimen, Atlantic Ocean, America;
726 (6379) *Oliva sp.* Bruguière, 1789, 27 specimens, Atlantic Ocean, West Indies.

Genus *Jaspidella* Olsson, 1956:
697 (6338) *Jaspidella jaspidea* (Gmelin, 1791), label *Oliva exigua* Martini, Marrat, 1871, 7 specimens, West Indian Ocean or Indies.
Genus *Amalda* H. Adams & A. Adams, 1853:
714 (3685) *Amalda tankervillii* (Swainson, 1825), 1 specimen, East Indies;
730 (3688) *Amalda australis* (Sowerby I, 1830), label *Ancillaria australis* Sowerby, 1830, 1 specimen, Natal (Brazil).

Genus *Anolacia* Gray, 1857:
715 (3689) *Anolacia mauritiana* (G.B. Sowerby I, 1830), label *Ancilla mauritiana* G.B. Sowerby I, 1830, 2 specimens, East Africa;
716 (3690) *Anolacia mauritiana* (G.B. Sowerby I, 1830), label *Ancilla mauritiana* G.B. Sowerby I, 1830, 1 specimen, East Africa;

Genus *Ancilla* Lamarck, 1799
717 (370) *Ancilla castanea* (G.B. Sowerby I, 1830), 1 specimen, Dahlak Arhipelago, Red Sea;
718 (370) *Ancilla castanea* (G.B. Sowerby I, 1830), 3 specimens, Dahlak Arhipelago, Red Sea;
719 (369) *Ancilla ventricosa* (Lamarck, 1811), 8 specimens, Dahlak Arhipelago, Red Sea;
720 (3686) *Ancilla acuminata* (G. B. Sowerby II, 1859), 5 specimens, Massawa, Eritrea, northern Red Sea;
721 (3687) *Ancilla acuminata* (G. B. Sowerby II, 1859), 3 specimens, Dahlak Arhipelago, Red Sea;
722 (367) *Ancilla albisulcata* (G.B. Sowerby I, 1830), 2 specimens, Massawa, Eritrea, northern Red Sea;
723 (3691) *Ancilla lineolata* (A. Adams, 1853), 2 specimens, Massawa, Eritrea, northern Red Sea;
724 (3692) *Ancilla eburnea* (Deshayes, 1830), label *Ancillaria striolata* G.B. Sowerby II, 1859, 3 specimens, Massawa, Eritrea, northern Red Sea;
725 (368) *Ancilla ovalis* (G.B. Sowerby II, 1859), 3 specimens, Massawa, Eritrea, northern Red Sea;
727 (10585) *Ancilla sp.* Lamarck, 1799, label *Ancillaria* Lamarck, 1811, 2 specimens, Massawa, Eritrea, northern Red Sea;
728 (3693) *Ancilla sp*. Lamarck, 1799, 2 specimens, Ceylon today the Democratic Socialist Republic of Sri Lanka;
729 (6389) *Ancilla sp.* Lamarck, 1799, label Ancillaria Lamarck, 1811, 1 specimen, Santos (Brazil);
731 (10586) *Ancilla sp.* Lamarck, 1799, label *Ancillaria* Lamarck, 1811, 7 specimens, Pacific Ocean, Port Jackson, Australia.

Family *Olivellidae*

Genus *Olivella* Swainson, 183:
687 (6380) *Olivella biplicata* (Sowerby I, 1825), label *Oliva biplicata*, 6 specimens, Gulf of California;
688 (6382) *Olivella volutella* (Lamarck, 1811), label *Oliva volutella*, 1 specimen, Republic of Panama coastline;
693 (6375) *Olivella nivea* (Gmelin, 1791), label *Oliva nivea v. oryza*, 1 specimen, East Indies;
694 (6381) *Olivella semistriata* (Gray, 1839), label *Oliva semistriata*, 4 specimens, Gulf of California;
695 (6374) *Olivella nivea* (Gmelin, 1791), label *Oliva nivea eburina*, 1 specimen, East Indies;
698 (6377) *Olivella baetica* Carpenter, 1864, label *Oliva baetica*, 3 specimens, Gulf of California;
699 (6376) *Olivella miriadina* (Duclos, 1835), label *Oliva myriadina* Duclos, Marrat, 1871, 1 specimen, Bourbon today Réunion Island

(France), Indian Ocean, east of Madagascar, south west of Mauritius Island.

Order *Littorinimorpha*
Superfamily *Tonnoidea*
Family *Ranellidae*
Subfamily *Cymatiinae*

Genus *Monoplex* Perry, 1810:
287 (1409) *Monoplex parthenopeus* (Salis-Marschlins, 1793), label *Triton (Simpulum) parthenopsus*, 1 specimen, Mediterranean Sea, Provence;
288 (6088) *Monoplex pilearis* (Linnaeus, 1758), label *Triton (Simpulum) pilearis*, 1 specimen, Philippines Islands today the Republic of the Philippines, Southeast Asia;
289 (5178) *Monoplex nicobaricus* (Röding, 1798), label *Triton (Simpulum) chlorostomus* Lamarck, 1822, 2 specimens, Mauritius Island (Republic of Mauritius);
291 (6093) *Monoplex nicobaricus* (Röding, 1798), label *Triton (Simpulum) chlorostomus* Lamarck, 1822, 2 specimens, Jordan;
292 (5175) *Monoplex gemmatus* (Reeve, 1844), label *Triton (Simpulum) gemmatus* Reeve, 1844, 2 specimens, Mauritius Island (Republic of Mauritius);
295 (9105) *Monoplex pilearis* (Linnaeus, 1758), label *Triton (Simpulum) pilaris*, 1 specimen, Antilles Islands, Caribeean Sea;
296 (6089) *Monoplex pilearis* (Linnaeus, 1758), label *Triton (Simpulum) pilaris*, 5 specimens, Massawa, Eritrea, northern Red Sea;
297 (6090) *Monoplex pilearis* (Linnaeus, 1758), label *Triton (Simpulum) pilaris*, 1 specimen, Dahlak Arhipelago, Red Sea;
298 (6091) *Triton (Simpulum) baccatus*, 5 specimens, Massawa, Eritrea, northern Red Sea;
299 (6092) *Monoplex aquatilis* (Reeve, 1844), label *Triton (Simpulum) aquatile* (Reeve, 1844), 2 specimens, Massawa, Eritrea, northern Red Sea.

Genus *Septa* Perry, 1810:
290 (5177) *Septa rubecula* (Linnaeus, 1758), label *Triton (Simpulum) rubecula*, 2 specimens, Ambon Island, part of the Maluku Islands of Indonesia.
Genus *Charonia* Gistl, 1847:
293 (9106) *Charonia sp*. Gistl, 1847, label *Triton* Montfort, 1810, 2 specimens, Pacific Ocean, Port Jackson, Australia;
326 (6118) *Charonia lampas* (Linnaeus, 1758), label *Ranella lampas* (Linnaeus, 1758), 1 specimen, East Indies today known as Southeastern Asia;
327 (6119) *Charonia lampas* (Linnaeus, 1758), label *Ranella lampas* (Linnaeus, 1758), 1 specimen, Phillipines.

Genus *Cabestana* Röding, 1798:
294 (6094) *Cabestana cutacea* (Linnaeus, 1767), label *Triton (Linatella) doliarium*, 1 specimen, South-East Africa.

Genus *Cymatium* Röding, 1798:
300 (6095) *Cymatium femorale* (Linnaeus, 1758), label *Triton (Cymatium) femorale*, 1 specimen, West Indies Federation;
301 (6096) *Cymatium lotorium* (Linnaeus, 1758), label *Triton (Cymatium) lotorium*, 1 specimen, Dahlak Arhipelago, Red Sea.
Genus *Ranularia* Schumacher, 1817:
302 (6097) *Ranularia pyrum* (Linnaeus, 1758), label *Triton (Cymatium) pyrum* (Linnaeus, 1758), 1 specimen, Maluku Islands, Southeast Asia.
303 (6098) *Ranularia trilineata* (Reeve, 1844), label *Triton trilineatus* Reeve, 1844, 5 specimens, Red Sea;
307 (6104) *Triton (Epidomus) reticula*, 2 specimens, Mediterranean Sea;
308 (6101) *Ranularia gallinago* (Reeve, 1844), Label Triton (Gutturuium) aegrotum, 1 specimen, Massawa, Eritrea, northern Red Sea;
310 (6100) *Ranularia exilis* (Reeve, 1844), label *Triton (Gutturuium) exilis*, 1 specimen, Maluku Islands of Indonesia.

Genus *Gutturnium* Mørch, 1852:
304 (6102) *Gutturnium sp*. Mørch, 1852, label *Triton (Gutturnium)* Mörch, 1852, 2 specimens, Pacific Ocean, Port Jackson, Australia;
305 (10578) *Gutturnium sp*. Mørch, 1852, label *Triton (Gutturnium)* Mörch, 1852, 1 specimen, New Zealand;
306 (6103) *Gutturnium sp*. Mørch, 1852, label *Triton (Gutturnium)* Mörch, 1852, 1 specimen, Australia.
311 (6099) *Gutturnium muricinum* (Röding, 1798), label *Triton (Gutturuium) tuberosum*, 1 specimen, Indian Ocean.

Subfamily *Ranellinae*

Genus *Gyrineum* Link, 1807:
338 (6129) *Gyrineum concinnum* (Dunker, 1862), label *Ranella concinna*, 3 specimens, Dahlak Arhipelago, Red Sea;
339 (6130) *Gyrineum concinnum* (Dunker, 1862), label *Ranella concinna*, 5 specimens, Massawa, Eritrea, northern Red Sea;

340 (6130) *Gyrineum concinnum* (Dunker, 1862), label *Ranella concinna*, 5 specimens, Massawa, Eritrea, northern Red Sea;
341 (6129 *Gyrineum concinnum* (Dunker, 1862), label *Ranella concinna*, 5 specimens, Dahlak Arhipelago, Red Sea;
342 (6130) *Gyrineum concinnum* (Dunker, 1862), label *Ranella concinna*, 8 specimens, Massawa, Eritrea, northern Red Sea;
343 (6128) *Gyrineum gyrinum* (Linnaeus, 1758), label *Ranella ranina* Lamarck, 1816, 1 specimen, Phillipine;
344 (5180) *Gyrineum pusillum* (Broderip, 1833), label *Ranella pusilla* Broderip, 1833, 3 specimens, Mauritius Island (Republic of Mauritius);
345 (6131) *Gyrineum natator* (Röding, 1798), label *Ranella tuberculata* Broderip, 1833, 1 specimen, East Indies today known as Southeastern Asia.

Genus *Ranella* Lamarck, 1816:
347 (6127a) *Ranella sp.* Lamarck, 1816, 1 specimen, Massawa, Eritrea, northern Red Sea;
348 (1410) *Ranella olearium* (Linnaeus, 1758), label *Ranella alacolog* Lamarck, 1816, 1 specimen, Mediterranean Sea, Provence.

Genus *Argobuccinum* Herrmannsen, 1846:
349 (6132) *Argobuccinum* Herrmannsen, 1846, label *Ranella argus*, 1 specimen, Cap-Français today Cap-Haïtien (Haiti).

Family *Personidae*

Genus *Distorsio* Röding, 1798:
312 (6105) *Distorsio anus* (Linnaeus, 1758), label *Persona anus*, 1 specimen, Maluku Islands of Indonesia;
313 (6101) *Distorsio clathrata* (Lamarck, 1816), label *Persona clathrata*, 1 specimen, People's Republic of China;
314 (6107) *Distorsio clathrata* (Lamarck, 1816), label *Persona clathrata*, 2 specimens, Indian Ocean;
315 (5176) *Distorsio clathrata* (Lamarck, 1816), label *Persona clathrata*, 2 specimens, Tokio (Japan);
316 (6108) *Distorsio clathrata* (Lamarck, 1816), label *Persona clathrata*, 2 specimens, Massawa, Eritrea, northern Red Sea.

Family *Bursidae*

Genus *Bufonaria* Schumacher, 1817:
317 (6109) *Bufonaria rana* (Linnaeus, 1758), label *Ranella (Bursa) albivaricosa* Reeve, 1844, 2 specimens, People's Republic of China;
318 (6113) *Bufonaria rana* (Linnaeus, 1758), label *Ranella (Bursa) albivaricosa* Reeve, 1844, 1 specimen, People's Republic of China;
319 (6110) *Bufonaria rana* (Linnaeus, 1758), label *Ranella (Bursa) subgranosa* Sowerby II, 1836, 1 specimen, Manila (Philippines);
320 (6111) *Bufonaria rana* (Linnaeus, 1758), label *Ranella (Bursa) subgranosa* Sowerby II, 1836, 2 specimens, Indian Ocean;
321 (6114) *Bufonaria echinata* (Link, 1807), label *Ranella (Bursa) spinosa* Lamarck, 1816, 1 specimen, Philippines;
322 (6112) *Bufonaria alacol* (Broderip, 1826), label *Ranella (Bursa) alacol* Broderip, 1826, 1 specimen, Mauritius Island (Republic of Mauritius);
323 (6115) *Ranella (Bursa) cornuta*, 3 specimens, Massawa, Eritrea, northern Red Sea;
324 (5181) *Bufonaria crumena* (Lamarck, 1816), label *Ranella (Bursa) crumena* Lamarck, 1816, 1 specimen, Ambon Island, part of the Maluku Islands of Indonesia.

Genus *Marsupina* Dall, 1904:
325 (6116) *Marsupina nana* (Broderip & G.B. Sowerby I, 1829), label *Ranella (Bursa) nana* Brodrip & G.B. Sowerby I, 1829, 1 specimen, Republic of Panama.

Genus *Bursa* Röding, 1798:
328 (6120) *Bursa granularis* (Röding, 1798), label *Ranella affinis* Broderip, 1833, 9 specimens, Massawa, Eritrea, northern Red Sea;
329 (6121) *Bursa granularis* (Röding, 1798), label *Ranella affinis* Broderip, 1833, 11 specimens, Massawa, Eritrea, northern Red Sea;
330 (6120a) *Bursa granularis* (Röding, 1798), label *Ranella affinis* Broderip, 1833, 4 specimens, Massawa, Eritrea, northern Red Sea;
331 (6122) *Bursa granularis* (Röding, 1798), label *Ranella affinis* Broderip, 1833, Dahlak Arhipelago, Red Sea;
332 (6124) *Bursa granularis* (Röding, 1798), label *Ranella affinis* Broderip, 1833, 2 specimens, Massawa, Eritrea, northern Red Sea;
333 (6123) *Bursa granularis* (Röding, 1798), label *Ranella affinis* Broderip, 1833, 2 specimens, Dahlak Arhipelago, Red Sea;
334 (6125) *Bursa granularis* (Röding, 1798), label *Ranella affinis* Broderip, 1833, 1 specimen, Suakin, Sudan, Red Sea;

335 (6126) *Bursa granularis* (Röding, 1798), label *Ranella affinis* Broderip, 1833, 1 specimen, South Sea;
336 (6127) *Bursa granularis* (Röding, 1798), label *Ranella granifera* (Lamarck, 1816), 5 specimens, Massawa, Eritrea, northern Red Sea;
337 (5179) *Bursa rosa* (Perry, 1811), label *Ranella siphonata* Reeve, 1844, 1 specimen, Mauritius Island (Republic of Mauritius);
346 (6127a) *Bursa granularis* (Röding, 1798), label *Ranella granifera* (Lamarck, 1816), 3 specimens, Massawa, Eritrea, northern Red Sea.

Conclusions

The catalogue of the Kimakowicz Malacological Collection from the Natural History Museum Sibiu part II presents 897 inventory numbers belonging to 123 genuses.

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A REEVALUATION OF THE AVIFAUNA FROM CÂMPENEȘTI FISHING COMPLEX (CLUJ COUNTY – ROMANIA) IN THE CONTEXT OF HIGH HUMAN IMPACT

Valentin Adrian KISS *
Liviu Răzvan PRIPON **

Abstract*. Herein, we present new data collected during October 2017 and May 2019 regarding the avifauna of the Câmpeneşti fishing complex located in Cluj County, Romania. This data corresponds to the current situation characterized by intense development of buildings and therefore reflects the anthropogenic pressures on this semi-natural environment. Due to the existence of bibliography in which information about the Câmpeneşti avifauna is available before the anthropic development, the human impact can be evaluated regarding its repercussions to the composition and structure of this avifauna. Constant published data is important for the continuity of this long-term study as well. A total of 127 bird species were identified in the present study, some of them representing new records (15 species) and among these, some were found nesting. From 161 species known in previous studies 53 were not identified in the current study, and from those currently identified about half of them are low in abundance species and with a very short presence over time. In the case of species with quantitative data from the past, half of the nesting pairs can be observed in the present years. All these new data confirm the negative impact of the human presence and settlements but also reflects that many species continue to settle and nest in these conditions. For this reason, few natural habitat fragments need to be maintained and more attention to human activity must be given to protect and conserve the species that continue to exist in such semi-natural environments.*
Keywords*: semi-natural habitats, wetlands, waterfowls, fishing complex management.*

Rezumat. *În această lucrare prezentăm noi date colectate în perioada octombrie 2017 – mai 2019 referitoare la avifauna complexului piscicol de la Câmpenești (Cluj, România). Aceste date corespund situației actuale caracterizată de o puternică dezvoltare a construcțiilor din regiune și prin urmare reflectă presiunile antropice asupra acestui mediu semi-natural. Datorită existenței unei bibliografii în care se găsesc informații referitoare la avifauna de la Câmpenești înainte de dezvoltarea antropică s-a putut evalua ce repercusiuni are activitatea umană asupra compoziției și structurii avifaunei. Totodată, publicarea datelor din timp în timp despre această regiune este importantă pentru continuitatea unui studiu de lungă durată. În prezent au fost identificate un număr de 127 de specii dintre care unele reprezintă noi semnalări (15 specii) iar dintre aceste noi specii identificate în prezent unele au fost cuibăritoare. Dintre cele 161 de specii descrise în studiile anterioare 53 nu au mai fost identificate în studiul actual iar dintre cele identificate în prezent aproximativ jumătate sunt specii cu abundențe reduse și prezențe foarte scurte în timp. În cazul unor specii despre care există date cantitative se poate constata o înjumătățire a numărului de perechi cuibăritoare. Toate datele confirmă efectul negativ al impactului uman dar reflectă și faptul că în aceste condiții multe specii continuă să se instaleze și să cuibărească. Din acest motiv puținele fragmente de habitat natural trebuie menținute și o mai mare atenție în ceea ce privește activitatea umană trebuie acordată pentru a proteja și conserva speciile care continuă să existe în astfel de medii semi-naturale.*
Cuvinte cheie: *habitate seminaturale, zone umede, păsări de apă, managementul pescăriilor*

Introduction

In this paper, we present the results collected between October 2017 and May 2019, regarding the composition of the avifauna from Câmpeneşti where some semi-natural wetlands are located.

The wetland from Câmpenești is a manmade pond complex with fishery destination. This locality is in a rapid process of anthropic development therefore nowadays a high human impact affects the avifauna established there. Many studies focus on natural habitats and give less importance to semi-natural habitats or artificial ones like forest plantations or human settlements even though they could give some answers to hot topics in environmental science (Cristea *et al.* 2002, Hedblom 2007). Bird monitoring data can reveal

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the differences between artificial and natural modifications (Koskimies 1989). The qualitative and quantitative results come to elucidate which bird species are established in such semi-natural habitat with a strong anthropic impact and on the other hand what changes occur in the composition and structure of the avifauna following such an impact. These are two central questions that correspond to the aim of the present research, which is concerned with the inventory of the actual avifauna from Câmpeneşti and the highlighting of the changes occurring at the avifauna level due to the human interventions. These analyses are possible by comparing the current results with the data recorded in past studies of the same region. The data related to Câmpeneşti avifauna extend for a period of 31 years, the first studies being represented by Dan Munteanu's work which shows results since 1988 (Munteanu 2004, Munteanu, Munteanu 2005). Other authors such as Moga and Stermin (Moga, 2004, Stermin 2009) present their data in several articles and conferences presentation (Pripon, Stermin 2012). The latest publication on Câmpeneşti avifauna was published in 2013 and consist of a synthetical presentation of the avifauna until that time (Pripon, Stermin 2013). Along with these mentioned studies, the current paper represents the continuation of a long-term study, which has the advantage of more comprehensive evaluations. At the same time, the current data are important for the continuity of this long-term study in order to anticipate certain ecological trends concerning bird communities. Examples of bird community structure modification in the context of semi-natural ponds can be found in other studies and reveal variations caused by human interventions (Munteanu, Mătieș 1983).

Similar studies as the one presented here are important because fewer areas are devoided of human presence even when considering protected areas. Everywhere, the anthropic impact is increasing, and its effects must be known in order to understand what environmental path is followed by the animal and plant communities in this actual ecological context (Cam et al 2000; Blair 1996; Bezzel 1984). Such data is needed for a better understanding of where and how to act in the process of nature protection and conservation. The data presented here is an argument that such semi-natural areas should be given greater importance even if specific rules for protected areas cannot be implemented.

Materials and methods

In order to achieve our goal, we have carried out successive monitoring of avifauna, we assessed the anthropic impact, assessed the current habitats and compared the results with those in the bibliography. The data presented here were collected in 81 field trips between October 2017 and May 2019 with several field trips per month (between 2 and 5). Bird monitoring was performed using the transect method (Korodi-Gal 1969) and fixed-point method (Ralph *et al.* 1995) with the average length of a monitoring campaign around one and a half hours. The transect route was in the NE part of the pond complex with a length of 4 km and the data were collected both from the perimeter of the ponds as well as from the road and from the nearby hills. Data collecting was undertaken visually using the binoculars and photographically documented as well as acoustic in the case of birds that cannot be otherwise identified. The taxonomy used in this paperis based on the Illustrated Checklist of the Birds of the World (del Hoyo, Collar 2014, del Hoyo, Collar 2016). Comparison with previous data was performed with certain limitation due to the incompatibility between old and new data sets (Pripon, Stermin 2013, Igl, Johnson 2005) but qualitative data can serve very well to this purpose (Radovic, Tepic 2009).

The raw data is presented in a table in which we used the following classification codes. For the frequency we have established four classes as follows: constant species with more than 20 observations denoted by C, frequent species with 10 to 20 observations denoted F, occasional species with a number of observations between 2 and 10 marked with O and accidental species with 1 or 2 observations marked with Ac. The aquatic species were marked with A and terrestrial ones with T. In terms of nesting, we used four categories: breeding species marked with B, non-breeding species labelled with nB, probably breeding species marked with B?. For phenology we used five classes as follows: Resident – R, summer resident – SR, winter visitor – W, passage species – P. To reflect the real situation in the table 1 we chose to note the estimated abundance due to the fact that for terrestrial species the count was conducted only on one side of the fishing complex and should, therefore, be at least doubled, a need confirmed by observations and on the opposite side. The same evaluation should be applied to water species such as Little Bittern or Water rail that have a low detectability. Species

abundance is divided in four classes represented by letters: high abundance species (HA) – more than 50 individuals, abundant species (A) – between 21 and 50 individuals, low abundance species (LA) – between 6 and 20 individuals, and rare species ® – between 1 and 5 individuals.

