

Contributions to the Knowledge on the Occurrence of Agile Frog (*Rana dalmatina* Bonaparte, 1840) in Tulcea County, Romania

Contribuții la cunoașterea distribuției broaștei roșii de pădure (*Rana dalmatina* Bonaparte, 1840) în județul Tulcea, România

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Abstract

*The Agile Frog (*Rana dalmatina*) is a relatively common species in Romania. In the frame of a nation-wide, on-going project (implemented in 2012-2015 period with the financial support of the European Fund for Regional Development) we carried-out a comparative analysis of a total number of 1778 records (observations made since 1863 and published till 2011, inclusively), resulting that *Rana dalmatina* occurred in 793 plots of 10 x 10 square km (in the ETRS LAEA 5210 grid) distributed in four (out of the five) European biogeographically regions from Romania. In the Steppe European Biogeographical Region, in most of the cases *Rana dalmatina* was recorded in the Dobrogean mainland (continental plateau) respectively in the forested areas from the central and northern parts of Tulcea County and from the south-western part of Constanța County. In the last 10 years (2005 – 2014 period, but more intensively in 2013 and 2014) we have carried out several field-investigation in Măcin Mountains, Niculițel Plateau, Babadag Plateau and their neighbouring areas, in order to establish the current distribution and ecological status of *Rana dalmatina* in northern Dobrogea. Beyond reconfirming the species presence in sites where it was previously recorded (e.g. Atmagea, Nifon, Macin Mountains), we have recorded for the first time the occurrence of *Rana dalmatina* in sites that are outside of the areas dominated by compact forests, as it is the case of the record-sites from nearby Dorobanți and Greci, respectively the record-sites from nearby Luncavita, Isaccea and Cerbu, and the ones between Revărsarea and Rachelu. According to our knowledge, the southernmost site from Tulcea County where *Rana dalmatina* was recorded is a valley nearby Beidaud locality.*

Keywords: *Rana dalmatina*, distribution, Habitats Directive, Natura 2000, Romania

Introduction

Rana dalmatina Bonaparte, 1840 has a wide range in Europe, from North-Eastern Spain to the Southern coasts of the Sweden, respectively, to Western Ukraine (GASC *et alii*, 1997), meanwhile outside of Europe occurs only at the North-Western limit of the Asian part of Turkey (FUHN, 1960). *R. dalmatina* is widely distributed in Romania (TÖRÖK *et alii*, 2013), from at about 50 m a.s.l. to 800 m a.s.l. (COGĂLNICEANU, 1991).

Rana dalmatina is assessed as having Least Concern status, according to the IUCN Red List Category and Criteria (KAYA *et alii*, 2009; TEMPLE and COX, 2009), and is listed on Appendix II of the Bern Convention (***, 1979) – corresponding to Appendix II of Act 13/1993 (***, 1993) – and on Appendix IV of the Habitats Directive (***, 1992; ***, 2006) – corresponding to Appendix 4A of the Governmental Emergency Ordinance 57/2007 (***, 2007).

According to Article 17 of the Habitats Directive (***, 1992), every six years EU Member States shall draw up and forward to the European Commission a report on the conservation status of the so-called Species of Community Interest, as *R. dalmatina* is.

The present work contains information on the investigations performed to provide data from Tulcea County for the national report on the conservation status of *R. dalmatina* populations from the Steppic European Biogeographical Region.

Material and Methods

In March-October 2012 period, the author developed, with ArcView 3.1, polygon-type shapes with the records of *R. dalmatina* from Romania. Both data from scientific references (published in 1863 – 2011 period) and unpublished data resulted from the author's field investigations were uploaded. The shp-layers with distribution (record) data and the layer containing plots (from Romania) of 10 km x 10 km, in the ETRS LAEA 5210 grid, were overlaid and there were selected those 100 km² plots that included records of *R. dalmatina*. Than taking into account the distribution of record-sites of other native Romanian amphibian taxa, as newts (TÖRÖK, 2014a) and frogs (TÖRÖK, 2015a; TÖRÖK, 2015c), respectively of native reptiles (TÖRÖK, 2014b; TÖRÖK, 2015a), there were selected the primary target plots where periodical assessment of the presence and status of amphibians (including *R. dalmatina*) and reptiles considered Species of Community Interest was planned to be performed.