Study area

Câmpenești hosts a fishing complex with a total area of approximately 1247825 m^2 consisting of 7 ponds of different sizes and several smaller pools for fish breeding. The conformation of each pond is different from the perspective of their dimensions and geometry of the perimeter. On the ponds and their vicinity some types of aquatic and marsh vegetation are installed from which reedbeds are the most dominant and important for the avifauna. The reedbeds are edified by reed (*Phragmites australis*) and cattail (*Typha latifolia*). This type of vegetation occurs on each pond with a different percentage as follows: pond 0 – 12%, pond 1 – 41%, pond 2 – 5%, pond 3 – 25%, pond 4 – 40%, pond 5 – 42%, pond 6 – 0%. Other plant species that are found here are sedges from the genus Carex and the water-flag (*Iris pseudacorus*). On the pond 0 and on the pond 3, palustrine vegetation which forms a favourable environment for the nesting of species such as those of the genus Chlidonias, has developed. At the periphery of the pond 0, on the edges of the Feiurdeni Valley, which flows in this pond complex, there is a riparian forest edified by willow (*Salix sp*.) and poplar (*Populus sp*.). Terrestrial habitats are represented by hilly meadows with shrubbery edified by dog-rose, blackthorn or hawthorn and pine or False-acacia plantations. In some areas of these plantations, species of the genus Quercus and burning bush (*Dictamnus albus*) are reinstalled.

The anthropic impact is mainly due to the strong development of the constructions on the banks of the ponds, which involves taking over the habitats and the presence of man in these areas. Measuring the distance occupied by current building with respect to the perimeter of the pond complex, we obtain about 40% of occupied area by such human settlements. In the past, near the ponds, there were no constructions except in a very small percentage on the Pond 1 and the fish farm headquarters at the Pond 5 which did not exceed 10% of the total length of the banks. Buildings development has led to the development of traffic routes around ponds and frequent transit. Anglers represent a major disturbance for birds in parts of the pond that are not private property. Domestic animals represented by cats and dogs increase in number due to the development of human settlements, being raised near the houses but with free access in the neighbouring areas. These domestic animals are a threat many for aquatic or terrestrial bird species.

Results and discussions

Between October 2017 and May 2019, we identified 127 species of birds belonging to 41 families and 18 orders. The data obtained are summarized in Table 1. Concerning the qualitative analysis of the avifauna, we can see that both the composition of orders in families (Fig. 1.) and species (Fig. 2.) resembles the ones very much recorded in the past and synthesized by Pripon (2013). However, several species of birds identified in our study were not found in the past lists and at the same time, a number of species observed in the past have not been identified anymore. The number of current species (127) is lower than that found in the synthetic list of the past, amounting to 161 species (Pripon, 2013). This is due to the longer duration considered in the previous study, but also to some accidentally occurring species listed there.

Analysing from a phenological perspective, from the total of all species identified, most of them are summer resident species (36%), followed in almost equal percentages (approximately 30%) by passage and resident species (Fig. 3. B). The least species are wintering and some accidentally species (Fig. 3).

If we analyse the data from the perspective of the reproductive character, we can see that most species are non-breeding, but a significant and close number is that of nesting birds (Fig. 4. A). If we also take into account the probable nesting species, those from which only the juveniles were observed or adults were constantly observed in the appropriate nesting places with the mating behaviour but without identifying the nests, the percentages corresponding to breeding and non-breeding species are approximately equal (Fig. 4. B). Several species with a lower rate (2%) showed signs of mating behaviour over a short period of time in the breeding season but were no longer present, reflecting the fact that they had a favourable ecological context but probably some factors, presumably anthropically, led to the abandonment of the Câmpeneşti ponds.

Considering that the studied area is a wetland, a high number of species were aquatic, but a higher number of terrestrial species were observed (Fig. 5.). If we transform the numbers in percentage, 54% are terrestrial species and 46% are aquatic

species (Fig. 5.) and that shows a balanced situation between the two categories even in the immediate vicinity of the ponds.

An important aspect of our study is the frequency of the bird species observed. What we can see in this case is that, although we identified many bird species, a very large number of them have a low frequency, being occasional species (27 species) and accidental species (24 species) (Fig. 6. A). They make up a considerable percentage of 40%, which represents almost half of all observed species (Fig. 6. B). This result says that some species stop at Câmpenești during the passage but do not spend much time here and therefore only half of the species can be considered as true residents in this region.

The quantitative analysis of Câmpenești avifauna shows that many species are represented by one or few individuals, being rare species and representing 52% of all identified ones (Fig. 6. B). A total of 44 (34%) species is present with a low abundance of 6-20 individuals and 18 (8%) species are present with an abundance between 21-50 individuals. Another category of 4%species is present with very high abundance. One of these is the Common starling (*Sturnus vulgaris*) with numerous flocks of around 3000 individuals using reedbeds as sleeping and resting refugees during August-October. The same situation can be observed during the swallow's (*Hirundo rustica*) passage, but with fewer flocks around 1000 individuals. There are also several water species with fewer but relatively abundant flocks among which the Eurasian Coot (*Fulica atra*) and Common Pochard (*Aythya occot*) which form massive agglomerations during the winter season when the ponds are almost frozen. The Mallard duck (*Anas platyrhynchos*) is also noticeable even after the ponds began to freeze in a considerable percentage. Another aquatic species found with an abundance of about 100 individuals and forming these agglomerations for short periods during autumn is the Black-headed gull (*Chroicocephalus ridibundus*). The rook (*Corvus frugilegus*) is another species that is sometimes present with numerous groups of up to around 500 individuals, being a species that feeds on grasslands and shrubs around the ponds.

Two observations were made at approximately 8 km from Câmpenești and can be considered important records. We will mention the observations here due to the importance of data on this species distribution and because they could be present at Câmpenești even if we haven't identified or seen the individual ourselves. We're talking here about 20-30 individuals of Rosy starling (*Pastor roseus*) observed on 26.05.2018 in Răscruci village, the same or another one flock being observed on 27.05.2018 near the town of Țaga. The second species is the Ortolan Bunting (*Emberiza hortulana*) observed on 01.05.2018 at the exit from the village of Rascruci to Borșa village. This was a singing male that could reflect the possibility of nesting of the species in the area.

Conclusions

Based on our results, we can answer the two questions asked at the beginning of this paper. On the one hand, we can see that in the context of anthropogenic impact a considerable number of birds, reaching 127 species, are still present on Câmpenești ponds. However, many of them are represented by species with few individuals and many of them have low frequency being just passing by or remaining for a short period of time. Other species have numerous populations, such as Eurasian Coot (*Fulica atra*), which reproduce in large numbers even where there is intense human activity. Other species such as Turtle dove (*Streptopelia turtur*) still appear in the rural area where several other species such as Stonechat (*Saxicola torquatus*) and Red-backed Shrike (*Lanius collurio*) are nesting in ruderal vegetation of this urbanized environment. Thus, in the context of anthropogenic impact, many bird species are still found, but most of them with a low abundance and just passing without spending much time or becoming residents.

On the other hand, we identified almost three quarters (68%) of the species identified in the previous period, when the anthropic impact was not so intense. A total of 53 species have not been identified in present years and 15 species have been identified only in present but not in the past records. Among the latter, we can mention: *Gavia occothr, Mergellus albelus, Clanga occothr, Himantopus himantopus, Merops apiaster, Picus viridis, Dendrocopos major, Anthus spinoletta, Troglodytes troglodytes, Phylloscopus trochilus, Luscinia megarhynchos, Turdus philomelos, Poecile palustris, Chloris chloris, Pyrrhula pyrhula* and *Coccothraustes occothraustes*. Some situations may reflect certain climatic changes such as the Bee-eater (*Merops apiaster*) that was not present in the past and is now a nesting species in Câmpenești. If we want to analyse quantitative data of nesting populations, we can take as an example the Great crested grebe (*Podiceps cristatus*) about which we have such

quantitative data from 2006-2007 (13 years ago) (Stermin 2009). In the present, there can be found only half of the nesting pairs that were found in the past. There were between 17 and 28 nests of Great crested grebe in the past (Stermin, 2009), but only 10-14 pairs of birds were currently found. This situation can also be applied to other nesting species.

All these changes are due to the anthropogenic impact that is reflected in the actual occupation of semi-natural areas by building installation, frequent human presence, the presence of fishermen in the remaining areas, domestic animals such as cats and dogs that disturb and kill birds and, last but not least, the burning of reedbeds. However, it can be noticed that the presence of more habitats such as reedbeds, marshes that form on the shores of ponds, allow the installation of many species of birds even in the context of a strong anthropogenic impact. Thus, allowing the development of these habitats and some restrictions in areas where human disturbance is too high, can lead to a coexistence of avifauna with humans even where man makes his presence strongly felt.

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LIST OF ILLUSTRATIONS

Fig. 1. Bird orders composition in species in past studies (B) (Pripon 2013) in comparison with the current situation (A). The following bird orders are represented clockwise from 1 to 18 as follows: Anseriformes, Galliformes, Gaviiformes, Podiciformes, Suliformes, Pelecaniformes, Ciconiiformes, Accipitriformes, Falconiformes, Gruiformes, Charadriiformes, Columbiformes, Cuculiformes, Strigiformes, Bucerotiformes, Coraciiformes, Piciformes, Passeriformes.

Fig. 2. Bird orders composition in families in past studies (B) (Pripon 2013) in comparison with the current situation (A). The following bird orders are represented clockwise from 1 to 18 as follows: Anseriformes, Galliformes, Gaviiformes, Podiciformes, Suliformes, Pelecaniformes, Ciconiiformes, Accipitriformes, Falconiformes, Gruiformes, Charadriiformes, Columbiformes, Cuculiformes, Strigiformes, Bucerotiformes, Coraciiformes, Piciformes, Passeriformes.

Fig. 3. Graphic representation with the number (b) and the percentage (a) of phenological types of birds: sresident (S), wintering (W), summer resident (SR), passage birds (P).

Fig. 4. Graphic representation with the number (b) and the percentage (a) of breeding (B), possible breeding (B?), non-breeding (nB).

Fig. 5. Graphic representation with the number and percentage of terrestrial (T) and aquatic (A) birds

Fig. 6. Graphic representation of species frequency in number (b) and percentage (a) of each category:), constant species (C), frequent species (F) occasionally species (O) and accidental species (Ac).

Fig. 7. Graphic representation of species abundance in number (b) and percentage (a) of each category: high abundance species (HA), abundant species (A), low abundance species (LA) and rare species (R).

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Fig. 1. Compoziția în specii a ordinelor de păsări în studiile din trecut (B) în comparație cu situația din prezent (A). Următoarele ordine sunt reprezentate în sensul acelor de ceasornic începând de la 1 până la 18: Anseriformes, Galliformes, Gaviiformes, Podiciformes, Suliformes, Pelecaniformes, Ciconiiformes, Accipitriformes, Falconiformes, Gruiformes, Charadriiformes, Columbiformes, Cuculiformes, Strigiformes, Bucerotiformes, Coraciiformes, Piciformes, Passeriformes.

Fig. 2. Compoziția în familii a ordinelor de păsări în studiile din trecut (B) în comparație cu situația din prezent (A). Următoarele ordine sunt reprezentate în sensul acelor de ceasornic începând de la 1 până la 18: Anseriformes, Galliformes, Gaviiformes, Podiciformes, Suliformes, Pelecaniformes, Ciconiiformes, Accipitriformes, Falconiformes, Gruiformes, Charadriiformes, Columbiformes, Cuculiformes, Strigiformes, Bucerotiformes, Coraciiformes, Piciformes, Passeriformes.

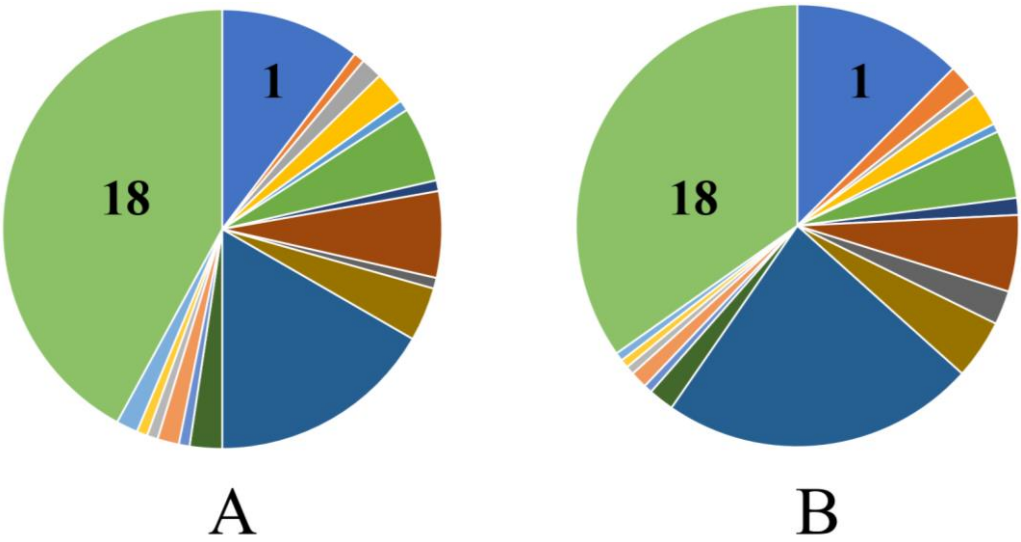
Fig. 3. Reprezentarea grafică a numărului de specii (b) și procentajelor (a) categoriilor fenologice: specii sedentare (S), oaspeți de iarnă (W), oaspeți de vară (SR), specii de pasaj (P).

Fig. 4. G**.** Reprezentarea grafică a numărului de specii (b) și procentajelor (a) păsărilor: reproducătoare (B), posibibil reproducătoare (B?) și nereproducătoare (nB).

Fig. 5. Reprezentarea grafică a numărului de specii (b) și procentajelor (a) categoriilor de păsări terestre (T) și a celor acvatice (A).

Fig. 6. Reprezentarea grafică a numărului de specii (b) și procentajelor (a) categoriilor de frecvență: specii constante (C), specii frecvente (F), specii ocazionale (O) și specii accidentale (Ac).

Fig. 7. Reprezentarea grafică a numărului de specii (b) și procentajelor (a) categoriilor de abundență: specii cu abundență foarte mare (HA), specii abundente (A), specii cu abundență redusă (LA) și specii rare (R).



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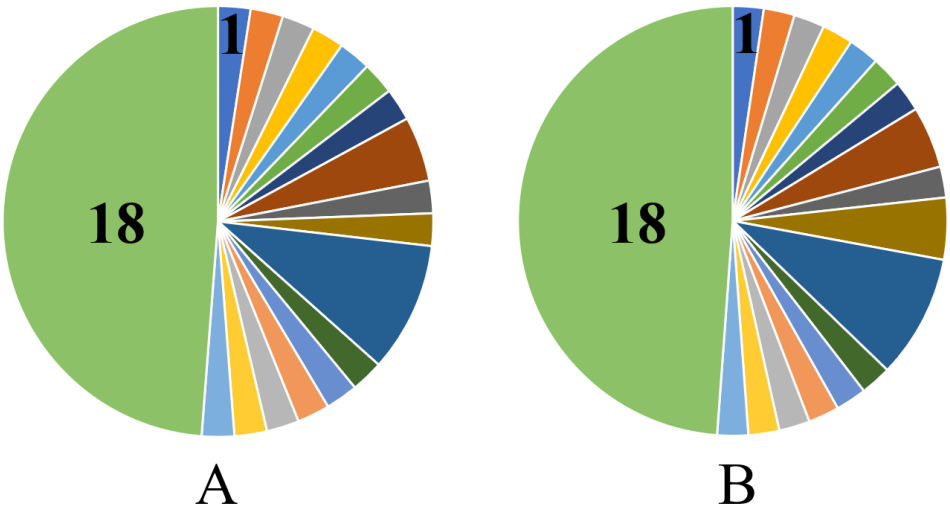

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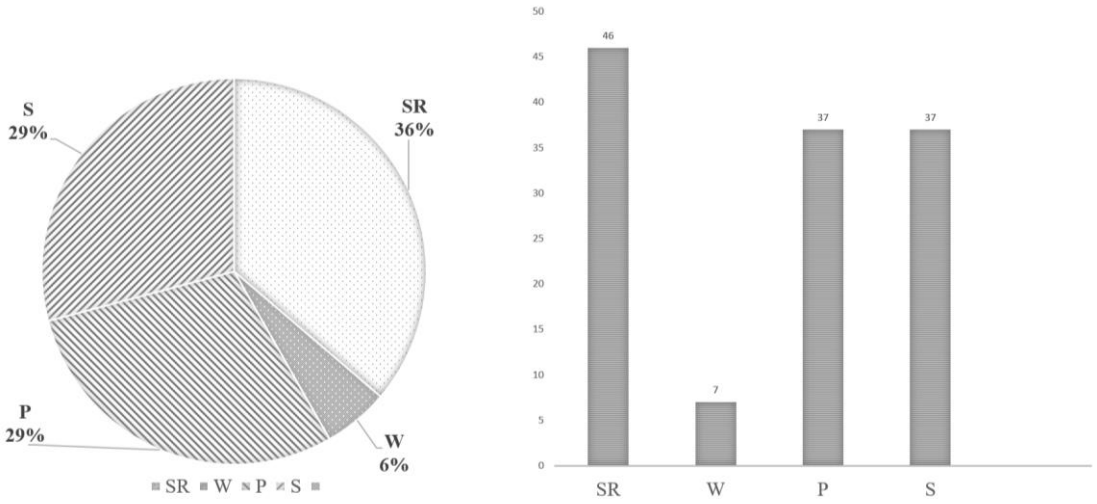

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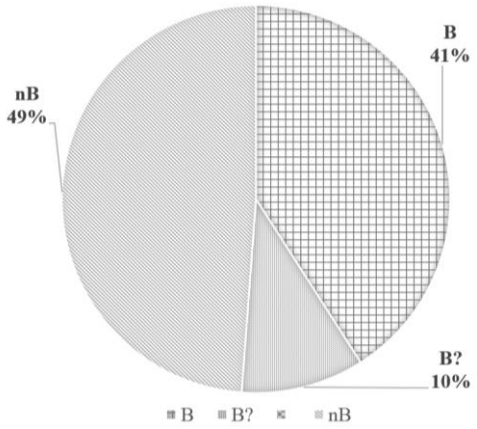
Fig. 3. Graphic representation with the number (b) and the percentage (a) of phenological types of birds: Resident (S), wintering (W), summer resident (SR), passage birds (P).



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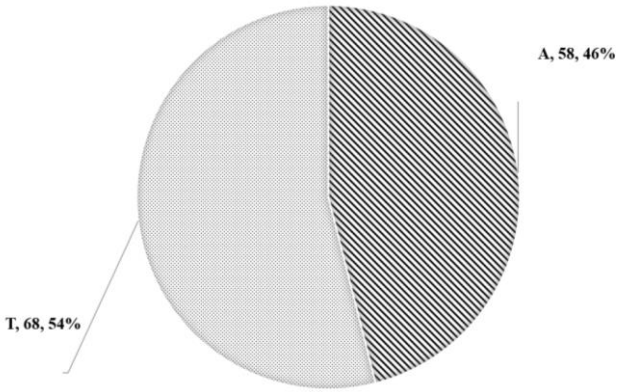

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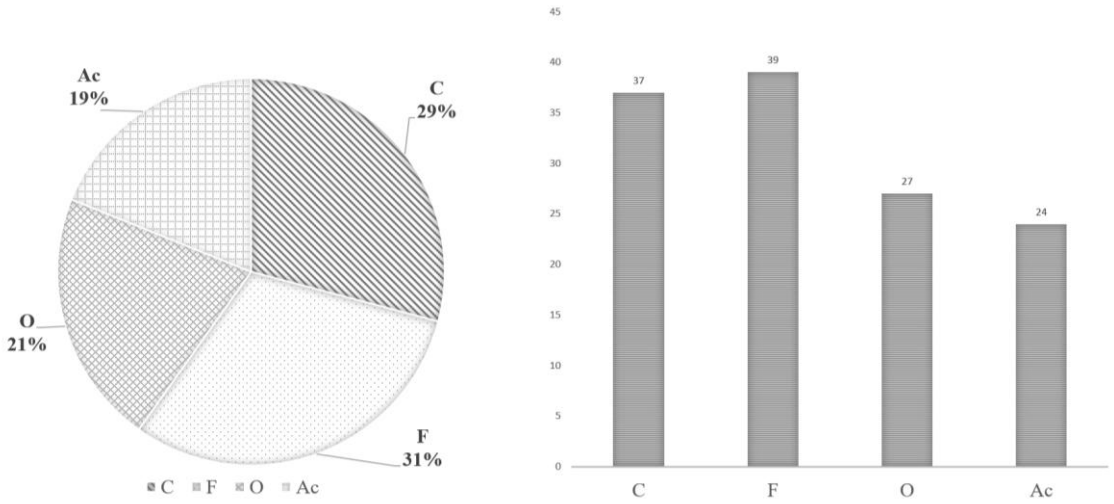

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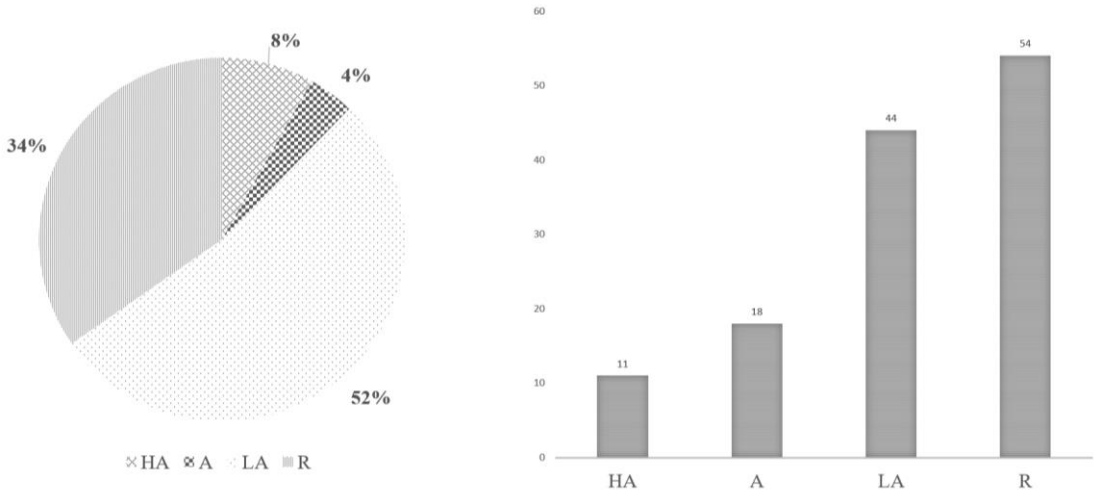

a b

Fig. 7. Graphic representation of species abundance in number (b) and percentage (a) of each category: high abundance species (HA), abundant species (A), low abundance species (LA) and rare species (R).

Tab. 1. Identified taxa in Câmpenești during 2017 and 2019

TAXA	Abundance	Frequency	Breeding	A/T	Phenology	IUCN
Ord. Anseriformes						
Fam Anatidae						
1.Cygnus olor	R	O	NB	A	P	LC
2.Anas platyrhynchos	HA	C	B	A	R	LC
3.Anas crecca	A	C	B?	A	R	LC
4.Mareca strepera	R	AC	NB	A	P	LC
5.Mareca penelope	LA	O	NB	A	P	LC
6.Spatula querquedula	LA	O	B?	A	P	LC
7.Spatula clypeata	R	F	NB	A	P	LC
8.Netta rufina	R	AC	NB	A	P	LC
9.Aythya ferina	HA	C	B	A	R	LC
10.Aythya fuligula	LA	F	NB	A	P	LC
11.Aythya nyroca	R	AC	NB	A	P	NT
12.Bucephala clangula	R	AC	NB	A	W	LC
13.Mergellus albellus	R	AC	NB	A	P	LC
Ord. Galliformes						
Fam. Phasianidae						
14.Phasianus colchicus	LA	C	B	T	R	LC
Ord. Gaviiformes						
Fam. Gaviidae						
15.Gavia stellata	R	O	NB	A	W	LC
16.Gavia arctica	R	O	NB	A	W	LC
Ord. Podiciformes						
Fam. Podicipedidae						
17.Tachybaptus ruficollis	LA	C	B	A	SR	LC
18.Podiceps nigricollis	R	O	NB	A	P	LC
19.Podiceps cristatus	A	C	B	A	SR	LC
Ord. Suliformes						
Fam. Phalacrocoracidae						
20.Phalacrocorax carbo	A	O	NB	A	SR	LC
Ord. Pelecaniformes						
Fam. Ardeidae						
21.Botaurus stellaris	R	F	B	A	SR	LC
22.Ixobrychus minutus	LA	C	B	A	SR	LC
23.Ardeola ralloides	R	AC	NB	A	P	LC

24.Egretta garzetta	R	F	NB	A	SR	LC
25.Ardea alba	LA	C	B?	A	R	LC
26.Ardea cinerea	LA	C	NB	A	R	LC
27.Ardea purpurea	R	AC	NB	A	P	LC
Ord. Ciconiiformes						
Fam. Ciconiidae						
28.Ciconia ciconia	R	AC	NB	T	SR	LC
Ord. Accipitriformes						
Fam. Accipitridae						
29.Clanga pomarina	R	AC	NB	T	P	LC
30.Circus aeruginosus	LA	C	B	A	SR	LC
31.Circus cyaneus	R	O	NB	T	W	LC
32.Buteo buteo	LA	C	NB	T	R	LC
33.Buteo lagopus	R	AC	NB	T	W	LC
34.Accipiter nisus	R	F	NB	T	R	LC
35.Accipiter gentilis	R	O	B?	T	R	LC
Fam. Pandionidae						
36.Pandion haliaetus	R	AC	NB	T	P	LC
Ord. Falconiformes						
Fam. Falconidae						
37.Falco tinnunculus	LA	C	B	T	R	LC
Ord. Gruiformes						
Fam. Rallidae						
38.Crex crex	R	F	B?	T	SR	LC
39.Rallus aquaticus	LA	F	B?	A	SR	LC
40.Zapornia parva	R	AC	NB	A	P	LC
41.Gallinula chloropus	LA	F	B	A	SR	LC
42.Fulica atra	HA	C	B	A	R	LC
Ord. Charadriiformes						
Fam. Recurvirostridae						
43.Himantopus himantopus	R	AC	NB	A	P	LC
Fam. Charadriidae						
44.Charadrius dubius	R	F	B?	A	SR	LC
45.Vanellus vanellus	LA	F	B	A	SR	LC
Fam. Scolopacidae						
46.Calidris alpina	R	O	NB	A	P	LC

47.Calidris minuta	LA	AC	NB	A	P	LC
48.Calidris pugnax	A	F	NB	A	P	LC
49.Actitis hypoleucos	R	O	NB	A	P	LC
50.Tringa ochropus	LA	O	NB	A	P	LC
51.Tringa glareola	LA	O	NB	A	P	LC
52.Tringa totanus	R	AC	NB	A	P	LC
53.Tringa eythropus	R	AC	NB	A	P	LC
54.Tringa nebularia	LA	O	NB	A	P	LC
55.Tringa stagnatilis	R	AC	NB	A	P	LC
56.Gallinago gallinago	A	O	NB	A	P	LC
Fam. Lariidae						
57.Larus michahellis	A	C	NB	A	R	LC
58.Larus ridibundus	HA	F	NB	A	SR	LC
59.Hydrocoloeus minutus	R	AC	NB	A	P	LC
60.Sterna hirundo	R	O	B?	A	SR	LC
61.Chlidonias hybrida	R	F	NB	A	SR	LC
62.Chlidonias leucopterus	A	O	NB	A	P	LC
63.Chlidonias niger	LA	O	NB	A	P	LC
Ord. Columbiformes						
Fam. Columbidae						
64.Columba palumbus	LA	F	B	T	SR	LC
65.Streptopelia decaocto	A	C	B	T	R	LC
66.Streptopelia turtur	R	O	B	T	SR	LC
Ord. Cuculiformes						
Fam. Cuculidae						
67.Cuculus canorus	LA	C	B	T	SR	LC
Ord. Strigiformes						
Fam. Strigidae						
68.Athene noctua	LA	F	B	T	R	LC
69.Asio otus	R	AC	NB	T	R	LC
Ord. Bucerotiformes						
Fam. Upupidae						
70.Upupa epops	LA	F	B	T	SR	LC
Ord. Coraciiformes						
Fam. Meropidae						
71.Merops apiaster	LA	F	B	T	SR	LC
Ord. Piciformes						

Fam. Picidae						
72.Picus viridis	R	AC	B?	T	R	LC
73.Dendrocopos major	R	O	NB	T	R	LC
Ord. Passeriformes						
Fam. Alaudidae						
74.Alauda arvensis	LA	C	B	T	SR	LC
Fam Hirundinidae						
75.Riparia riparia	HA	C	NB	T	SR	LC
76.Hirundo rustica	HA	C	B	T	SR	LC
77.Delichon urbicum	A	AC	NB	T	P	LC
Fam. Motacillidae						
78.Anthus campestris	R	F	B	T	SR	LC
79.Anthus spinoletta	R	O	NB	T	P	LC
80.Mottacilla flava	LA	C	B	T	SR	LC
81.Motacilla alba	HA	C	B	T	SR	LC
Fam. Muscicapidae						
82.Luscinia megarhynchos	R	F	B	T	SR	LC
83.Erithacus rubecula	R	F	B?	T	SR	LC
84.Phoenicurus ochruros	R	F	B	T	SR	LC
85.Oenanthe oenanthe	LA	F	B	T	SR	LC
86.Saxicola rubetra	LA	F	B	T	SR	LC
87.Saxicola rubicola	A	F	B	T	SR	LC
Fam. Turdidae						
88.Turdus merula	R	F	B?	T	R	LC
89.Turdus pilaris	A	O	NB	T	P	LC
90.Turdus philomelos	LA	F	NB	T	P	LC
Fam. Sylviidae						
91.Sylvia communis	LA	F	B	T	SR	LC
92.Sylvia curruca	R	F	B	T	SR	LC
Fam. Locustellidae						
93.Locustella luscinioides	R	F	B	A	SR	LC
Fam. Acrocephalidae						
94.Acrocephalus arundinaceus	A	C	B	A	SR	LC
95.Acrocephalus scirpaceus	LA	C	B	A	SR	LC
96.Acrocephalus schoenobaenus	LA	C	B	A	SR	LC
97.Acrocephalus palustris	R	F	B	A	SR	LC

Fam. Phylloscopidae						
98.Phylloscopus trochilus	LA	F	NB	T	P	LC
99.Phylloscopus collybita	LA	F	NB	T	P	LC
Fam. Troglodytidae						
100.Troglodytes troglodytes	R	O	NB	T	P	LC
Fam. Paridae						
101.Parus major	LA	C	B	T	R	LC
102.Cyanistes caeruleus	LA	C	B?	T	R	LC
103.Poecile palustris	R	AC	NB	T	R	LC
Fam. Aegithalidae						
104.Aegithalus caudatus	R	AC	NB	T	R	LC
Fam. Panuridae						
105.Panurus biarmicus	LA	C	B	A	SR	LC
Fam. Laniidae						
106.Lanius collurio	LA	C	B	T	SR	LC
107.Lanius excubitor	R	F	B?	T	W	LC
Fam. Corvidae						
108.Pica pica	A	C	B	T	R	LC
109.Garrulus glandarius	R	F	B	T	R	LC
110.Corvus monedula	A	F	NB	T	R	LC
111.Corvus frugilegus	HA	C	NB	T	R	LC
112.Corvus cornix	A	C	B	T	R	LC
113.Corvus corax	LA	O	NB	T	R	LC
Fam. Sturnidae						
114.Sturnus vulgaris	HA	C	B	T	SR	LC
Fam. Oriolidae						
115.Oriolus oriolus	LA	F	B	T	SR	LC
Fam. Passeridae						
116.Passer domesticus	HA	C	B	T	R	LC
117.Passer montanus	HA	C	B	T	R	LC
Fam. Fringillidae						
118.Fringilla coelebs	R	O	NB	T	R	LC
119.Pyrrhula pyrrhula	R	O	NB	T	R	LC
120.Coccothraustes coccothraustes	R	O	NB	T	R	LC
121.Carduelis carduelis	LA	C	B	T	R	LC
122.Linaria cannabina	A	C	B	T	R	LC
123.Spinus spinus	A	AC	NB	T	W	LC

124.Chloris chloris	LA	F	B	T	R	LC
Fam. Emberizidae						
125.Emeberiza schoeniclus	A	F	B	A	SR	LC
126.Emberiza citrinella	LA	F	B	T	R	LC
127.Emberiza calandra	LA	C	B	T	SR	LC

MORPHOLOGICAL DIFFERENCES OF *CENTAUREA* SPECIES (LEPTERANTHUS SECTION) WITH PCA METHOD

Ghizela Daniela VONICA*

Abstract*. Due to the morphological polymorphism and its hybrids encountered in the Centaurea genus, their recognition becomes increasingly difficult, especially for beginners. The proposed method used in the morphological differentiation of the Centaurea species (Lepteranthus section), wants to initiate the students in the statistical analysis realized with the CANOCO 5.1 software. The determination of the discriminating morphological characters in the species diagnosis of the Lepteranthus section can be done by several methods but the most common analysis remains PCA - Principal Component Analysis. The method reduces the number of cases by linear transformation and highlights the relationship between species and morphological characters. Following the proposed study, the species of the Lepteranthus section can be distinguished by a few important morphological characters related to the presence of the inflorescence. The middle involucral bracts of Centaurea inflorescence remains one of the important keys of the determination and for a small group of taxa from the Lepteranthus section even a few features of the steam. The method can also be applied in other types of statistical packages, free or licensed.*
Key words: *CANOCO 5.10 software, Centaurea genus, Lepteranthus sect., Principal Components Analysis (PCA), morphological traits*

Rezumat. *Datorită polimorfismului morfologic întâlnit în cadrul genului Centaurea și a capacității sale de hibridizare, recunoașterea acestora devine tot mai dificilă, mai ales de către începători. Prin metoda propusă în diferențierea morfologică a speciilor de Centaurea secția Lepteranthus, se dorește, mai ales, inițierea studenților în analiza statistică din programul CANOCO 5.1. Determinarea caracterelor morfologice discriminante în determinarea speciilor din secția Lepteranthus se poate face prin mai multe metode dar analiza cea mai uzuală rămâne PCA - Analiza Principalelor Componente. Metoda reduce numărul de cazuri prin transformare liniară și evidențiază relația dintre specii și caracterele morfologice. În urma studiului propus, speciile secției Lepteranthus se pot distinge prin câteva caractere morfologice importante care țin de prezența inflorescenței. Foliola bracteală a inflorescenței de Centaurea rămâne una dintre cheile importante ale determinări iar pentru un grup restrâns de taxoni din secția Lepteranthus chiar și câteva caracteristici ale tulpinii. Metoda poate fi aplicabilă și în alte tipuri de pachete statistice, libere sau cu licență.*
Cuvintele cheie: *CANOCO 5.10 - program statistică, genul Centaurea, secția Lepteranthus, analiza PCA, caractere morfologice*

Introduction

The hybridisation and polyploidy within the *Centaurea* genus create many problems in determination of this group (Kouteký 2007, 2008, Kouteký *et al.* 2011, 2012, Susanna, Garcia- Jacas 2009). In Europe, detailed studies of the morphological differentiation on the *Lepteranthus* groups were published, but very few studies were published on *Centaurea* from Romanian Flora (Garcia-Jacas *et al*. 2001, Kouteký *et al*. 2011, 2012, Vonica *et al*. 2013, Vonica, Cantor 2010). However, the determination of this species remains still controversial and for beginners or students it is very difficult to recognize in field.

In the Romanian flora, many infra-specific taxa, hybrids or cytotypes are treated as autonomous taxa of various ranks, up to species (Ciocârlan 2009, Prodan, Nyárády 1964, Vonica *et al*. 2013). Many of these taxa are not recognized from a morphological point of view and it is necessary to make more aditional studies (Kouteký *et al.* 2012). Some times, the morphological characters can be easily evaluated directly in the field, other times, they can be evaluated only with statistical methods, after many observations. The question is that the PCA method fitted to find the best morphological traits, which help us in the determination of *Centaurea* species?

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In Romania up to 6 taxa were recognized by the majority of the authors from *Lepteranthus* section, namely *C. phrygia* L., *C. pseudophrygia* C. A. May, *C. stenolepis* A. Kern, *C. indurata* Janka, *C. melanocalathia* Borbás, *C. carpatica* (Porcius) Porcius and *C. ratezatensis* Prod. (Ciocârlan 2009). Some of these taxa are treated as subspecies of *C. phrygia* L., or of *C. stenolepis* A. Kern, *C.pseudophrygia* C. A. May (Ciocârlan 2009). Other studies indicate that these taxa are the same lavel of ploids, excepting *C. phrygia* L., wich has 2 cytotypes (diploids and tetraploids) (Garcia-Jacas *et al*. 2001, Kouteký 2007, 2008, Kouteký *et al*. 2012, Vonica et al. 2013).

Material and methods

This study focuses on morphological statistical analysis of *Lepteranthus* sections (*Centaurea* genus) with Principal Components Analysis - an unconstrained linear method.

Morphometric analyses (Tab. 1.) were made on dried sample specimens (232 taxa), part of them were colllected from flora of Transilvania and other part are herbarium specimens, deposited at the Natural History Museum Sibiu (SIB). The individuals analysed belong to the following taxa: *C. phrygia* L, *C. erdneri* J. Wagner, *C. stenolepis* A. Kern., *C. ratezatensis (Prod.), C. pseudophrygia* C.A. May and *C. indurata* Janka. For the identification were used Determination of Romanian Flora books (Ciocârlan 2009).

The plants were collected from different regions of Transylvania (Romania), 105 individuals (belonging to 7 populations). These individuals belong to *C. phrygia* L, *C. erdneri* (J. Wagner) Koutekỳ & Štěpánek , *C. stenolepis* A. Kern, *C. ratezatensis (Prod.), C. indurata* Janka, *C. pseudophrygia* C. A. May and few hybrids with species from *Lepteranthus* section. The majority of the individuals of *Centaurea* species grow in lax clusters, each cluster corresponding to one genet. Therefore, only one stem from a cluster was sampled.

The final data matrix includes 22 quantitative characters, from which 6 are ratios (Tab. 1.). Morphological characters were measured on dried plants (field or herbarium). The majority of the characters were recorded on the inflorescence. Everything is contained in a single sheet, the columns contain various types of measurements taken mostly on the flowers or on the bracts, which are parts of the inflorescence. The measurement unit is millimetres. The next column, named *Group*, identifies the taxonomic group to which the particular observation (row) belongs. This coding can be used in CANOCO only in expanded form in the next four columns. The individual levels (1–6) of the *Group* variable *(phrygia, erneri, pseudophrugia, indurata, stenolepis, ratezatensis)* are re-coded into dummy (0/1) variables, which also have more informative names.

The statistical analyses were run with CANOCO for Windows 5.10 (Terr Braak, Šmilauer 2018).

Method PCA used is based on morphological traits correlation and it was run to obtain a first insight into the structure of the studied group.

Results and discussions

Response data from the CANOCO package are compositional and have a gradient 0.7 SD units long, so a linear method for multivariate data is recommended in this case. The data contain 6.8% of zero values. If the data were compositional in the strict sense (row sums would not carry information for the research question) than a unimodal method would be another choice.

The linear method of indirect gradient analysis (PCA) shows that this method is looking for one or more gradients of predictors for fitting the regression model. Assumptions of these linear method revealed that there is morphological differentiation between the analysed species. The Principal Components Analysis (PCA) centering and standardizing by sample (in our case each sample). Standardization by *Centaurea* species results of each row or column being equal to one. After stardadization by species, PCA performed on the species data and the result is a matrix of correlations between species of *Leptheranthus* group.

The aim of this method is to find the variability in species composition that can be explained by the measured morphological variables. The goal of ordination is to find how many axes shows the greatest variability in the morphology of *Centaurea* species (Tab. 2.). It seems that total variation, for 232 cases and 22 response variable is 1185.721 (PCA analysis). The '*Total Inertia'* wich measure the total variability in the dataset is the sum of eigenvalues of principal ordination axes. In our case the '*Total Inertia'* for the first two axes is 71.41 (Tab.2.) wich is a good percent for interpretation. The *eigenvalues* (is an expresion from linear algebra) is the weight of the eigenvector of that particular axis, and reflects the dispersion of species scores along the principal axes. The eigenvalue for axis 1 indicate a good dispersion af the *Centaurea* species along this axis,

while the next eigenvalue (for axis 2) indicates no dispersion at all axis (Tab.2.).

The results of the PCA method is displayed as the ordination diagram. Plots (samples) are displayed by points (symbols) in all the methods. Species are shown by the arrows in the linear methods (the direction, in which the species abundance increases) and by the points (symbols) in the weighted averaging methods (the species optimum). The quantitative environmental variables are shown by arrows (direction, in which the value of environmental variable increases). For qualitative environmental variables, the centroids are shown for individual categories (the centroid of the plots, where the category is present).

The problem of an unconstrained ordination is that the requirement can be formulated in two ways. The both formulations may lead to the same solution. For example, principal component analysis can be formulated either as a projection in Euclidean space or as a search for latent predictor variables when linear species responses are assumed. In the CANOCO program, the approach based on the second formulation is adopted.

The principle of ordination methods can be elucidated by their algorithm. We will use the weighted averaging methods as an example. We try to construct the 'latent' variable (the first ordination axis) so that the fit of all specimens using this variable as the predictor will be the best possible fit. The result of the ordination will be the values of this latent variable, in our case for each sample/ individual from *Lepteranthus* section (called the sample scores). The variability for each species is called the species scores. Further, we require that the species optima be estimated by weighted averaging and the sample scores be correctly estimated as weighted averages of the species scores. This can be achieved by the PCA method (see further information in CANOCO 5.1 manual).

The results of ordination methods can be summarized in one or a few ordination diagrams. The ordination axes can be used in addition as a framework. The morphological traits diagram can be used to summarize patterns of morphological variation across specimens of *Lepteranthus* section (Fig. 1). Score scaling is focused on morphological trait scores (standardized) which can be interpreted as follows: each arrow points in the direction of steepest increase of the values for the corresponding morphological trait. The length of MW (width of middle bracts), MLW (ratio between length and width og middle bracts), SB (high of steam), SN (number of cluster steam), IN (inflorescence number) arrow are the multiple correlation of that morphological trait with the ordination axes. In our case these are the most important morphological traits. The angle between MLW and ML arrows indicate no correlation between them and the sharp angle between SB, SN and IN indicate a positive correlation. More quantitatively, we can read the approximated correlations of one morphological trait (e.g. MLW) with the others by projecting the arrowheads of the other morphological traits (SB, SN, IN) onto an imaginary line overlaying that morphological trait's arrow. If the projection line ends up at the coordinate origin (zero point), the correlation is predicted to be zero.

The biplot diagram can be used to summarize patterns of morphological trait composition variation across specimens (Fig. 2.). It seems that differences between *C. erdneri* and *C. phrygia* are MW and BW (width of apendix and bracts). C. *indurata* can be differentiated from other species along SB and SN (hig and number of cluster steam) and C. *stenolepis* – C. *ratezatensis*, by MLW (ratio between length and width of middle bracts). The diagram displays the first two discriminant axes. The discriminating characteristics and the centroids of classes are shown (Fig. 2.).

The distance between the individual's symbols approximates the dissimilarity of their morphological trait composition as measured by the Euclidean distance. It seems that C. *erdneri*, C. *pseudophrygia* and C. *stenolepis* with C. *ratezatensis* are placed in an almost compacted group (Fig. 3.), with few exceptions where the species make hibryds. The grade of similarity between *C. stenolepis* and *C. ratezatensis* was discussed in another work, where *C. ratezatensis* has been proposed to be treated as an infrataxon of *C. stenolepis* (*C. stenolepis* subsp. *ratezatensis* (Prod.) Vonica, Kouteckỳ & Bădărău). However, there is extensive variation within each species in other characters probably due of hibryds.

Conclusions

The PCA method is a good analysis for *Centaurea* genus with a high morphological diversity.

The PCA on *Lepteranthus* section indicate the correlation between SB, SN and IN morphological traits.

The biplot of PCA compare the correlation of explanatory variable (morphological traits) with response variable (species arrow) by angle and projecting on the explanatory variable. The biplot projection of response arrow tips onto the arrow of an explanatory variable provide a more precise approximation.

The best morphological traits to recognize the *Centaurea* species from *Lepteranthus* section with PCA remains involucral bracts (width) and few steam traits (SN, SB).

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LIST OF ILLUSTRATIONS

LISTA ILUSTRAȚIILOR

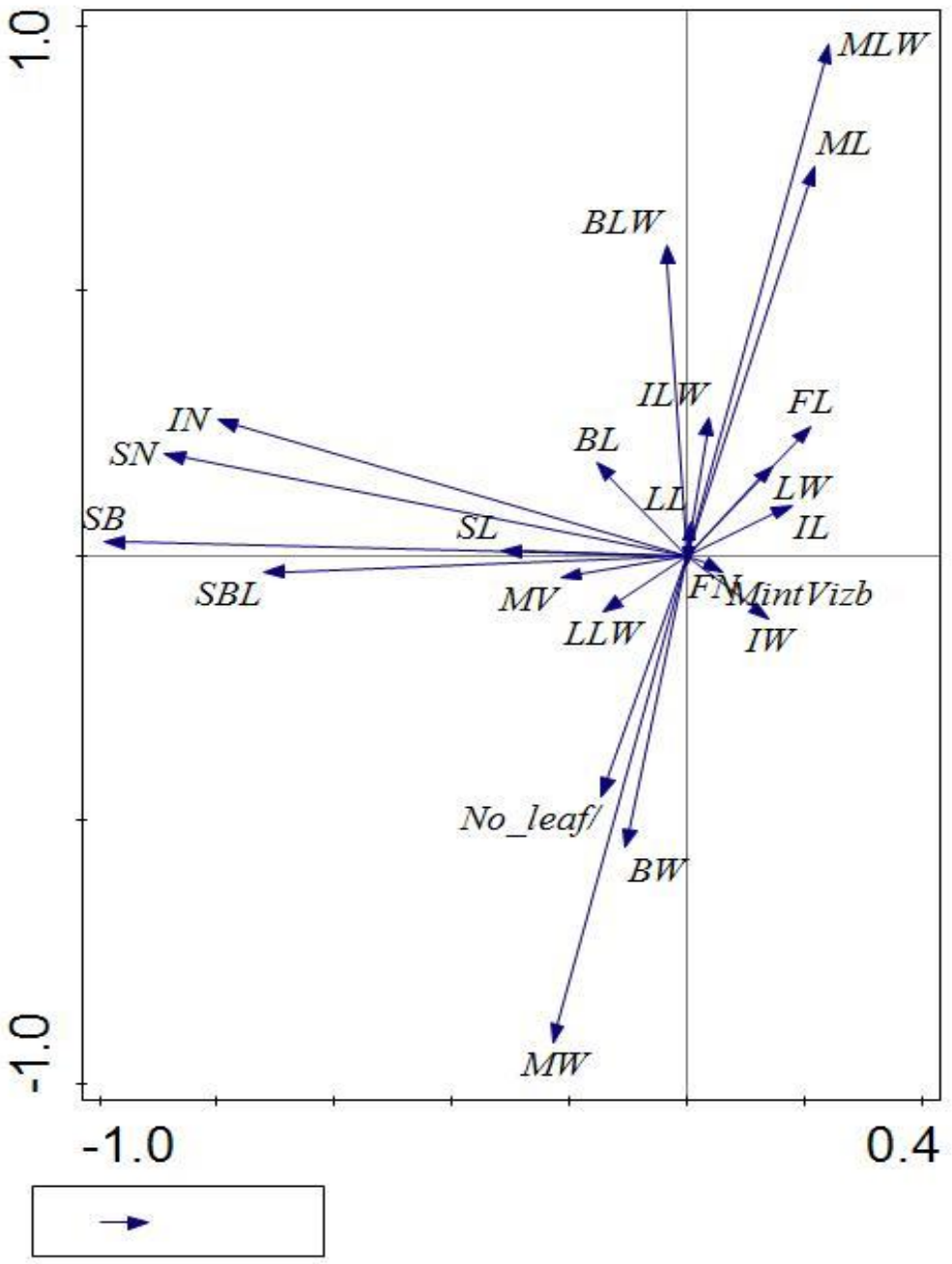

Fig. 1. Morphological traits diagram of PCA analysis (using 22 characters), along axes 1 and 2. Analysed *Centaurea* taxa are from *Lepteranthus* section (*C. phrygia*, *C. erdneri*, *C. indurata*, *C. pseudophrygia*, *C. stenolepis* and *C. ratezatensis*).