Monitoring of *Rana dalmatina* populations from the target plots from Tulcea County was performed in 7th March 2013-29th October 2014 period (totally, there were 46 days of field-surveys; usually one day in the middle of each week in the periods/months when *R. dalmatina* was supposed to be active), using the methods developed at the end of 2012 (TÖRÖK *et alii*, 2013). Also, investigations using the same method were carried out in several other plots of 10 km x 10 km, in the ETRS LAEA 5210 grid, located in the neighbourhood of the main target plots.

Processing of the records (with the use of ArcView 3.1) was performed mainly in November 2014-April 2015 period, both for data gathered in the monitoring period and for those obtained before February 2013.

Results and Discussion

According to a recent work, till February 2013 the Agile Frog (*R. dalmatina*) was recorded 2027 times in Romania (COGĂLNICEANU *et alii*, 2013). In order to draw the distribution map and the range map, respectively to establish the monitoring plots for *R. dalmatina*, we selected 1709 records (from 1863 – 2011 period) of the species that were distributed in 793 plots of 100 km² (Fig. 1) in the ETRS LAEA 5210 grid.

We have to mention that the respective 793 plots included those areas where *R. dalmatina* populations were reported (GHIRA *et alii*, 2002), but the respective records were afterward considered either as being based on misidentification or as demonstrating a recent local extinction of the species (DEMETER *et alii*, 2007). In spite of this uncertainty we have taken into account some of these records during the processing of the data which had as a result the distribution map (Fig. 2) and the range map (Fig. 3) of *R. dalmatina*, meanwhile the questionable reports from sites located at the limit of the species range, as the one from Constanta city (KIRITESCU, 1930), were considered unreliable to include the species into the list of amphibians occurring in a certain biogeographically region (in case of Constanța City, into the Black Sea European Biogeographical Region).

Taking into account the distribution of the record-sites of *R. dalmatina*, the distribution of the records-sites of the other amphibian taxa considered Species of Community Interest, the records-sites of the native reptile taxa considered Species of Community Interest, the currently available human resources and technical possibilities, for nation-wide monitoring of the ecological status of different amphibian or reptile taxa of the mentioned category there were selected 156 plots (of 100 km², in the ETRS LAEA 5210 grid), out of which 80 plots were with previous records of *R. dalmatina* populations.

Furthermore, out of the 793 plots with *R. dalmatina* records 41 plots are exclusively or partially overlapping the Steppic European Biogeographical Region from Romania (see rows 1 to 6 in Table 1), among them being 8 plots included into the list of plots where assessment of *R. dalmatina* was considered compulsory. The 27 plots that are exclusively in the Steppic European Biogeographical Region include the 16 plots of 100 km² that are located in Tulcea County, two of the plots being on the list of those where performing of monitoring was compulsory.

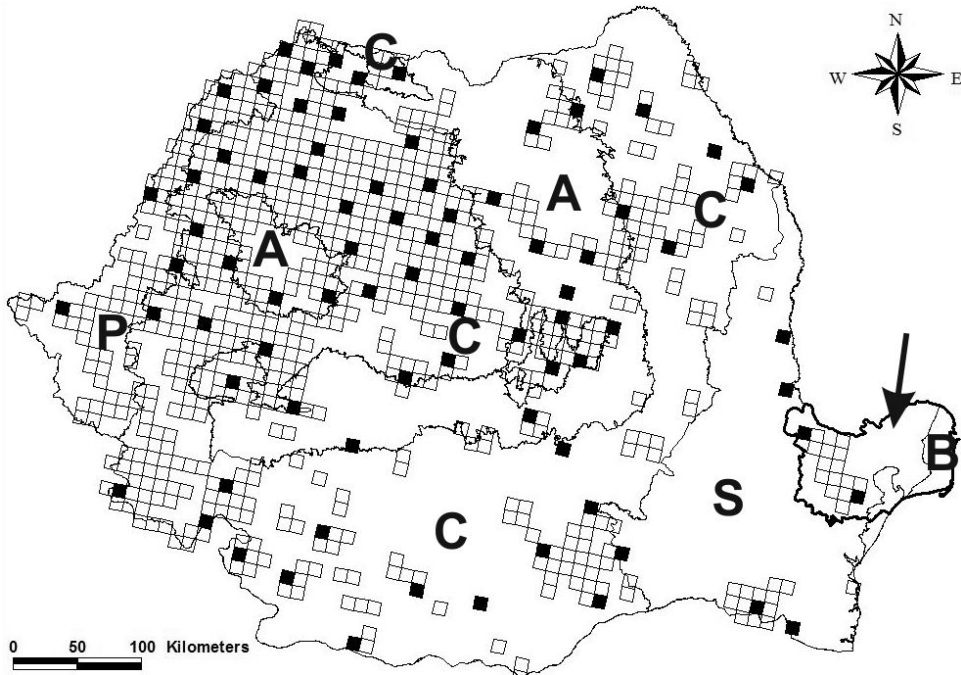


Fig. 1. Distribution of plots of 100 km² (of ETRS LAEA 5210 grid) that overlap with record-sites of Agile Frog (*Rana dalmatina*) populations in Romania