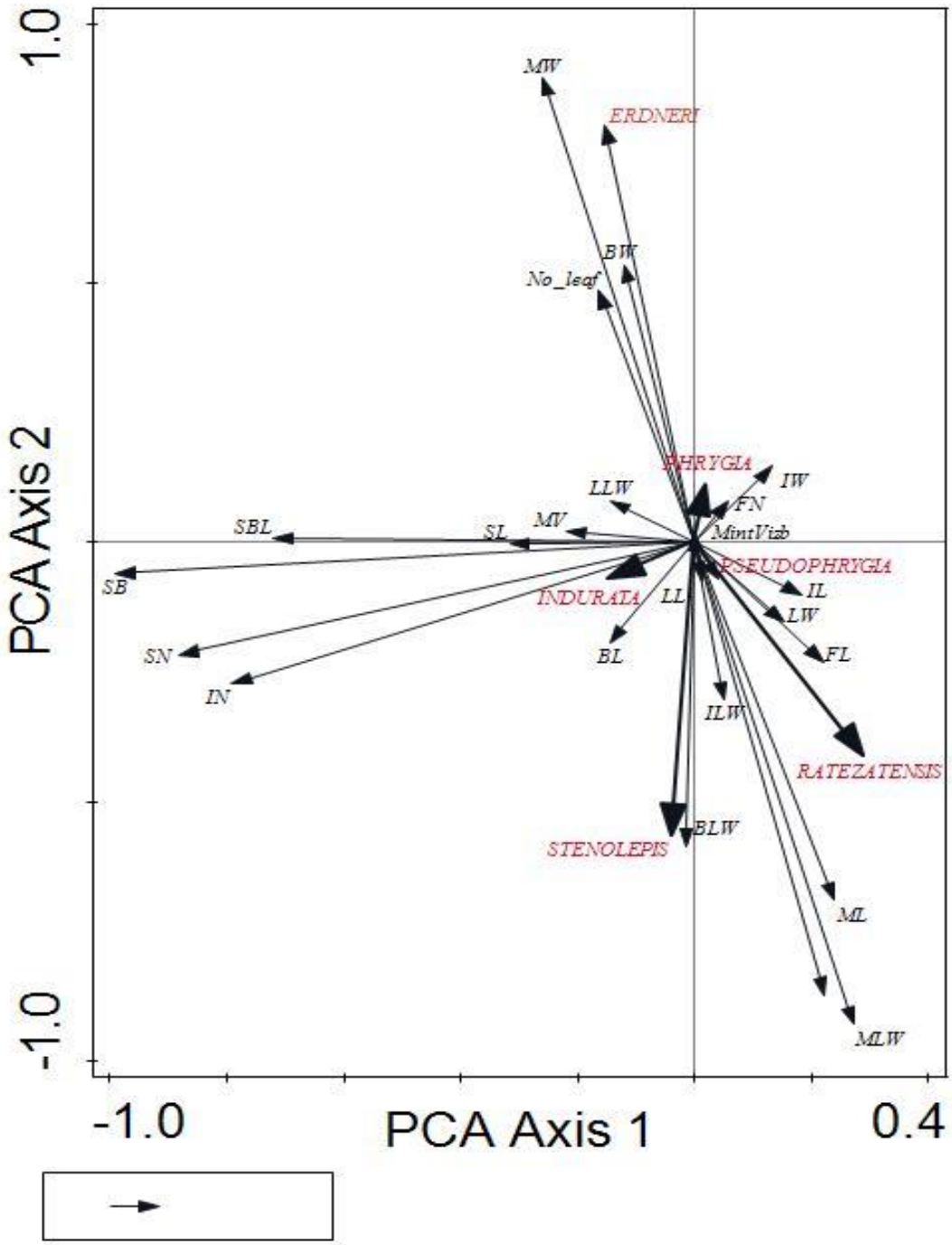

Fig. 2. Biplot of morphological traits and specimens diagram of PCA analysis (using 22 characters), along the first two axes. Analysed *Centaurea* taxa are from *Lepteranthus* section (*C. phrygia*, *C. erdneri*, *C. indurata*, *C. pseudophrygia*, *C. stenolepis* and *C. ratezatensis*).

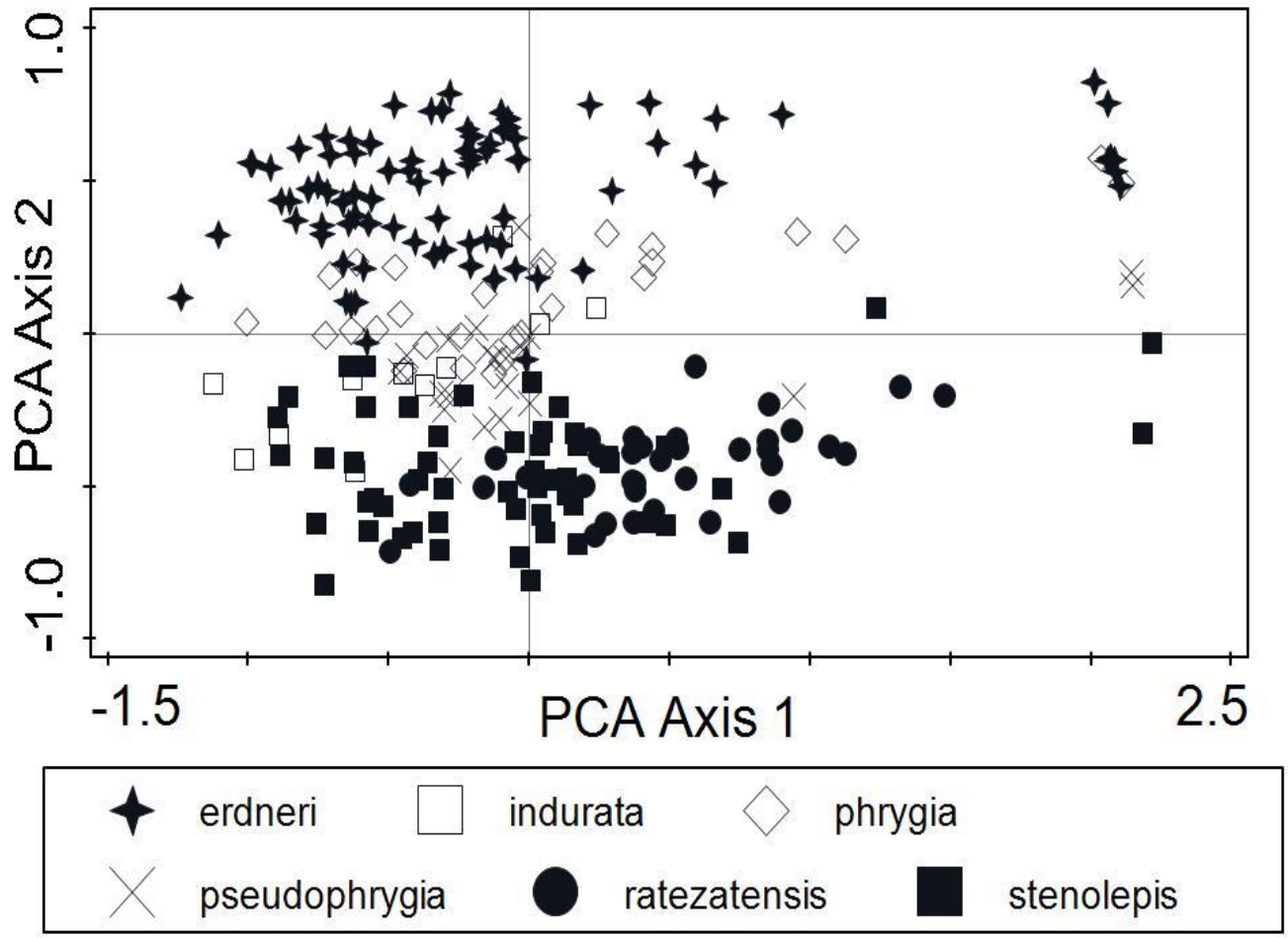

Fig. 3. Diagram of specimen scores based on standardized morphological trait scores with PCA analysis (using 22 characters), along the first two axes. Analysed *Centaurea* taxa are from *Lepteranthus* section.

Table 1. List of morphological characters studied. All characters were measured on specimens with a fully developed and undamaged terminal capitulum. The accuracy of the measurements is two decimal places.

Quantitative characters		
SL	total stem height	mm
SB	height of the flowering part of the stem, i.e. height from the lowest flowering branch to the first inflorescence; short (a few cm) thin branches with reduced capitula that sometimes develop in the lower leaf axils were not considered	mm
SN	number of stem branch	
LL	lamina length of a middle stem leaf	mm
LW	lamina width of a middle stem leaf, including lateral teeth / lobes	mm
IL	height of the involucre of the terminal capitulum, i.e. from the base of the involucre to the top of appendages on the innermost involucral bracts	mm
IW	width of the involucre of the terminal capitulum; the distance between outer surfaces of involucral bracts is measured, recurved parts of involucral bracts were not included	mm
IN	inflorescence number / stem	
BL	length of the middle involucral bracts of the terminal capitulum, whithout appendage	mm
BW	width of the middle involucral bracts of the terminal capitulum	mm
ML	length of the longest appendage on middle involucral bracts of the terminal capitulum, including the terminal seta on the appendage	mm
MW	maximal width of the lower widened part of the longest appendage on middle involucral bracts of the terminal capitulum; lateral teeth / fimbriae were not included	mm
FN	number of lateral fimbriae on one side of the longest appendage on middle involucral bracts of the terminal capitulum	
FL	length of the longest lateral fimbriae of the appendage on middle involucral bracts of the terminal capitulum	
AL	achene length, excluding the pappus (average of 3 achenes)	mm
AW	achene width (average of 3 achenes)	mm
PL	length of the longest setae on the pappus (average of 3 achenes)	mm

Ratios		
SBL	proportion of the height of the flowering part of the stem (SF/ST)	
LLW	length / width of the lamina of a middle stem leaf (LL/LW)	
ILW	length / width of the involucre of the terminal capitulum (IL/IW)	
BLW	length / width of the middle involucral bracts of the terminal capitulum (BL/BW)	
MLW	length / width of the longest appendage on middle involucral bracts of the terminal capitulum (ML/MW)	

Table 2. Summary Table of PCA with CANOCO 5.10.

Statistic	Axis 1	Axis 2	Axis 3	Axis 4
Eigenvalues	0.52	0.19	0.05	0.03
Explained variation (Cumulative)	51.94	71.41	76.66	80.45

THE REDISCOVERY OF JOHANN LUDWIG NEUGEBOREN (1806-1887) FOSSIL SHARKS TYPES COLLECTION

Nicolae TRIF *, **
Vlad CODREA**

Abstract. *In the mid-19th century, in Sibiu, Johann Ludwig Neugeboren – a pioneer of Transylvanian paleontology – has published a paper devoted to fossil shark teeth, a publication of first importance for the history of the vertebrate paleontology. The collection he gathered and published had been considered lost for a very long time, but now it has been brought back to the attention of the scientific community.*
Keywords: collection, sharks, Eocene, Porcești, history of paleontology

Rezumat. *La mijlocul secolului al XIX-lea apărea la Sibiu o publicație foarte importantă pentru istoria paleontologiei vertebratelor, publicație a unuia dintre pionierii paleontologiei din actuala România, Johann Ludwig Neugeboren. Colecția pe care acesta a adunat-o și publicat-o a fost considerată pierdută pentru o perioadă îndelungată, dar acum este adusă din nou în atenția comunității științifice.*
Cuvinte cheie: colecție, rechini, Eocen, Porcești, istoria paleontologiei

Introduction

In the mid-19th century a rare publication has been published in Sibiu (Hermannstadt) under the name of "Die vorweltlichen Squaliden-Zähne aus dem Großkalke bei Portsesd am Altfluß unweit Talmats" [The Prehistoric Shark Teeth from the Limestones of Porcești on the Olt River, in the Proximity of Tălmaciu] (Neugeboren, 1850, 1851). This publication devoted to the fossil sharks was the first of this kind in Transylvania and one of the few in Europe at that time. The author described and illustrated himself no less than 65 shark species from the Eocene deposits of Porcești (today, named Turnu Roșu). Unfortunately, his work remained largely unknown to the scientific community. Now, more than a century and a half after the original publication of the study, an important part of his collection has been rediscovered. Our study aims to refocus the attention of the scientific community towards Neugeboren's pioneering work on vertebrate paleontology.

Methods

In order to establish the exact location of the shark teeth specimens used by Neugeboren for his publications we traveled to Budapest and visited the Hungarian Museum of Natural History (herein the abbreviated HMNH) and the Hungarian Geological Institute. We compared the material hosted there with Neugeboren's drawings (1850, 1851). Also, we applied the same method of comparison to the paleontological collections from the Natural History Museum in Sibiu (herein abbreviated NHMS). We need to note that the Hungarian Geological Institute hosts only the catalogs of the collection and none of the specimens. The task of matchig the specimens with the original drawings was not an easy one. As far as the Sibiu collection is concerned, we found that fortunately some of the labels also preserved the indication of the plate and number of the drawing. For the Budapest collection Pálfy *et al.*, (2008) indicated the corespondence of the specimen to the original plate, but the illustrated teeth have not all been preserved or the specimens from the collection are in a higher number than the illustrated ones. For example, the species *Carcharodon elegans* (number V.69.959A and V.69.959B from Budapest), illustrated by Neugeboren in plate I (fig 28 a-c), is not present in any of these collections. In the list of illustrations, we included in square brackets the correspondence between the specimens and the published drawings, as we correlated them. We put a question mark in front of the teeth where are missing clear distinguishing characters. For some of the teeth we did not indicate any correspondences, since the drawings are too

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sketchy, or the specimens are very similar to each other.

The plates of the present article include pictures of the entire material found in these two collections and reproductions of the original plates published by Neugeboren. The plates have been scanned with an HP 7500 scanner and then processed with GIMP 2.8. The pictures have been taken with a Nikon D700 camera and a 105 mm Sigma lens mounted on a professional tripod.

Discussions

The first indications that the Johann Ludwig Neugeboren collection still exists came out only in the second decade of the 21st century. In the catalog of vertebrate type specimens from the Hungarian Museum of Natural History in Budapest (Palfy *et al.*, 2008) are listed 18 of the species that Neugeboren has described from Turnu Roșu: *Carcharodon elegans* Neugeboren, 1850, syntypes, HMNH V.69.959 (two teeth); *Lamna ackneri* Neugeboren, 1851, syntypes, HMNH V.69.1030 (eight teeth); *Lamna* (*Odontaspis*) *alveata* Neugeboren, 1851, syntypes, HMNH V.69.1069 (two teeth); *Lamna cavidens* Neugeboren, 1851, syntypes, HMNH V.69.1077 (eight teeth); *Lamna depressa* Neugeboren, 1851, syntypes, HMNH V.69.998 (five teeth); *Lamna* (*Odontaspis*) *elongata* Neugeboren, 1851, holotype, HMNH 2008.35.1. (one tooth); *Lamna* (*Odontaspis*) *ferox fossilis* Neugeboren, 1851, syntypes, HMNH V.69.1036 (three teeth); *Lamna hauerii* Neugeboren, 1851, syntypes, HMNH V.69.902 (seven teeth); *Lamna minima* Neugeboren, 1851, holotype, HMNH V.69.904 (one tooth); *Lamna minuta* Neugeboren, 1851, holotype, HMNH V.69.1087 (one tooth); *Lamna* (*Odontaspis*) *serrata* Neugeboren, 1851, syntypes, HMNH V.69.109 (two teeth); *Lamna speciosa* Neugeboren, 1851, syntypes, HMNH V.69.1032 (three teeth); *Lamna xyphodon* Neugeboren, 1851, holotype, HMNH V.69.1081 (one tooth); *Otodus ambiguus* Neugeboren, 1851, holotype, HMNH V.69.892 (one tooth), *Otodus arcuato-decrescens*, Neugeboren, 1851, holotype, HMNH V.69.994 (one tooth); *Oxyrhina hauerii* Neugeboren, 1851, syntypes, HMNH V.69.995, (five teeth); *Oxyrhina heckeliana* Neugeboren, 1851, holotype, HMNH V.69.1049 (one tooth); *Oxyrhina lata* Neugeboren, 1851, syntypes, HMNH V.69.999 (two teeth). Neugeboren did not designate any holotype, so the holotype and syntypes have been designated by the catalog authors (Pálfy *et al.*, 2008, p. 8).

An important information that we found in the catalog of the Hungarian Geological Institute was the indication of the place of origin of the specimens. Both the labels and the catalog indicate that *locus typicus* for all the specimens is Grohotișul Hill from Porcești. Today this hill is part of the village pasture and it is almost completely covered by vegetation. The early 20th century historic photos of this hill show extensive erosion areas from where these teeth have been probably collected. The age of the teeth is indicated as Priabonian (Pálfy *et al.*, 2008, p. 123-126), with a stratigraphic origin in the Valea Nișului Formation. The indication of the stage is undoubtedly a much later addition to the labeling of the specimens, since the age of the three Turnu Roșu formations has been established by Mézáros, (1996) much later than Neugeboren's work. However, we need to stress that the field observations led us to the conclusion that the stratigraphic units established by Mézáros (1996) are in need of a revision and it is unlikely that all the deposits from the Grohotișul Hill are exclusively Priabonian.

The collection of fossil fish teeth from the Natural History Museum in Sibiu is rather large (over 5000 teeth), but most of it belongs to another collector, namely Richard Ernst Brekner (Ciobanu, 1998). For a long time this collection has been considered to be Neugeboren's collection. This confusion has only been discovered over the past couple of decades by the former curator of the paleontological collections, Rodica Ciobanu. The remaining part of the fossil fish teeth collection, known as the Society Collection, revealed the rest of the Neugeboren's shark teeth.

Two species only are shared between the two museums, *Otodus arcuato-decrescens* and *Oxyrhina hauerii*. The teeth from Sibiu correspond to 15 other species published by Neugeboren: *Oxyrhina leptodon*, Agassiz 1843, NHMS 8711 (one tooth); *Lamna elegans* Agassiz, 1843, NHMS 8962 (one tooth), *Carcharodon gracilis*, Neugeboren, 1850, NHMS 9241 (one tooth); *Lamna contortidens* Agassiz, 1843, NHMS 9273 (one tooth); *Lamna dubia*, Agassiz, 1843, NHMS 9275, NHMS 9277 (two teeth); *Otodus appendiculatus*, Agassiz, 1843, NHMS 9280 (one tooth); *Sphyrna prisca*, Agassiz, 1843, NHMS 9298 (one tooth); *Oxyrhina hauerii*, Neugeboren, 1851, NHMS 9299 (one tooth); *Carcharodon haidingerii*, Neugeboren, 1850, NHMS 9301 (one tooth); *Notidanus primigenius*, Agassiz, 1843, NHMS 9302, NHMS 9357 (two teeth); *Carcharodon leptodon*, Agassiz, 1843, NHMS 9303 (one tooth); *Carcharodon heterodon*, Agassiz 1843, NHMS 9305 (one tooth);

Carcharodon lanceolatus, Agassiz, 1843, NHMS 9330 (one tooth); *Carcharodon sulcidens*, Agassiz, 1843, NHMS 9349 (one tooth); *Carcharodon semiserratus*, Agassiz, 1843, NHMS 9351 (one tooth); *Carcharodon toliapicus*, Agassiz, 1843, NHMS 9352 (one tooth); *Otodus arcuato-decrescens*, Neugeboren, 1851, NHMS 9359 (one tooth); *Carcharodon gracilis*, Neugeboren, 1850, NHMS 9360 (one tooth).

Conclusions

Neugeboren's collection represents an important step in the study of vertebrates in general and of the fossil sharks in particular, in the mid-19th century.

We considered as very important that the attention of the scientific community be refocused on this collection as it is an important part of the pioneer period of paleontology in south-eastern Europe. Unfortunately, 32 other species described by Neugeboren have not been preserved or are still missing at this moment.

Acknowledgments

We thank both reviewers, Marton Venczel from Țării Crișurilor Museum, Oradea and Ionuț Grădianu from Natural Sciences Museum, Piatra Neamț for their critical reading of the manuscript and for their valuable suggestions. The authors also would like to thank Zoltán Szentesi from the Department of Paleontology and Geology at the Hungarian Natural History Museum in Budapest and László Makádi from the Mining and Geological Survey of Hungary for their warm welcome and help in the research of this collection. Maria Sasu kindly helped in organizing the data from the plates and from the list of illustrations. V.A.C thanks Babeș-Bolyai University of Cluj-Napoca that partly supported this research by the grant AGC32164.

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LIST OF ILLUSTRATIONS

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* within the captions of Figures 1 to 5, the corresponding illustrations from the Neugeboren plates are given in square brackets.
***** în parantezele pătrate din explicațiile figurilor de la 1 la 5 se găsesc ilustrațiile corespondente din planșele lui Neugeboren

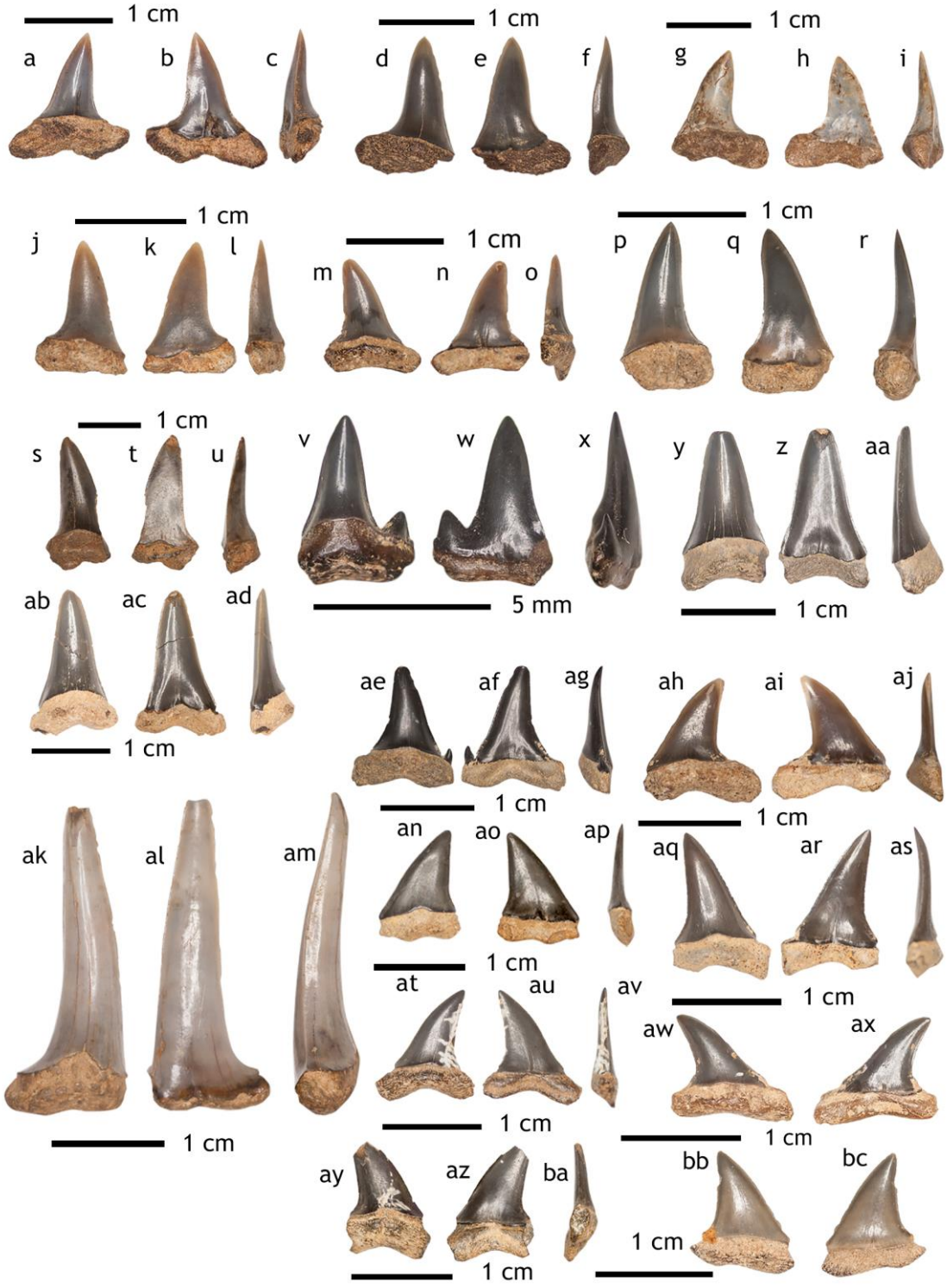

Fig. 1 Fossil shark teeth from Neugeboren's collection

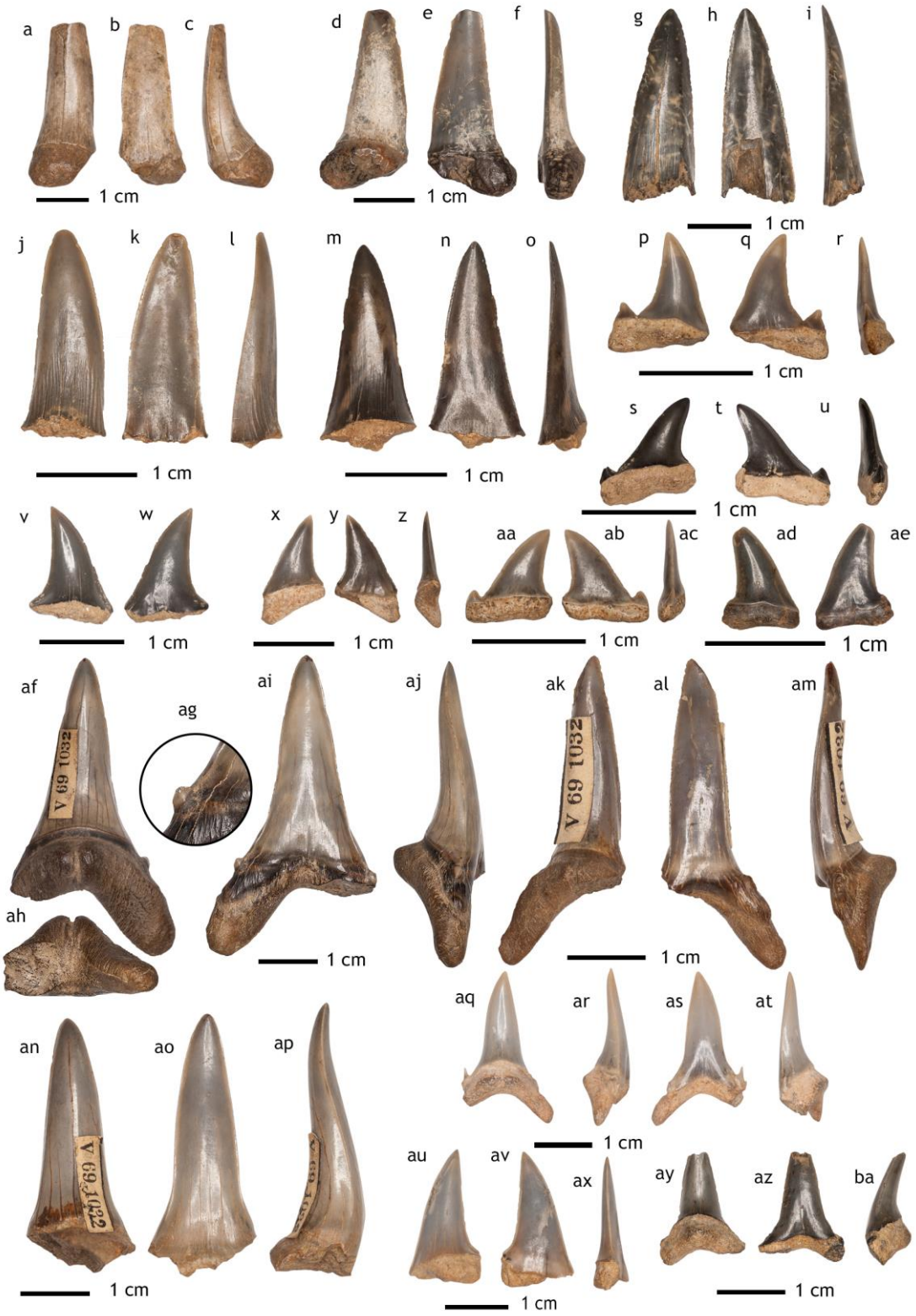

Fig. 2 Fossil shark teeth from Neugeboren's collection

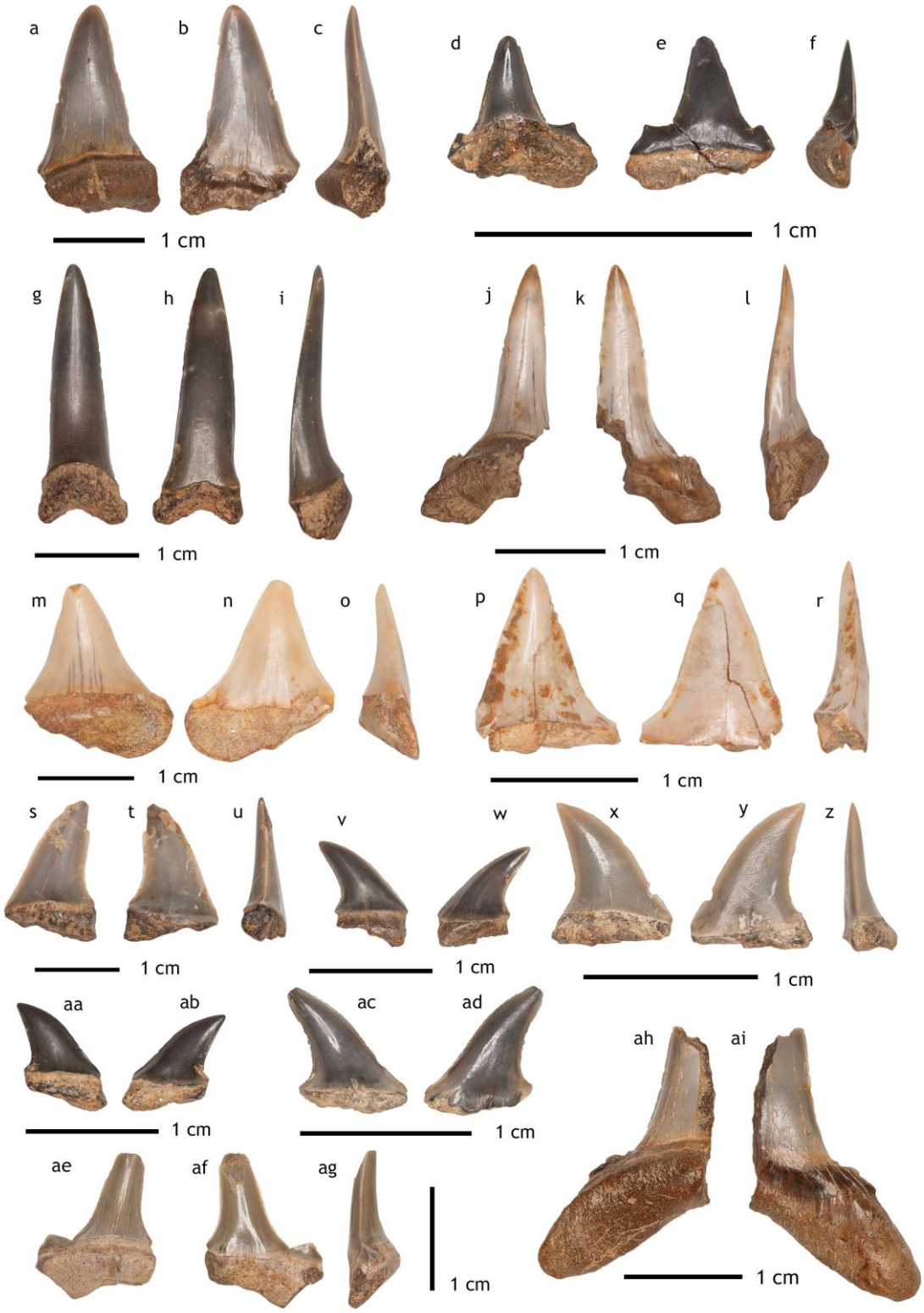

Fig. 3 Fossil shark teeth from Neugeboren's collection

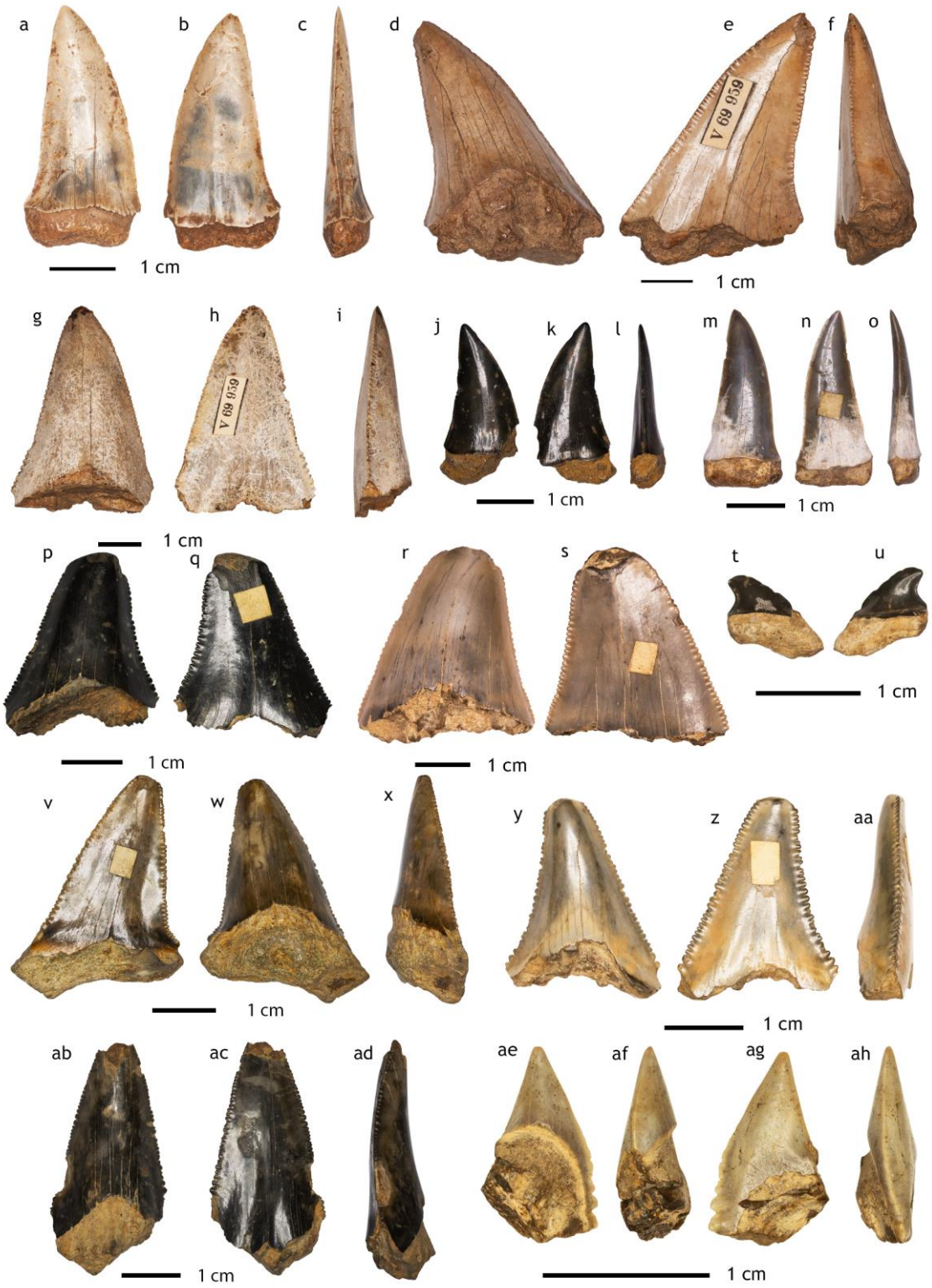

Fig. 4 Fossil shark teeth from Neugeboren's collection

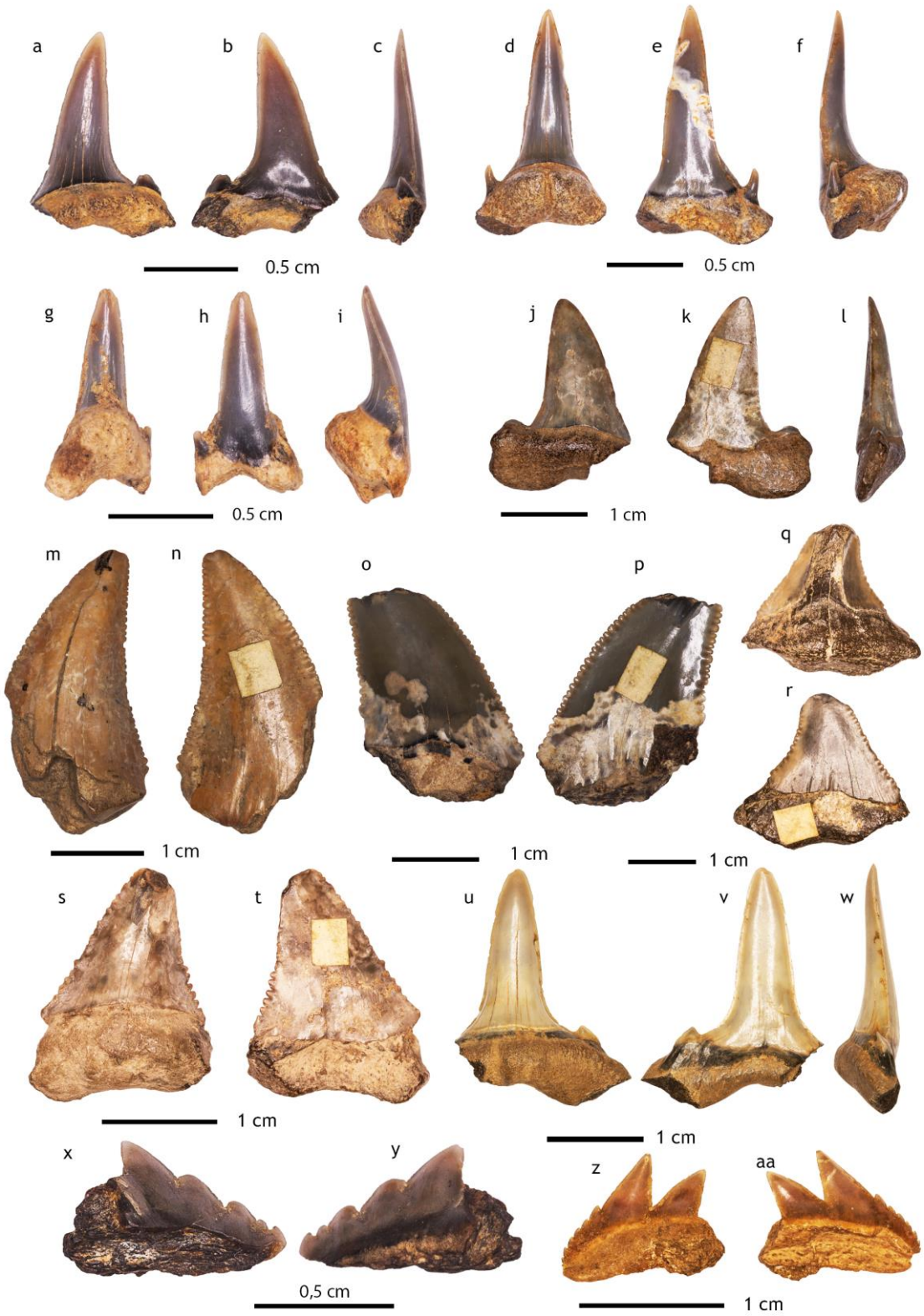

Fig. 5 Fossil shark teeth from Neugeboren's collection

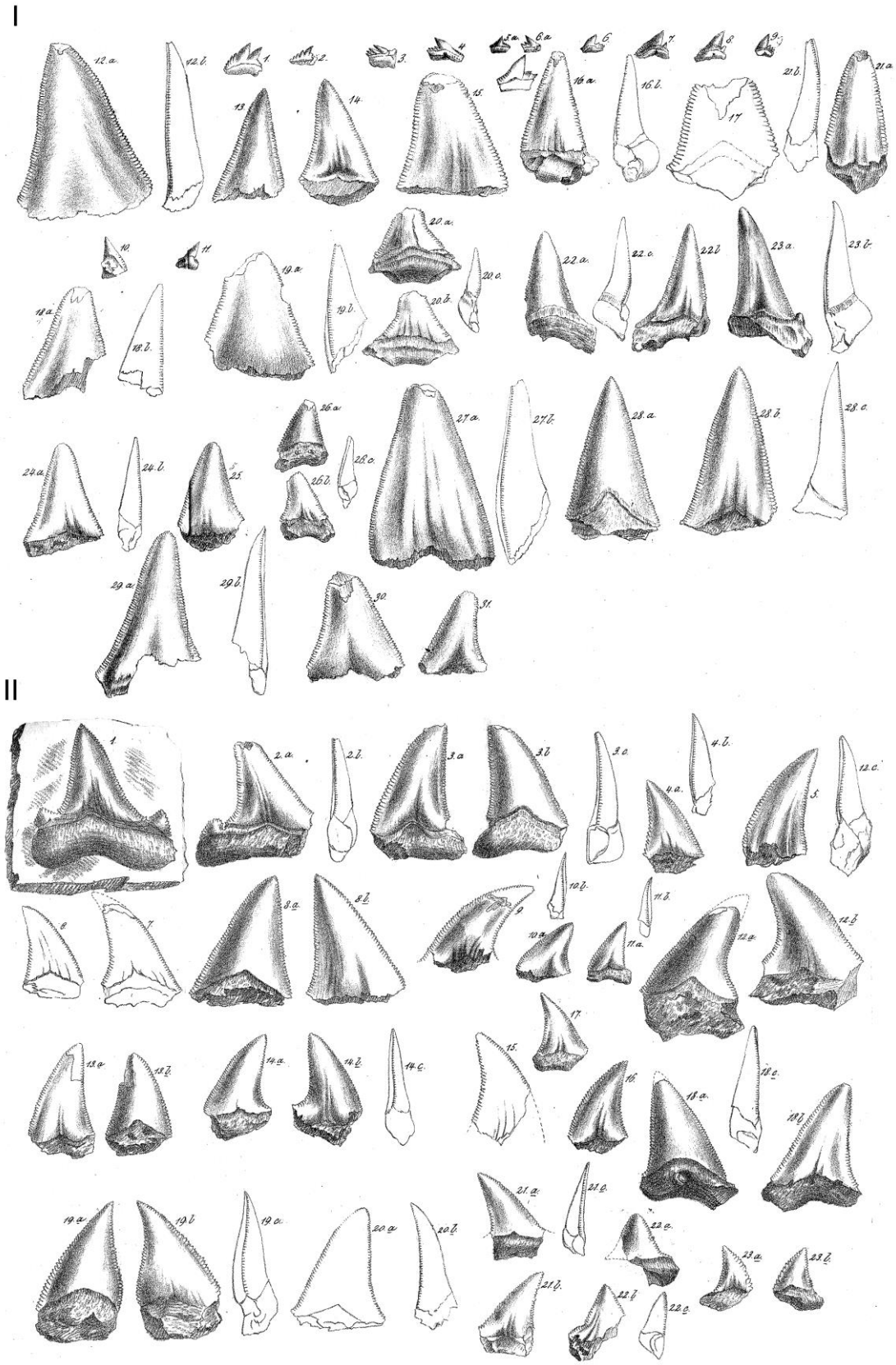

Fig. 6 Neugeboren's plates I and II

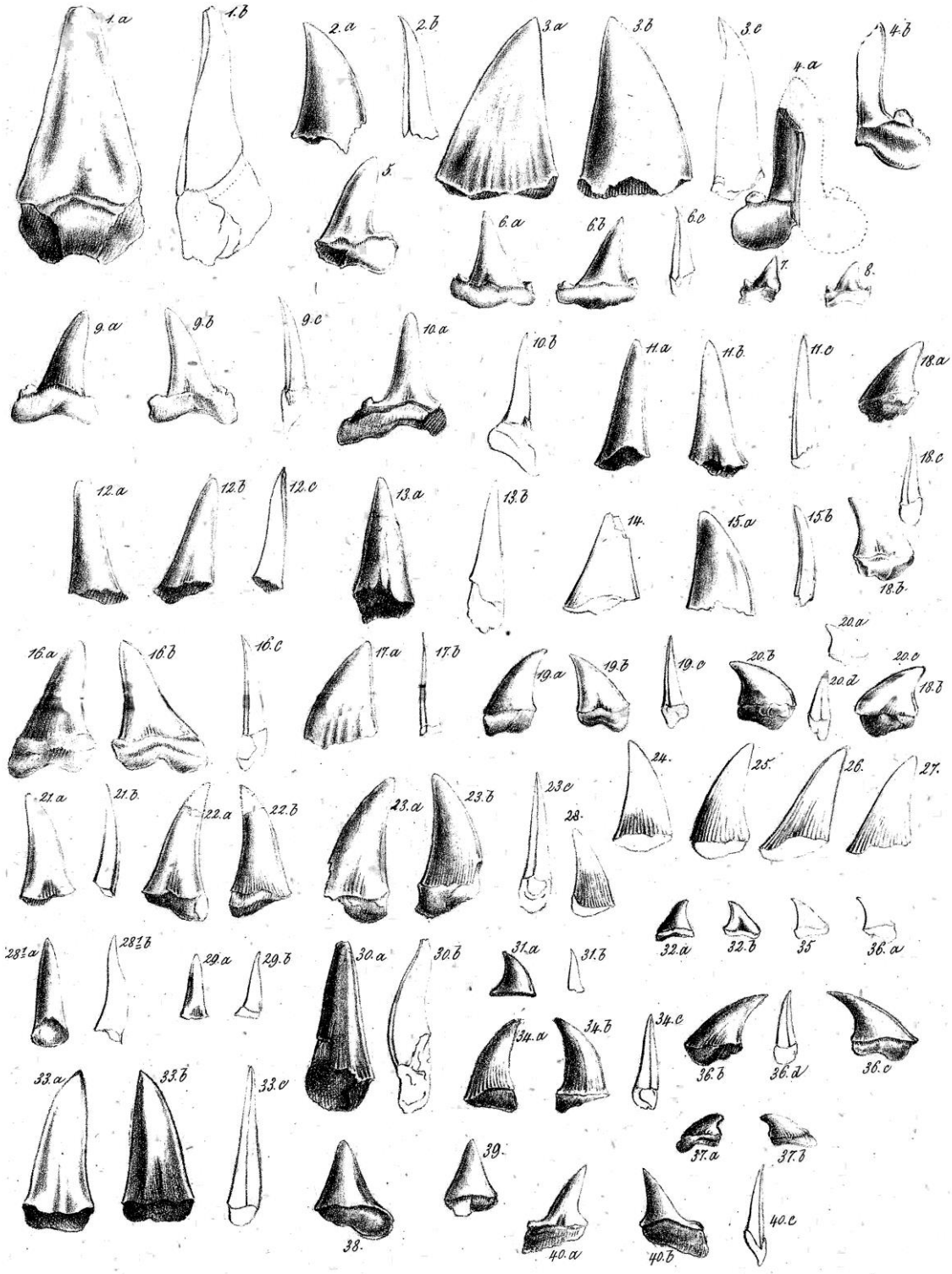

Fig. 7 Neugeboren's plate III

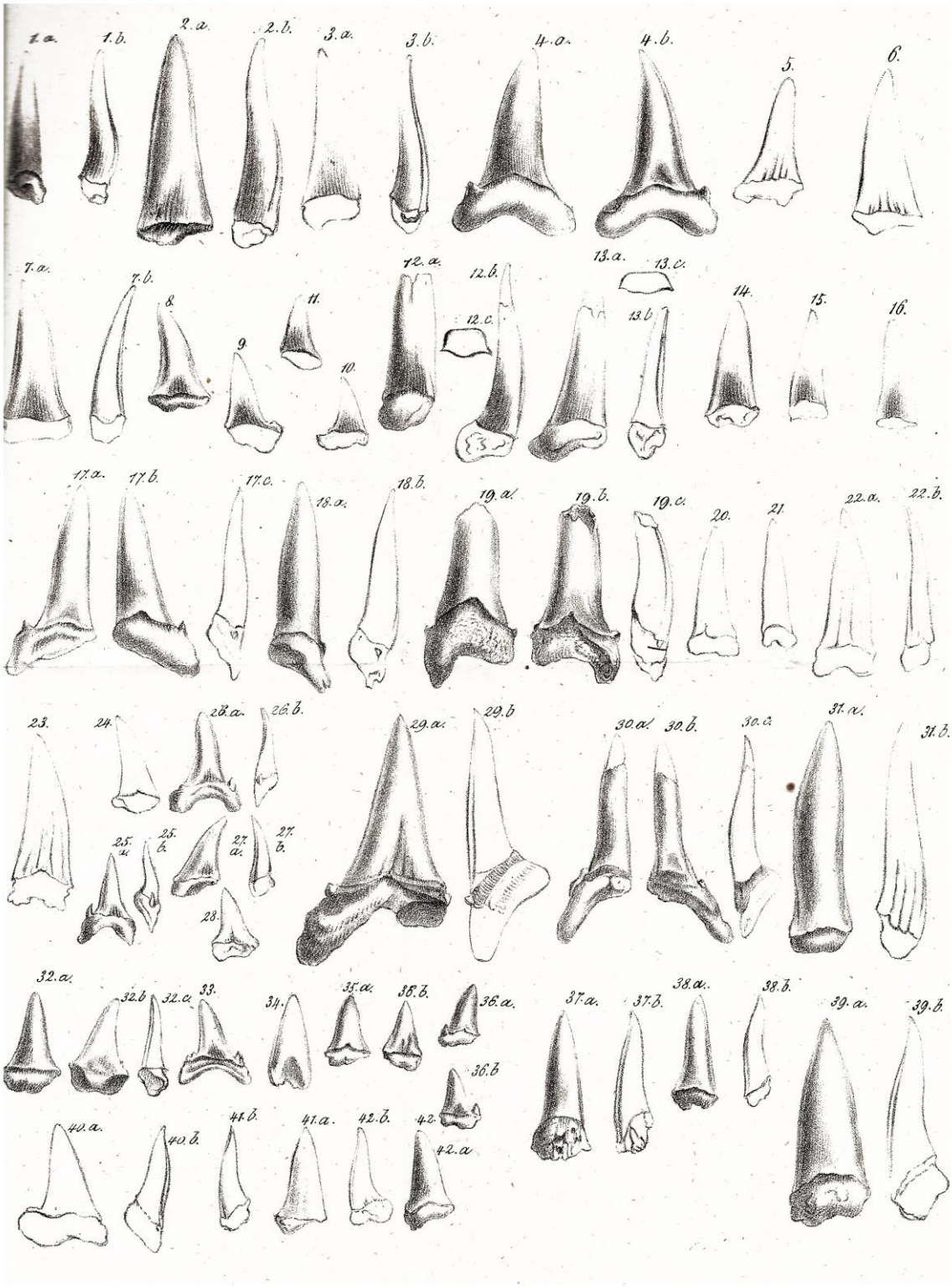

Fig. 8 Neugeboren's plate IV

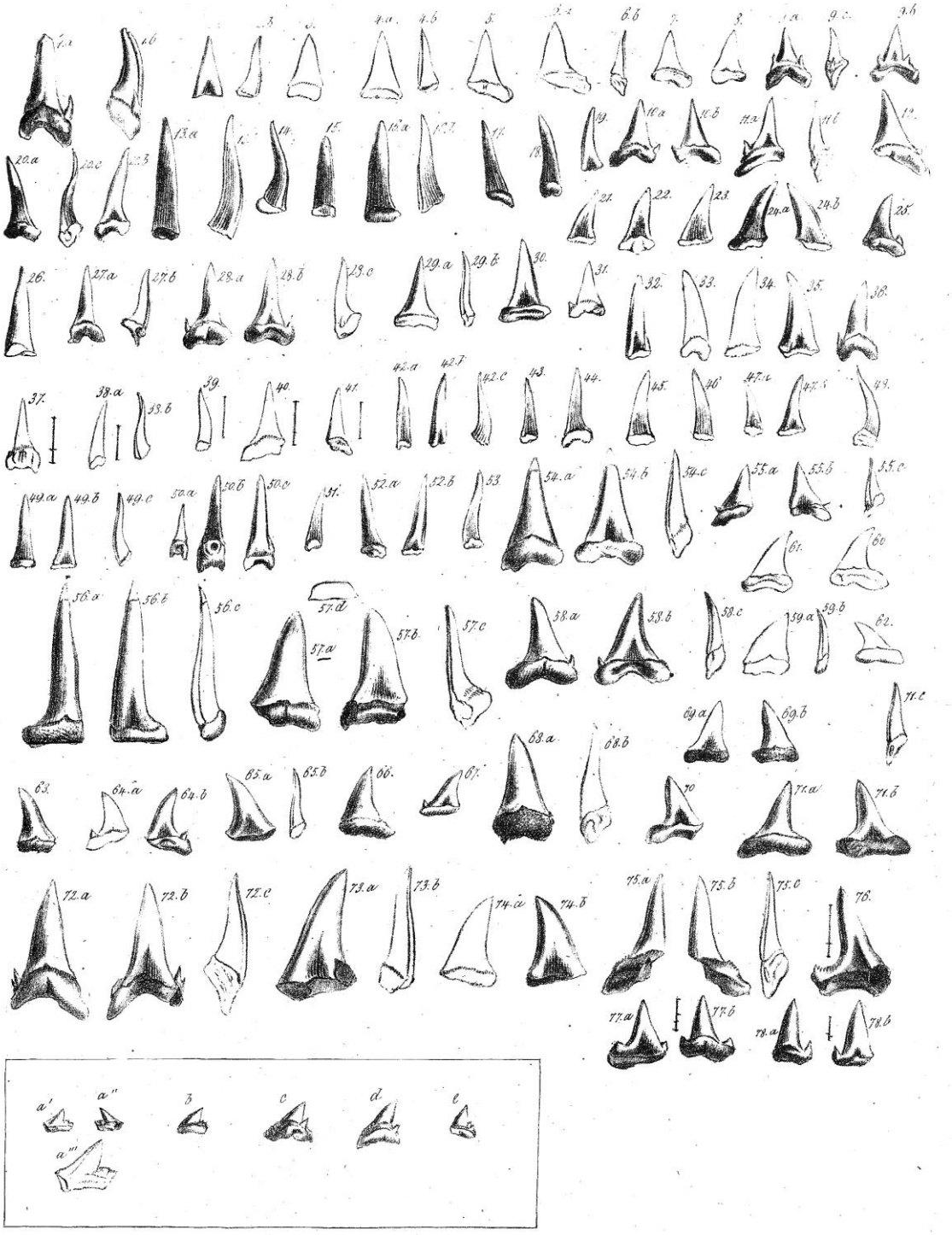

Fig. 9 Neugeboren's plate V

CULTURAL SPACES AND CULTURAL MOVEMENT AS A HIGHER TYPE OF FORM OF MOVEMENT. STUDY CASE: BIRDS

Liviu Răzvan PRIPON*
Valentin Adrian KISS **

Abstract: *In this paper we proposed and presented two new concepts: cultural space and cultural movement. The analysis of these two concepts can lead to the development of new methods for interdisciplinary research in ornithology and other biology fields following the new trends in science in which cultural, linguistic and sociological perspectives are integrated in the traditional way of thinking and studying animals. Historical evaluations of ornithological nomenclature and the inspection of relations between species names are some of the methods we use in this work. The importance of the results consists in opening new roads in classical research and have a strong echo in nature protection and conservation.*
Key words: *cultural niche, taxonomy, nomenclature, vernacular nomenclature*

Rezumat. *În lucrarea de față prezentăm două noi concepte: spațiul cultural și mișcarea culturală. Analiza acestor două concepte poate conduce la dezvoltarea unor noi metode de cercetare interdisciplinară în ornitologie și alte domenii din biologie în acord cu noile tendințe din știință în care perspective culturale, lingvistice, sociologice sunt integrate în modul traditional de a gândi și cerceta animalele. Evaluarea istorică a nomenclaturii ornitologice și inspectarea relațiilor care se stabilesc între numele atribuite speciilor de păsări sunt câteva metode folosite în cercetarea de față. Importanța rezultatelor consistă în deschiderea de noi drumuri în cercetarea clasică, acestea având un ecou puternic pentru protecția și conservarea naturii.*
Cuvinte cheie*: nișe culturale, taxonomie, nomenclatura ornitologică, nomenclatură vernaculară*

Introduction

Some of the latest research in different fields of biology such as ornithology integrate an interdisciplinary approach that include linguistic, cultural, sociological and philosophical perspectives in addition to classical ecological analyses. These interdisciplinary investigations give rise to concepts like cultural niches (Robinson 2019) which can open a road to new fields of research such as the biology of culture where we can include the study of cultural spaces that we analysed in this paper. Other views coming from philosophy that have a significant impact on biological concepts have raised over the past years and gained popularity.

One of them is the concept of hyperobject as proposed by Timothy Morton who took interest in ecological phenomena such as climate change (Morton 2013). The nonlocal characteristic of the hyperobject (Morton 2013) can be applied to the concept of cultural space in which birds manifest through their nomenclature, for a better understanding of its nature.

The concept of cultural space was first presented in 2011 (Pripon, Stermin 2011) as a cylinder-shaped space in which the concept of species evolved over time. Still it wasn't mentioned under this name, but the structure and the coordinates of such space were referred to in order to explain the dynamics of the species nomenclature. A transversal slice in this cylinder, representing a perpendicular plan on the axis of time, serves as the basis of the concept of cultural plan which we analysed below. We emphasize that the cultural space can be the totality of possible positions that an object can have through its name in the cultural coordinates system, and we will try to argue this hypothesis below.

The concept of space is referred in literature concerning a concrete or abstract environment with geometrical applications but recently it received an alternative perspective in which the cultural space integrates, (Rouhvand 2017) as a perceptual reality (Ferdous, Nilufar 2008).

The form of movement specific to this cultural space is a key phenomenon presented in this paper in order to reveal how objects through their cultural values behave in such an environment. According to Aristotel the movement is

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essentially the change that an object manifests in time, implying that there are four forms or kinds of movement: change in substance, change in quality, change in quantity and change in place that are mentioned through six principles of movement: generation, destruction, growth, decrease, alteration and change of place (Brăileanu 2007). As early as the Aristotelian thinking, the idea of movement doesn't refer only to the change in place but to a range of changes in position in respect to a set of coordinates that can have different natures from space coordinates in the material sense. In this study we take into account cultural coordinates that characterize the cultural movement of bird names and the dynamics of the ornithological nomenclature.

In order to present the cultural space and the cultural movement in case of bird names we analysed the vernacular and taxonomic nomenclature from a historical point of view. To do so we evaluate the nomenclature of some bird species from literature and described two types of cultural plans: the free cultural plan and the normative or standardized cultural plan. The assemblage of those structures generates the cultural space as it will be presented below.

The Cultural Plan

Taking into account the concept of cultural niches (Robinson 2019) we can state that birds occupy places in human culture in the same way they occupy different places in nature. They play important roles in alimentation, art or religion (Robinson 2019) and are frequently present in our language due to their establishment even in the biggest cities. One way in which we can research the behaviour (in the sense of manifestation) of birds in culture is by analysing the human language in respect to bird nomenclature. From the language point of view two situation can arise in chronological order. A vernacular nomenclature appears first, locally and in strong relations with different aspects of the individuals of one species, related to visual appearance, role, mythology, behaviour and other biological characteristics. This situation gave rise over time to the second linguistic system which is the scientific nomenclature. This system has a normative background in which only one name is valid, usually selected and transcribed in a particular way from all the sympatric and allopatric vernacular synonyms and short diagnosis (Munteanu 2010), as was the case of Linnaeus's binomial nomenclature (Botnariuc 1961). The scientific nomenclature took into account practical, technical and phylogenetic investigation and manipulation of species in both informational and material state, mostly in the natural history collections management context (Pripon 2011). From now on we are going to refer to these situations by their correspondence to a free cultural plan in the first case (vernacular nomenclature) and a standardized cultural plan in the second case (scientific nomenclature or biological taxonomy).

For a better understanding of the cultural plan we propose a parallel comparison with the ecological plan (Fig. 1.). In the ecological plan the individual integrates in an ecological niche and in a population that in its turn is restricted with some exception to this niche (Fig. 1.). In the cultural plan the form integrates in a category and subscribes to a name that will be attached to this category (Fig. 1.). In case of the free cultural plane we have multiple association between names and forms and the category has no strict status while in the case of standardized cultural plan the association between name and form is singular and the category became species in terms of biological systematics. At a closer look on the ecological plan we notice that the individual fits in a determined space and particular ecological conditions as microclimate, habitat conformations, food availability and so on receiving a type of ecological coordinates (Fig. 2. A). On the other hand, in the cultural plan the form is connected to a name and both must fit in a cultural area in respect to a set of cultural coordinates (Fig. 2. B). In this sense the cultural niche is more complex because each element must fit in, with both elements and, as well as with the relation between them. The theoretical ecological niche is more inclusive for its elements in relation with the real one than the theoretical cultural niche in relation with the real cultural niche that must comprise more complex elements that are usually gravitating on its borders (Fig. 2. B).

The free cultural plan functions in the context of everyday life. It appeared and is strongly manifested in the rural environment, in the context of a pragmatic perspective and a strong connection between humans and nature, defined by a direct and continuous interaction between these two poles. The standardized cultural plan functions in the context of the intermediate methods of knowledge specific to positivist science where the interaction with nature is regulated and usually detached from the utility purposes. The environment of the standardized cultural plan is mostly urban and knowledge oriented, which would have led to an objective

perspective on nature and finally to an abstract thinking.

We will present bellow the two types of cultural plans considering that their structure is based on the relations between the form and the name of one bird species. The form is attributed to a category in respect to its name which will become the symbol of this category and therefore the process of classification will be determined by the form-name association. We will present these types of relations in each case. We also must consider that both plans have a *manifested nature* which is reflected in oral and written communication and a *potential nature* which is reflected by collective and individual information in a mental or pure cultural state. One of the goals of the following analysis is to determine which nature characterizes each of the two plans to better draw a distinction mark between them.

Free Cultural Plan

The free cultural plan represents the projection of natural elements in the mental plan without a rigorous set of norms regarding language or form perception and classification but only by a sort of tradition and direct education (other than school and organized institutions). This plan develops in the context of everyday life and is orally transmitted over generations based as well as on the direct experiencing of the natural environment by humans. Even if it is represented by a common shared background (pool) the free cultural plan has a high variability concerning its individual manifestation. Not being regulated by a set of norms, conventions or standards it accumulates in its inefficient perpetuation a series of mutations (aberrations) of names and of the relations between names and forms. Together with the local specificity and the diversity of human cultures, even on a small scale, the free cultural plan manifests a significant diversity of its elements. The term "free" refers to the fact that the names of forms and the relation between those two is at free usage by people in the context of nonconventional conversations between them.

The vernacular nomenclature obviously reflects the free cultural plan, but we cannot reduce this plan to it, as we must consider the processes of form identification and classification as well as the perpetuation of these processes. In his work, regarding the common names of birds in the life of Romanian people, Băcescu presents the nomenclature of over 350 bird species which reflects the high resolution of form distinguishing in Romanian folk culture (Băcescu 1961). From the total of species dealt with here 62 species belong to the section entitled "Considerations on some birds more widely distributed and better known by the Romanian people". Certainly, in the case of a particular individual or for a more restricted local community this resolution in discriminating bird forms and the linguistic pool are far less numerous. Nevertheless, from the data collected all over the country Băcescu presents up to 35 linguistic correspondents or synonyms in case of some species and only one correspondent in case of others. Species with higher number of synonyms tend to be species with higher cultural identity related to arts, religion or mythology but a clear trend in this sense cannot be assigned.

The knowledge, in the sense of this kind of nature projection in the mental plan, has in the first place a pragmatic role and it is secondary conditioned by tradition. On one hand we have the rural context and ancient human settlements. For the members of such communities it was and still is important to know which species are useful, which can cause damage on crops or health, which foretell some phenomena important to the everyday life and where species live or behave in order to be hunted for food. In this case the knowledge of animal and plant names as well as form identification and correct association between form and names was a strong necessity. On the other hand, different traditional practices such as songs, stories and storytelling, poetry and festivities integrate animal names or animal representation and represent the main transmission channel for bird nomenclature as well as the manner in which knowledge is passed by, from one generation to the next. In both cases, birds, other animals and plants must have a purpose in human life and in this way, they are integrated in the free cultural plan. In the urban space where animal and plant knowledge are not a necessity, birds enter in the free cultural space only by their names and a weak discrimination of form but in this context the standardized cultural plan will rise from the development of abstraction and the educational institutions. We notice that, even in the free cultural plan, there are a set of conditions for bird nomenclature implementation or learning but the *per se* usage of names is not regulated. Consequently, people have a high degree of freedom in choosing and using one name or other.

Further on we analysed the free cultural plan from the perspective of name-category-form relation as presented in Fig. 1. In order to present this relation we are going to treat at a time each of the

three direct relation: name-form, name-category and form-category under the values of the two parameters (a) and (e) (Fig. 1.) which represent the abundance of associations between a form and its correspondent names (a) and between a name and its correspondent forms (e).

From the name perspective, the free cultural plan is characterized by a high permissibility for synonyms. As an example, the European goldfinch (*Carduelis carduelis*) presents 35 synonymic vernacular names (Băcescu 1961) from which we give a few examples in the Romanian language: *domnișor, ciuș-de-ghimpe, logosiță, oiță, scai, sticlete, țiglișor, vărguță, turculeț* (Băcescu 1961). When we take into account the whole Romanian territorial range, the high number of names argues a vague relation between name and form as the nomenclature can determine the ambiguity of form between regions adopting different names for the same bird species. We can observe this situation in the case of other related species like the Common redpoll (*Acanthis flammea*) which presents a lower number of synonyms, the most frequent being: *inăriță* and *țintar*. Bird keepers usually use the second name while the official name used in present bird guides or other books in Romanian is the first. Because the second name is no longer popular and out of usage other than the bird keepers community, but the two names still function concomitantly they give rise to a confusion. The two names function separately and most of the times depending of the contact of one person with the bird keeper online information will lead to existence of two different species in case of the same form. Depending on the first contact with the name, interlocutors in a conversation will not know what species is being referred to, because these two names have a high and separate identity.

The forms are quite ambiguously perceived in the context of free cultural plan mostly because no rigorous knowledge is implied in the recognition of significant traits for species identification. Also, the usage of binoculars or other equipment required for distinction of less obvious features for a direct observation is rare. Many resembling forms are interpreted as the same form even if they have clear different identities, due to a weak discrimination capacity in this type of cultural plan. In this way many forms are attributed to a single name so the value of (e) is over unit and in some cases very high.

Thus, in the case of the free cultural plan we can admit a category of forms and under no circumstances a species, neither taxonomically nor logical. In this context the forms are not ordered and classified so as to constitute homogenous and equivalent groups. One category can be represented by only one species and others by closely related species that subscribe to one Genus. In other cases, a category can include unrelated species that have no similarity in the actual form. This is the case for duck species which are linguistically associated sometimes with coots or grebes (both species belonging to different Orders of birds). There is a resemblance in silhouette, and all are found in the same aquatic habitat but at a closer look ducks, coots and grebes share different fundamental form structure. For this reason, we cannot admit an equivalence regarding category inclusion.

The free cultural plan is characterized by an inefficiency in communication and as well in the process of form identity transmission from one generation to another. Another communication barrier is the usage of regional synonyms which even if they guaranty the identity of form at a local scale, they will generate a blocking wall between communities that actively use different and highly distinct synonyms. Coming back to the example of European goldfinch it is noted that the name *domnișor* is used especially in Muntenia while the name *turculeț* is used in Banat (Băcescu 1961). Between these two regions a blocking may occur in transmitting the identity of this bird species. More than that, the name *domnișor* given to the goldfinch is attributed as well to the Eurasian wren (*Troglodytes troglodytes*). There is an association of two different forms to the same name, therefore the ambiguity in communication, leads to confusion and errors.

The communication problem is the cause of development of the next type of cultural plan, the standardized cultural plan. This transition implies processes of nomenclature standardization, elaborated methods of form identification and most of all establishment of clear limits for category inclusion as to result an equivalent unit. All these processes represent normative rules and therefore the standardized cultural plan represents a normative system. In other words, the rules and criteria that will be imposed are concrete through their specification in writings, but they do not guarantee the rigor of manifested language, nor the correct identification when needed and, much less, the correct systematization of form as concrete manifested acts. In terms of usage of rules there will always be an error in nomenclature, identification and systematics resembling the situation of the free cultural plan.

The free cultural plan is characterized by a high number of names attributed to one species and in the same time a high number of different forms associated to the same name. This situation characterizes an increased ambiguity of one category which cannot function as a species or precise logical class with equivalent status but as an assemblage with a variable inclusion status, sometimes more specific and other times more general.

Standardized Cultural Plan

We begin the presentation of the standardized cultural plan from a parallel with the free cultural plan point of view (Fig. 1.) referring to the three essential aspects discussed before: name, form and category.

The first aspect of the standardized cultural plan is reflected in the distinction regarding the relation name – form and, in particular, the number of names assigned to a form as well the limits of form variation that regulate its affiliation to a particular category. In this case, the most striking distinction is the selection and authorization of only one name for a category of forms which became species. This unique name manifests in two linguistic systems not in a synonymous but identity-based relationship. Thus, for a particular species, a popular name is established from the variety of synonyms used in the free cultural plan. The common name is singular only in the context of the same language but globally there are as many official common names as many languages. This designation is mainly authorized through the occurrence of *bird identification keys and guides* that are used both *in situ* (in the field) as well as ex situ (schools, universities, laboratory, museums etc.). By using bird guides that give a single name for a certain form (Munteanu 1999, Svensson 2010) a homogenization of the name that can be used universally is achieved and thus the problem of communication regarding the identity of a species is partially solved. The emergence of taxonomy, meaning an organized and normative linguistic system is the specificity of the standardized cultural plan. This linguistic system implies the binomial nomenclature or the scientific names and is governed by a very clear set of nomenclature rules set out in the International Code of Zoological Nomenclature (Maggs 1999). The nomenclature code does not only regulate the designation of a name but also the way it is attributed to a set of forms and the criteria on the basis of which a category establishes its inclusion limits regarding form variation of the individuals. This unique scientific name will represent the scientific identity of the common name and will have a high degree of stability. However, the scientific name will undergo changes, that is to say, a dynamic according to the evolution of the form understanding both from a morpho-structural perspective as well as phylogenetic. We will discuss this dynamic below referring to it as the concept of cultural movement.

The form in the standardized cultural plan is no longer a product of direct and personal perception in an empirical manner but is subject to a set of inspections from different perspectives that are the repercussions of scientific methods of biological analysis (morphology, ecology, genetics, phylogeny etc). Therefore, not only the inspection but the description of this form takes into consideration the set of rules stipulated in the International Code of Zoological Nomenclature (Maggs 1999). Based on these criteria the intensions (in the logical sense) of categories are established. These criteria and the result of their application in the process of establishing and describing a category will constitute an informational set that operates in a particular scientific environment but will have an echo in the general (common, everyday) environment. This implies an isolation of identification and nomenclature processes of biological forms in the context of the scientific environment that does not have high accessibility for those outside it. Another aspect of the standardized cultural plan from the perspective of form is that, unlike the free cultural plan where contact with an animal was remote and ephemeral, we are dealing with a near contact and long-term analysis of the animal. This animal usually turns into an authentic proof of the species, such as museum type specimens (Bănărescu 1973). This process is very important and argued by the fact that some rare species with a particular aspect or cryptic lifestyle cannot be correctly identified otherwise even if they are large animals like birds. Common species may mask this situation but if we analyse some problematic species, we can see that they are erroneously determined in a surprising percentage even in museum when closely evaluated specimens are considered (Stermin, Pripon 2011). Museum specimens that are characterized by a high inspection accessibility reveal at further successive inspection that previous identifications were incorrect and therefore it is certain that the identification process in the field was erroneous as well (Stermin, Pripon 2011). In this context, the evaluation and re-evaluation of species on the basis of directly analysed material, such as

museum specimens and in particular museum type pieces, is a regulatory factor for the identity of a form that, in a free cultural context, suffers from a certain ambiguity.

The category also undergoes a mutation in the standardized cultural plan in terms of inclusion limits, compatibility and its identity. First of all, the name's intension allows a high-resolution discrimination, which leads to the classification of forms according to many criteria, and so the limitation of inclusion narrows. The category becomes in the standardized cultural plan a biological species or other taxonomic category. The species represents the primary category in which the form falls and to which we associate the name we assign to the assemblage of forms with variation boundaries so that they have an identity status within the category. The species has the same degree of inclusion for every type of biological form, and therefore the forms are classified in equivalent categories, in contrast with the case of the free cultural plan, where a category could otherwise include a species and in the same time a collection of species. Within the standardized cultural plan, a certain category is established for each degree of inclusion so that systematic hierarchical groups such as: Genus, Family, Order, Class, Phylum or Kingdom are assigned. Thus, the groups can only be compared to one level of inclusion and thus the ambiguity is reduced.

In the standardized cultural plan, the main direction by applying the norms is to reduce names associations to a form and to reduce forms inclusion for a category, so that the relationships between them become direct and represented by a single association path. Both the association between names and forms and the extension of name to forms becomes singular. This singular relationship is manifested by the existence of two systems of communication, a scientific one that is concretized precisely in this plan, and a common one which is in fact a reduction of relations in a free cultural plan which leads to disambiguation and blocking the emergence of ambiguity. Through this duality, the form can function both scientifically, inaccessible to the great majority of the community, but also in everyday communication system where all individuals are connected to the norms of disambiguation of forms and categories in which they are ranked. Taxonomy arise in this context, representing the set of norms that standardize the name assigned to one type of forms and also the systematics of forms, both as performant (scientific) procedures governing the identification and classification of biological species. Unlike the free cultural plan that manifests itself in an individual context or local communities, the standardized cultural plan represents a set of norms and results of the application of these norms with objective overall value that are manifested collectively and in order to make communication more efficient in a collective context on a global scale (not only local). This is possible by switching from a local language to a universal one which in this case is Latin. That is why the standardized cultural plan is of a nonlocal nature that is perpetuated through standardized education in schools based on a written code. Written names do not allow errors in transmission as in the case of subjective perpetuation within the free cultural plan that presents subjectivity due to oral transmission. The standardized cultural plan has a material informational support represented by writings that use to objectify the process of applying the methods and transmitting them from one generation to the next. Thus, there are two natures of the standardized cultural plan one mentally and another material represented by written records. This makes the standardized cultural plan work not individually but collectively, that is, as a common space. At the same time, the manifestation implies errors because the material nature (recorded by writing) is not perfectly and totally assimilated. Each individual partially assumes this plan and manifests within it at a certain capacity.

Essentially, the standardized cultural plan is a development of the intension and a reduction of the extension of a term. In this way, free associations and often erroneous association between names and category of forms in the context of individual ambiguity are regulated. This process can be observed even in the common language and observable in intermediate works between the scientific texts and science popularization texts. The work of Ion Simionescu called *Fauna României* (Simionescu 1983) represents such situation in which the common language both in terms of names and descriptions hybridizes with the scientific language so that the popularity of the latter is opened to common accessibility.

Another important aspect of the standardized cultural plan is the fact that it allows for the first time an orderly movement of the form identity unlike the chaotic movement that characterized the free cultural plan. This movement refers to the change in names associated with one species and

at the same time replacing forms corresponding to that species from one category into another. Although the nomenclature in the standardized cultural plan has a fixed character, which is essential to preserve the identity of the forms due to the increase in knowledge, it undergoes some changes. In the bellow discussion will analyse these changes.

By randomly selecting eight bird species from the Estrildidae Family and comparing their initial nomenclature with the current situation (Table 1), we come to the following finding. The eight species are described successively in a time interval of about 100 years. The first Genus name associated with these species is *Loxia* followed by a period of about 50 years in which all the described species we took in consideration here received the Genus name *Fringilla*. After 1835, the Genus name *Amadina* appears in which some species are framed. The first two Genus names: *Loxia* and *Fringilla* belong to the Fringillidae Family with which estrildids resemble but are not related directly. Therefore, the Estrildidae species are integrated in their original Genus nomenclature by 75% in the Fringillidae Family, of which the Genus name *Fringilla* had the highest percentage of association (63%) (Fig. 4. A). In their actual nomenclature, the 8 species considered here have particular Genus names associated only with Estrildidae Family in a more diverse assortment and with a smaller number of species associated with one Genus name (Fig. 4. B). We can consider their initial classification as yet artificial, although regulated both by the nomenclature principles and those of establishing the species status. Moreover, we can see a shift of some species from one genus to another. This phenomenon prefigures the cultural movement that we are discussing in this paper. When the grouping of species under the initial conditions was evaluated, we noticed a temporal succession of Genus names characterized in each period by a certain preference for a certain name mostly based on morphological traits taken into account without a detailed and strict analysis. In this case, species are grouped as follows: species 2-6 in a cluster which together with species 1 form another cluster that is then associated with the cluster formed by species 7 and 8 (Fig. 3. A). Integrating several aspects related to morphology but mainly evolutionary data on the basis of which phylogenetic relationships are established, we are currently dealing with another array of the 8 species (Fig. 3. B). In this ordering scheme the species form two main clusters, one represented by African species and the other one of Australian species. In each of these clusters smaller groups are distinguished related to the association with a certain Genus name.

From the previous analysis, it is noted that the species move from one group to another and this movement is evident by changing the position in the classification and succession series (Fig. 3.) determined by the nomenclature modification process. To better exemplify this movement, we will present bellow an example of a particular species whose nomenclature dynamics over time and the relationship in terms of nomenclature with the species to which it is related, are evaluated.

Great Egret (*Ardea alba*) is a cosmopolit species that, like other species whose nomenclature has been stipulated since Carl Linnaeus's Systema Naturae (Munteanu 2010), had a frequent change of its scientific name (Linția 1955). Until now, 16 names have been recorded for this species (Linția 1955, Svensson 2010, del Hoyo 2014). The vernacular name of the species (*egreta mare/ Great egret*) relates this bird to the Genus Egretta, but the actual scientific name (*Ardea alba*) places it in the Genus Ardea (herons). Throughout the time, from the original name to the present one, the nomenclature oscillates relating the Great egret to one of these two Genus names (Ardea – Egretta), thus to one of these groups of birds. At the same time, some Genus names (ex. Casmerodius) attributed to the Great Egret are different than the ones mentioned before and therefore this species has its own identity slightly distinct from true herons (Genus Ardea) and true egrets (Genus Egretta). This distinct nomenclature identity is the basis for a separated category of forms concerning perception and systematics.

In order to perform the analysis of nomenclature variation process, we did the following assessment which can be applied to other names as well. The name of the Great egret was quantified based on its linguistic resemblance to other names. The score are assigned between 1 to 8 as follows: 1 – if genus is Ardea, 8 – if genus is Egretta, 1,5 – if the genus has the root Ardea and has suffixes attached, 7,5 – if the genus has the root Egretta and has suffixes attached, 4 – if genus is different from Ardea, Egretta or other names for the two genus, 3 – if genus incorporates other names for Ardea, 6 – if genus incorporates other names for Egretta (Herodias/ Herodia), -1,5 if the species incorporates in the species name *ardea* or related, + 1,5 – if the species name incorporates *egretta* or related. We have to take into account that the term *erodios* which is one of the ancient names mentioned in Aristotle's *Peri ta zoia*

istorion (The history of animals) one of the first work that was a basis for zoology and nomenclature (Munteanu 2010). The correspondent for this Greek word already existed in use in Latin at the time Theodor Gaza translated Peri ta zoia istorion in Renaissance therefore Gaza replaced in his translation *herodias* with Latin word *ardea* and settled the basis for the actual scientific nomenclature in this case and many others (Munteanu 2010). This is important for evaluating the root of the nomenclature in our analysis.

It is noted that the original scientific name that reflects the standardized cultural plan, integrates the word Ardea as Genus name in all of the three species presented (Table 3). Based on the score of the Great egret calculated in different periods of time which reflected the proximity of this species in relation to the other two we obtained the dynamics of species in terms of nomenclature (Fig. 5.). This dynamic is characterized by a continuously oscillation between the values corresponding to the other two species (Fig. 5.). We noted the most frequent association of Great egret with Genus Ardea (Table 3) which is also the nomenclature that suits the phylogenetic relations between Great egret and Grey heron (Sheldon 1987). A significant number of associations are made with names that place the Great Egret between the two groups in a particular category of which the most actual is the Genus name Casmerodius (Table 3). Most of these names integrate the root *herodias* which is more commonly found in the nomenclature series of the Little Egret therefore associating it with genus Egretta (Table 3) which is not closely phylogenetic related either with Great egret nor with true herons (Genus Ardea) (Sheldon 1987). By following this dynamic, we can make a clear picture of the movement of the species in the taxonomic field from the perspective of its classification in a group or another reflected by its nomenclature. This type of changes characterizes the movement in the cultural space.

The movement or change the Great egret manifests in terms of supra-Family classification (taxonomic coordinates system) is not represented here because it does not reflect in the nomenclature of the species but in the one of the taxonomic Order it belongs to. The Family Ardeidae to which Great egret belongs was part of Order Ciconiiformes until 2008 when it switches to the Order Pelecaniformes (Hackett *et al.* 2008). This reintegration determines a replacement of the species in the standardized plan or at least a reorientation in the direction of the new related groups.

These movements are related to the variation of the species concept which in turn exhibits oscillations in a space governed by several cultural dimensions. Among these, the main ones are the linguistic dimension, the practical classification (empirical and practical in the case of material such as museum pieces to be placed in showcases or stored in cabinets based on their distinctive morphological traits), the technical classification (scientific systematics using morphological and structural traits) and the phylogenetic (biological history that takes into account species evolution). At different historical stages, this concept varied. It started with a pure linguistic stage that had corresponded to the initial free cultural plan. The next phase was represented by a taxonomic stage in which evaluations began to integrate empirical morphological and structural traits. A technical stage followed that took into account an analytical perspective of the traits. Consequently, a phylogenetic stage succeeded defined by integrated evolutionary aspects and prioritizing them in favour of the morphological or structural traits that could have been a repercussion of some adaptation processes that could lead to misinterpretation of the phylogenetic lineage. Finally, a synthetic stage developed, and, in this stage, the linguistic aspect was re-integrated so that the species would function in the mental field with the aim to suggest the position of the form in relation to the others that are related or different. In other words, in this last stage the form begun to be strongly anchored in the cultural coordinates system.

What we can see from this analysis is that, although in the standardized cultural plan the fixity and unicity of the name of one species is established, this is not durable over a long period of time. Still in this plan the movement of names is regulated in the taxonomic field so species can be efficiently determined by them and coherently interrelated. The continuity and uniformity of the name of one species and hence of its identity is due to improved and complex evaluations but also to other factors such as traditional stability of some taxonomic systems that overlap with new ones from a pragmatic necessity. The use of an old taxonomic system even if a new one has emerged is due to the need for compatibility between studies. Even in the case of the same researcher performing studies over a long period of time it gets difficult to compare the old and new data if beside the new taxonomic system

some older ones are considered. Therefore, in a comparative study, this researcher will tend to use old taxonomy as well for practical reasons but also from the perspective of habit. Thus, old systems remain in use within the usage of new ones.

Discussions

From the above analysis it can be stated that the name of each species has a diversity that corresponds to the synonyms pool in the free cultural plan and a dynamic name that functions singularly in one period but shows variation in time in the standardized (normative) cultural plan. In relation with other species names one particular name finds itself in different position in different periods of time. The affiliation of one name to another or the distinctions between them corresponds to the relations between species they belong to. These relations between species are constituted in the taxonomic and phylogenetic context and the position that one species gain in this ordering system drag the name in a position that fits in a cultural constellation that we referred as a cultural space (Fig. 6.). We must admit this cultural space as a reality due to the movement that names have been showed to manifest and therefore require to carry out. This space is not a material one given that neither the names are. There is a correspondence between the cultural movement of names and material movement of objects that subscribe to a certain species more obvious observed in the reorganization of museum exhibition and collection storages and less obvious in nature as living animals are not dependent directly to the name they associate in human cultures.

The movement in the cultural space (the concept as it is proposed in this work) is specific to a set of values an object has. Among these, we can enumerate the aesthetic value, economic value, historical value and the linguistic value which we focused on here. This latter value has some coordinates that relate to a reference system consisting of four dimensions: pure linguistic, practical, technical and phylogenetic. In relations to these dimensions the form of one species as a general form of objects belonging to this category, determines a certain position and the variation of this position of the name over time. In the cultural space all the species vary through the position of their names in the taxonomic constellation array. Therefore, one species has a dependent and relative position which is more obvious in relation to the other species than to an absolute reference system of the cultural space.

In the free cultural plan, one species names can be represented as disparate dots that have spatial coordinates and function together in the same time as synonyms from the beginning of their assignment. In the cultural space they represent longitudinal continuous lines (due to the coexistence of synonyms) dispersed in the space in form of a bundle that has different start for its fibers (Fig. 6. right).

In the standardized cultural plan only one name is authorized at a time therefore no two names can function simultaneously. Once other name is approved a switch is immanent and the name manifests a variation, a change and as a consequence a movement. In the cultural space one species movement is represented by only one line that stretches to reflect the movement done in a certain moment. This curve line can be related to a sum of other straight lines corresponding to official common names in different languages they exist in. Even in the standardized cultural plan the number of common names is high and usually equals the number of local languages. For this reason, ambiguity arises as in the free cultural plan mostly when some common names are adopted and translated from foreign languages. This situation is not that simple because in one language there are names for local animals and a limited number of exotic ones and therefore the translation is necessary for the rest of animals.

The free cultural plan has spatial coordinates as vernacular nomenclature is geographically dependent. Antithetically, the standardized cultural plan is nonlocal as the norms have no spatial connection and they must be applied everywhere. The written or printed form of taxonomical conventions have a specific location in space but only by their materialisation.

Essentially, the free cultural plan represents a real concrete manifestation of culture and language in contrast with the standardized cultural plan that represents an abstract, artificial and potential language. Both plans are found in an individual's mind as a collection of capabilities and function as abstract structures usually built hierarchically. Fundamentally, the individual's mind functions in the free cultural plan and then reorganizes into the standardized cultural plan that regulates the first.

Even though the standardized cultural plan tends to regulate the relationships between form, category and names, we see that there are several factors that make it quite difficult and we find ourselves in a situation similar to the free cultural plan. To analyse the situation manifested in both

plans in order to be able to make a real comparison between the two, we will need an evaluation of the identity of bird species covering both situations which the subject of further research will be.

These two plans coexist and from their union and overlay, the cultural space is generated. The name has one plural and fix nature that show resistance to movement and one singular variable nature that generates the movement.

The movement can be represented by the trajectory of the objects name (Fig. 6.). In case of the cultural movement of one object we are dealing with more than one trajectory. In this gathering the individual trajectories are related and synchronized because of the cultural field determination that function in the cultural space. On the other hand, the connection between trajectories is given by the nature of the central one corresponding to the scientific name which is the result of old universal language names de-localised and de-temporalized. To take only one example let us analyse the formation of the scientific name of the Long-eared owl. *Asio otus* the actual name of this species was originally given by Linnaeus in 1758 as *Strix otus* (del Hoyo 2014) and in 1830 was placed by Lesson in the *Asio* genus. The actual name is formed by combining two ancient words. *Asio* is the Latin word for this owl and *otus* is the Greek word for the same species and were in use in these old languages at that time (Munteanu 2010). Those two names functioned as vernacular names and had their trajectories with which the actual scientific name is evidently connected and is determined by. We can see that this movement is complex, and it takes simultaneous more than one element, if a name can be considered a fraction of an object. This movement is powered by cultural factors and it is essentially of cultural nature. Culture develops in the context of biological organisms' interactions and therefore it will integrate the biological movement which is considered the highest form of natural movements. Therefore, cultural movement is on an even higher level than the biological one.

Conclusions

The cultural space is the totality of possible positions that an object can have through its name in the cultural coordinates system. These coordinates can be related to form, to the name in strict linguistic aspect, to the object behaviour, the object utility and administration or the object aesthetics. The coordinates can be practical, technical, phylogenetic, and translated in names relativity that reflects in systematics, classification and define the limits of the category in which form classifies.

In the cultural space there is a cultural field that acts on objects in the same way the fields described in physics affect the behaviour of material objects in terms of electricity, magnetism or gravity. This cultural field is responsible for the active movement of the cultural nature of objects. The cultural field can be argued in relation to the agency that non-human objects possess as proposed in the Actor-Network Theory (Latour 2007).

The cultural movement can be observed in the cultural coordinates system which is more evident in the case of nomenclature but is not limited to it. All the cultural values one objects has are projected in language and from language the name of the object gains a relative position to other names in the cultural coordinates system. Therefore, in a coarse reductionism we can reduce the cultural position of an object to its name systematics or taxonomy.

Acknowledgements

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LIST OF ILLUSTRATIONS

LISTA ILUSTRAȚIILOR

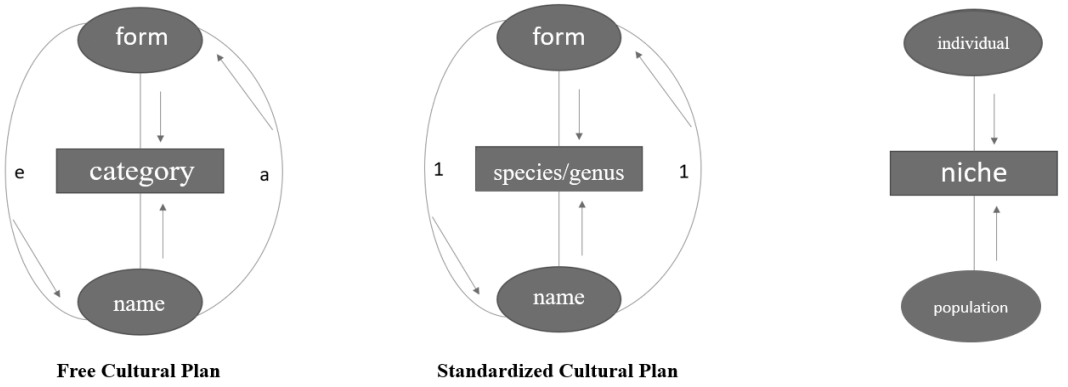

Fig. 1 Parallel between Cultural Plan and Ecological Plan regarding name-form relations

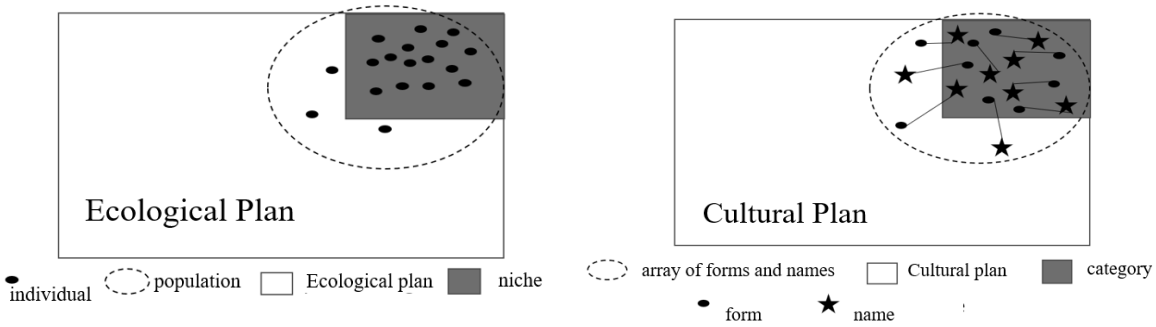

Fig. 2 Representation of name-form relations in the Ecological Plan (A) and in the Cultural Plan (B)

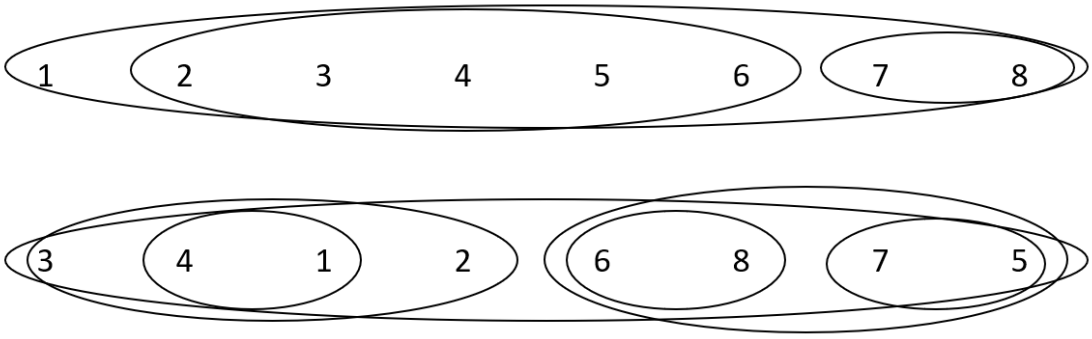

Fig. 3 Array of 8 Estrildidae species in chronological nomenclature order (first row A) and in the present taxonomic context (second row B)

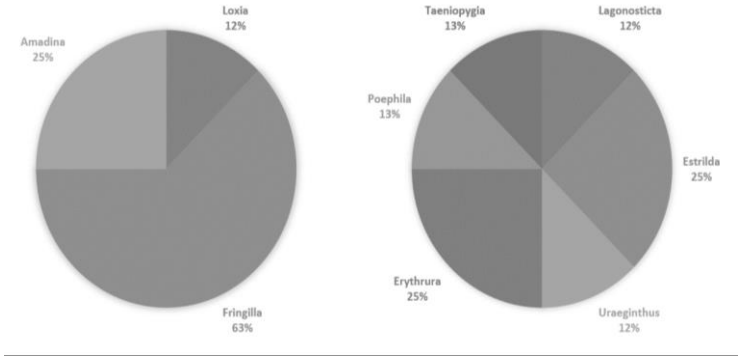

Fig. 4 Composition in Genus and the percentage of each Genus of the Estrildidae 8 species group

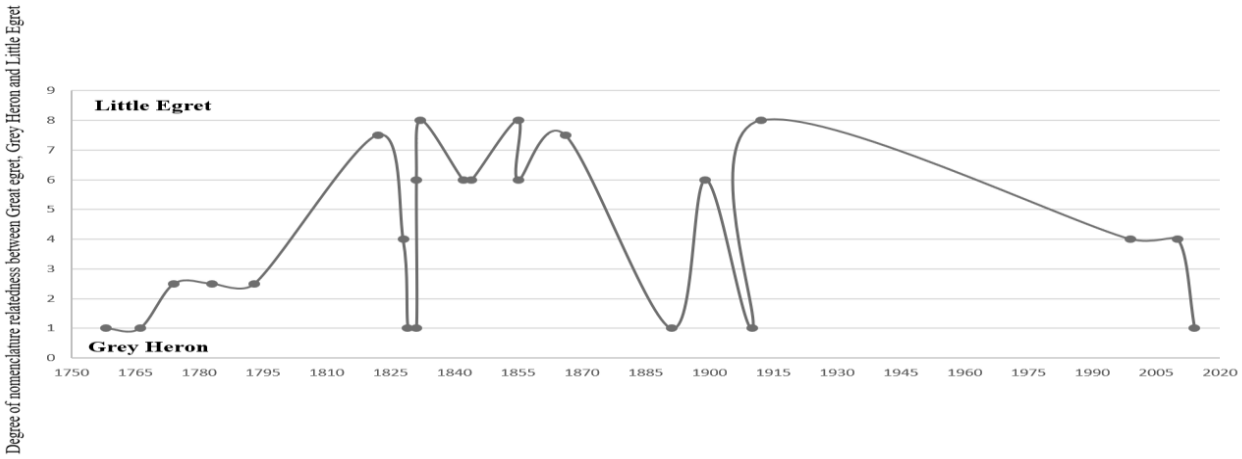

Fig. 5 Variation in time of the Great egret taxonomic nomenclature

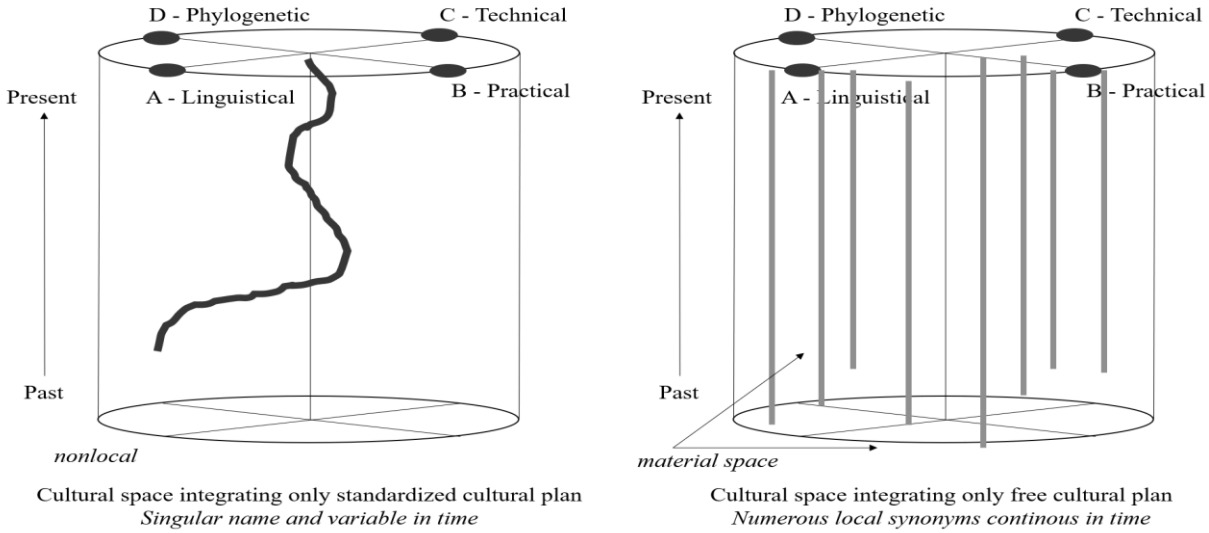

Fig. 6 Representation of the cultural space and its coordinates in which the value of object (in this case the linguistic value) manifests movement in time

Tab. 1 Nomenclature and array of 8 bird species from Estrildidae Familiy in their original form and in the present taxonomic system

Species	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Original Nomenclature	*Loxia astrild*	*Fringilla bengalus*	*Fringilla senegala*	*Fringilla caerulescens*	*Fringilla guttata*	*Fringilla trichroa*	*Amadina cincta*	*Amadina gouldiae*
Description Year	1758	1766	1766	1817	1817	1835	1837	1844
Chronological array	1	2	3	4	5	6	7	8
Present Nomenclature	*Lagonosticta senegala*	*Estrilda caerulescens*	*Estrilda astrild*	*Uraeginthus bengalus*	*Erythrura trichroa*	*Erythrura gouldiae*	*Poephila cincta*	*Taeniopygia guttata*
Actual Taxonomic array	3	4	1	2	6	8	7	5

Tab 2 Types and number of Genus found between the 8 species of Estrildidae and the percentage of these names in this series

	Original Nomenclature			**Present Nomenclature**					
Genus	*Loxia*	*Fringilla*	*Amadina*	*Lagonosticta*	*Estrilda*	*Uraeginthus*	*Erythrura*	*Poephila*	*Taeniopygia*
No. of Genus	**1**	**5**	**2**	**1**	**2**	**1**	**2**	**1**	**1**
% of Genus	12,5%	62.5%	25%	12,5%	25%	12,5%	25%	12,5%	12,5%

Tab. 3 Degree of nomenclature relatedness between Great egret, Grey Heron and Little Egret.

Year	**Great Egret**	**Grey Heron**	**Little Egret**	**Estimative relatedness**
1758	*Ardea alba*	*Ardea cinerea*		1
1766	*Ardea alba*	*Ardea major*	*Ardea garzetta*	1
1770			*Ardea nivea*	
1774	*Ardea egrettoides*			2,5
1783	*Ardea garzetta major*		*Ardea krammeri*	2,5
1788		*Ardea johannae*		
1793	*Ardea egretta*			2,5
1803		*Ardea vulgaris*		
1810			*Ardea xanthodactyla*	
1822	*Herodias egretta*		*Herodias garzetta*	7,5
1828	*Lepterodias flavirostris*			4
1829	*Ardea melanorhynchos*			1
1831	*Ardea modesta*	*Ardea cineracea*	*Ardea orientalis*	1
1831	*Herodias candida*		*Herodias jubata*	6
1832	*Egretta alba*			8
1838			*Egretta orientalis*	
1842	*Erodius victoriae*	*Ardea rectirostris*		6
1843				
1844	*Herodias alba*			6
1848		*Ardea leucophaea*		
1855	*Egretta melanorhyncha*			8

1855	*Herodias latiefii*		*Herodia lindermayeri*	6
1866	*Herodias egretta*	*Ardea media, branchyrhynchos*	*Egretta garzetta*	7,5
1868			*Herodias procerula*	
1891	*Ardea alba*	*Ardea cinerea*	*Ardea garzetta*	1
1899	*Herodias alba*	*Ardea cinerea*	*Garzetta garzetta*	6
1910	*Ardea alba*	*Ardea cinerea*	*Ardea garzetta*	1
1912	*Egretta alba*	*Ardea cinerea*		8
1932			*Egretta garzetta*	
1999	*Casmerodius albus*	*Ardea cinerea*	*Egretta garzetta*	4
2010	*Casmerodius albus*	*Ardea cinerea*	*Egretta garzetta*	4
2014	*Ardea alba*	*Ardea cinerea*	*Egretta garzetta*	1

BRUKENTHAL NATIONAL MUSEUM IN 2018: A CHRONICLE OF NATURAL HISTORY EXHIBITIONS AND EVENTS

Dana Roxana HRIB*

Abstract: *The present study is a synthetic presentation of Brukenthal National Museum's cultural offer in the field of natural history during 2018.*
Keywords: *Brukenthal National Museum, natural history, 2018.*

Rezumat: *Articolul de față constituie o prezentare sintetică a ofertei culturale a Muzeului Național Brukenthal în domeniul istoriei naturale, pe parcursul anului 2018.*
Cuvinte cheie: *Muzeul Național Brukenthal, istorie naturală, 2018.*

1. Temporary exhibitions[1]

a. Exhibitions at the museum locations:

Out of the 37 temporary exhibitions that were organized at the Museum's premises during 2018, 9 exhibitions displayed selections of exhibits in various fields of natural history.

To be noted in the 2018 exhibition agenda is the diversity and the interdisciplinary approach shown by the exhibition projects coordinated by the Museum of Natural History:

_*Pharmaceutical traditions from Sibiu* (Museum of Pharmacy, 26.01 – 31.12): organized together with the Romanian Pharmacy History Society (SRIF), Sibiu branch, the exhibition presented, for the first time at national level, the complete Romanian pharmacopoeia collection (1862 - 1993) of the late pharmacist Vasile Marin (1947-2015), a personality in the field, due to his exceptional professional activity. He is well remembered for his work in the Romanian Health Ministry - General Pharmaceutical Directorate, where he served as: Inspector Pharmacist (1978-1984), Head Inspector (1985-1986), General Inspector (1985-1990), Deputy General Director (1990-1992; 2002-2003), General Manager (1992-1993). Also, Vasile Marin was a collector of pharmaceutical objects and books of great historical and professional value. Pharmacist Anca Marin, his partner in life, wanted to share with all of those who love and practice this noble profession, a part of his collection through the present exhibition. The ten exhibited volumes mark the development of the pharmaceutical sciences in our country, commemorating 155 years since the First Romanian Pharmacopoeia was recognized as the only legal national pharmacopoeia, in January 1863. The value of the exhibits is enhanced by the space chosen to accommodate them, namely the Museum of Pharmacy History in Sibiu, where the pharmacy "At the Black Bear", one of the oldest pharmacies in town, was founded around 1600.

_*Predators of the Eocene Sea* (Museum of Natural History, 27.03-30.09): the exhibition invited the visitor to a trip into the world of marine vertebrates (sharks and fishes) from the geological age called Eocene (56-33 million years). The Museum of Natural History in Sibiu is known to have one of the richest collections of fish fossil-teeth of outstanding scientific value, permanently in the attention of researchers. The exhibition featured fossil-teeth that belonged to marine predators from all the ecological niches of this ancient sea.

_*Molluscs – the Witnesses of History* (Museum of Natural History, Multimedia Hall, 25.04 – 21.09): Molluscs (snails, shells, octopuses, chitons, etc.) are here on Earth for about 540 million years. The colorful shells of snails and the elegant shells have captured man's attention since ancient times. First of all, they were food and then they become tools, religious objects, source of artistic inspiration and, at present, medicines and raw material in various scientific and technical fields. In the exhibition, the visitor admired *Nassa*, the sea snail, which, 110,000 years ago, humans used to make the first adornments or the Pseudodon, a clam used for scratching. The Patella snails were food for humans from the Mesolithic (10,000 / 8,000-5,500). With "cowrie", a small shell formerly used as money, people were bought: a slave in Africa was worth 25,000 such "coins". The exhibition does not lack the ornament of the ancient European world or spiny oyster, Spondylus. The pieces are part of the malacological collections of the Museum of Natural History in

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[1] The short descriptions of temporary exhibitions are selected from the texts given by the curators for public information.

Sibiu, which counts 515,220 items. For over 160 years, these collections have been on the increase, on the one hand, as a result of the collection and research work of the Siebenbürgischer Verein für Naturwissenschaften zu Hermannstadt, the founding society of the museum, on the other, by receiving donations or purchasing private collections of particular scientific value.

_*Mineralia – crystals, jewelry, natural stone adornments* (Casa Albastră/Blue House, 11-13.05): Organized by Mineralia Association, the exhibition displayed precious stones such as sapphire, ruby, emerald and diamond, as well as many ornamental stones such as garnet, malachite, turquoise, jade, agate, amber and lapis lazuli are known from ancient times. In the modern times, hundreds of minerals belonging to the group of fine stones were added; they are less known but equally interesting: amethyst, adventurin, citrine, labradorite, aquamarine, rodocrosite, seraphinite, fluorine, tanzanite, citrine, moldavite, obsidian, etc. The 2018 spring edition was dedicated to a mineral that amazes for the multitude of colors it presents: tourmaline – the gem of modern times. Tourmaline is a privileged stone due to the extraordinary variety of colors that gave it different trade names: colorless / acroit; violet, green / verdelite; yellow / elbait, orange / dravit; red / rubelit; intense blue / indigo; black / schorl. Even tricolor crystals can occur, as is the case with the water-melon tourmaline. The clearer the stone and the better the contrast between the colours, the more valuable it is. Due to the transparency and special glitter, the jewels made of this mineral are distinguished, so tourmaline has become the gem of modern times.

_*Anti-Cancer Plants* (Museum of Natural History, 26.09 – 31.10): Numerous studies and scientific researches have tried to find out what determines the appearance of cancer and the way it spreads, but it has been proven that the disease is very complex and the causes are numerous. Let us not forget, however, that nutrition plays an important role in both the prevention but also in the occurrence of this disease. The "Anti-cancer plants" temporary exhibition presented a selection of well-known and recommended plants in the diet of any person, especially cancer patients. Although they are within the reach of any person, the therapeutic effect and mode of action on tumors is a lesser known aspect to the visitor. About the use or preparation of the plants presented, more information was provided on the occasion of the exhibition opening, delivered by specialists in the culinary domain.

_*Exotic butterflies from the collections of the Museum of Natural History* (Museum of Natural History, 26.10 - 31.12): the exhibition featured 94 exotic species of butterflies and moths from the entomological collection of the Sibiu Natural History Museum, a department of Brukenthal National Museum. These species come from South America (Peru, Brazil, Argentina, Colombia, Amazon region), Mexico, Cuba, North America, Africa, Madagascar, Australia, Japan, India, Indonesia, Taiwan, China, Thailand, Solomon Islands, Malaysia , etc. A selection of species was presented, namely the largest species of Asian moth - Edward's Molia Atlas (Archaeoattacus edwardsii), the largest moth in North America - Cecropia silk moth (Hyalophora cecropia), the largest Morpho butterfly - the Morpho hecuba butterfly, the largest North American butterfly - the giant doves (Papilio cresphontes), winged butterfly species - wolf moth White witch (Thysania agrippina); endemic species such as the Parides grunlachianus butterfly that lives only in Cuba, the Rotschilda jacobaea moth only spread in Argentina; butterflies of the genus Ornithoptera, called bird butterflies, which are considered to be the superlative of beauty in the world of butterflies, famous blue butterflies of the genus Morpho or azure butterflies, etc. Also, various aspects characteristic of the species regarding behavior, morphology, distribution were mentioned. The exhibits belong to the Wilhelm Weber collection, the material being purchased from Weber by the museum in 1971. Weber was known for his involvement in the growth of exotic butterfly species. He has managed to make a special collection of exotic butterflies both through his own activity and through exchanges and collecting. This collection is distinguished by a large variety of species, the result of the collector's concern to have as many representatives of the most attractive butterfly families.

_*The City in the Deep* (Museum of Natural History, 9.11.2018 - 30.04.2019): every year, on November 8, we are celebrating the International Day of Urban Areas. This anniversary is held since 1949 in more than 30 countries in order to help specialists and a broad audience with solutions for organizing cities without harming the environment. Humans, one of the forces of nature, build and transform the environment according to their will. The Museum of Natural History in Sibiu, as a protector of the environment, presents, on this occasion, the city from the depths of the seas and oceans, with which we share the vital space. The natural "cities" of the Earth are directly or indirectly affected by urban anthropic areas. Sustainable development of the latter will ensure the continuity of the natural environment and the resources needed for future generations. In every city we live, nature and its inhabitants are always present. The exhibition included more than 100 inhabitants of the seas and oceans and we invited the public to meet with them and contribute positively to the future of our common home - the Earth. This exhibition completed the permanent

exhibition of the museum. The exhibits were part of the collections of the Transylvanian Society of Natural Sciences in Sibiu, which, since the foundation in 1849, had the objective of knowing the natural world and promoting the need to protect and preserve it.

_*Mineralia: Minerals from Romania* (Brukenthal Palace, 23-25.11): organized by Mineralia Association, the exhibition emphasized that many regions of Transylvania – Baia Mare, Brad, Abrud and Mountainous Banat – have developed over the centuries, due to the natural richness of the Earth. The people settled in these places and founded communities dealing with the exploitation of copper, lead, gold, silver or iron. In addition to valuable economic products, individual mining, communal or industrial mining have revealed spectacular natural crystal samples. Attracted by their beauty, rarity, perfection or colors, people began to gather these wonders of nature as collectible or decorative items. These are the so-called "Crystal Clusters": rodocrozit, which appears in the form of intense pink petals; stibina, the symbol of aesthetic mineralogy in Romania, which creates spectacular dark, shiny black needles; calcite, which gives us the greatest variety of colors (shiny white, pink, black), shapes and aspects (saccharide); The transparent quartz, with perfect crystal columns, often found in the vast mineral world; the Roumanian ametist, pale purple, rarely encountered; the intense black sphalerite, galena, the golden pyrite, and the famous native gold. All of the above were presented in the exhibition along jewelry, ornaments and ornamental pieces of natural stones from all over the world.

_*Live reptiles* (Blue House, basement, 1.01 – 31.12): organized together with Gabonica, the exhibition presented a large variety of reptiles.

b. Online exhibitions:

_*2M2O - 2 Muzee 2 Obiecte* [2M2O – 2Museums 2 Objects] http://brukenthalnaturale.wordpress.com

2. Events

_*Double book-launch on the occasion of 129 birth celebration of Ionel Pop* (Museum of Hunting, 24.11): the enthusiasts of hunting literature were invited to the “August von Spiess” Hunting Museum for an event dedicated to August von Spiess and Ionel Pop.

3. Projects

_*Sibiu Pharmaceutical Traditions*

Since 2016, Brukenthal National Museum, through the Pharmacy Museum, is partner of the Romanian Society of Pharmacy History (Sibiu) in the development of the cultural and educational project “Sibiu Pharmaceutical Traditions”. Thematic lectures and various activities were held monthly in the Multimedia Room of the Museum of Natural History or within the Museum of Pharmacy.

4. Scientific symposiums

_*The 11th Congress of the Romanian Society of Apitherapy* (11-16.10): Brukenthal National Museum hosted in the Blue House the Api-Phyto and Api-History Session.

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_http://www.brukenthalmuseum.ro/publicatii/index.html

MUZEUL NAȚIONAL BRUKENTHAL

PUBLICAȚIILE PERIODICE APĂRUTE DE-A LUNGUL TIMPULUI
(INCLUSIV PRECURSORII)

CRONOLOGIE	ISTORIE, ARHEOLOGIE	ARTA PLASTICĂ	ȘTIINȚELE NATURII	RESTAURARE	ETNOGRAFIE
Ante 1950		Mitteilungen aus dem Baron von Brukentalischen Museum 1931-1937 - Neue Folge I-VII 1941 - Neue Folge I-VIII 1944 - Neue Folge IX-X 1946-1947 - Neue Folge XI-XII	Verhandlungen und Mitteilungen der siebenbürgischen Vereins für Naturwiessenschaften zu Hermannstadt 1849-1945 95 de numere		
1959-1989	Studii și comunicări Muzeul Brukenthal, Sibiu 1956, nr. 1 1965, nr. 12 1967, nr. 13 Volum omagial, Anuarul Muzeului Brukenthal, 1817-1967 1969, nr. 14 1973, nr. 18 1975, nr. 19 1977, nr. 20 1981, nr. 21	Studii și comunicări Muzeul Brukenthal, Sibiu 1956, nr. 4, 5 1956, nr. 7 Istoria culturii 1978, nr. 1 1979, nr. 2	Studii și comunicări Muzeul Brukenthal, Sibiu 1958, nr. 10, 11 1970, nr. 15 1971, nr. 16 1972, nr. 17 1973, nr. 18 1975, nr. 19 1976, nr. 20 1977, nr. 21 1978, nr. 22 1979, nr. 23 1980, nr. 24 + Supliment 1983, nr. 25 + Supliment 1984, nr. 26 1998, nr. 27 2003, nr. 28 2004, nr 29 + Supliment		Studii și comunicări Muzeul Brukenthal, Sibiu 1956, nr. 2, 3, 6 1958, nr. 8, 9 Cibinium, Studii și materiale privind Muzeul tehnicii populare din Dumbrava Sibiului, Sibiu 1966, vol I 1967/68, vol II 1969/73, vol III 1974/78, vol IV 1979/83, vol V
După 1989	2006, I, 1 2007, II, 1 2008, III, 1 2009, IV, 1 2010, V, 1 2011, VI, 1 2012, VII, 1 2013, VIII, 1 2014, IX, 1 2015, X, 1 2016, XI, 1 2017, XII, 1 2018, XIII, 1	2006, I, 2 2007, II, 2 2008, III, 2 2009, IV, 2 2010, V, 2 2011, VI, 2 2012, VII, 2 2013, VIII, 2 2014, IX, 2 2015, X, 2 2016, XI, 2 2017, XII, 2 2018, XIII, 2	2006, I, 3 2007, II, 3 2008, III, 3 2009, IV, 3 2010, V, 3 2011, VI, 3 2012, VII, 3 2013, VIII, 3 2014, IX, 3 2015, X, 3 2016, XI, 3 2017, XII, 3 2018, XIII, 3	2010, V, 4 2011, VI, 4 2012, VII, 4 2013, VIII, 4 2014, IX, 4 2015, X, 4 2016, XI, 4 2017, XII, 4 2018, XIII, 4	

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