Fig. 1. Distribuția careurilor de 100 km² (din grila ETRS LAEA 5210) care se suprapun cu zone din România unde au fost semnalate populații de broască roșie de pădure (*Rana dalmatina*)

Note: **black squares** – plots in case of which there were previous records of *R. dalmatina*, selected as main monitoring plots; **white squares** – plots in case of which there were previous records of *R. dalmatina*, but not selected as plots where monitoring should be compulsory in the frame of the project developed in 2012-2015 period; **A** – Alpine European Biogeographical Region; **B** – Black Sea (Pontic) European Biogeographical Region; **C** – Continental European Biogeographical Region; **P** – Pannonian European Biogeographical Region; **S** – Steppic European Biogeographical Region; **thin line** – limit of the European Biogeographical Regions; **thick line** – limit of Tulcea County; **arrow** indicates Tulcea County.

Considering the 793 plots with *R. dalmatina* records, with ArcView 3.1 there were analytically calculated the surfaces of distribution area and of range of the species from the whole country (Fig. 2 and Fig. 3), respectively the surfaces belonging to various European Biogeographical Regions from Romania (Table 2). The results show that the distribution area of *R. dalmatina* in the Steppic European Biogeographical Region represents 4.28% of the national distribution area of the species and the range of *R. dalmatina* in the Steppic European Biogeographical Region represents 4.86% of the Romanian range of the species.

Table 1. Number of plots of 100 km² (of ETRS LAEA 5210 grid) with *R. dalmatina* records in various European Biogeographical Regions from RomaniaTabel 1. Numărul de careuri de 100 km² (din ETRS LAEA 5210 grid) cu înregistrările de *Rana dalmatina* în diverse regiuni biogeografice europene din România

No.	Plots of ETRS LAEA grid overlapping with	No. of plots
1.	Steppic EBR	27
2.	Steppic EBR and Black Sea EBR	1
3.	Steppic EBR and Bulgaria	5
4.	Steppic EBR and Continental EBR	6
5.	Steppic EBR and Republic of Moldova	1
6.	Steppic EBR, Continental EBR and Republic of Moldova	1
7.	Alpine EBR	58
8.	Alpine EBR and Continental EBR	158
9.	Alpine EBR, Continental EBR and Ukraine	8
10.	Continental EBR	391
11.	Continental EBR	391
12.	Continental EBR and Bulgaria	2
13.	Continental EBR and Hungary	2
14.	Continental EBR and Pannonian EBR	53
15.	Continental EBR and Republic of Moldova	3
16.	Continental EBR and Ukraine	2
17.	Continental EBR and Yugoslavia	20
18.	Continental EBR, Pannonian EBR and Hungary	1
19.	Pannonian EBR	37
20.	Pannonian EBR and Hungary	14
21.	Pannonian EBR and Yugoslavia	2
22.	Pannonian EBR, Hungary and Yugoslavia	1

Note. EBR – European Biogeographical Region.

Table 2. Surfaces of distribution area and range of *Rana dalmatina* in the European Biogeographical Regions from Romania and in Tulcea CountyTabel 2. Suprafețele ariei de răspândire a *Rana dalmatina* în regiunile biogeografice europene din România și județul Tulcea

No.	Region	Distribution area (km ²)	Range (km ²)
1.	Alpine EBR	13,735.71	38,328.79
2.	Continental EBR	53,128.89	111,963.35
3.	Pannonian EBR	7,616.88	12,490.49
4.	Steppic EBR	3,336.74	8,320.46
5.	Tulcea county	1,598.82	2,338.00

Note. EBR – European Biogeographical Region

With the same soft there were calculated the surfaces of distribution area and of range of *R. dalmatina* from the Tulcea County (row 5 in Table 2). The results show that the distribution area of *R. dalmatina* in Tulcea County represents 2.5% of the national distribution area of the species and 47.92% of the species distribution area in the Steppic European Biogeographical Region. Concerning the range, the results show that the range of *R. dalmatina* in Tulcea County represents 1.37% of the Romanian range of the species and 28.1% of the species range in the Steppic European Biogeographical Region.

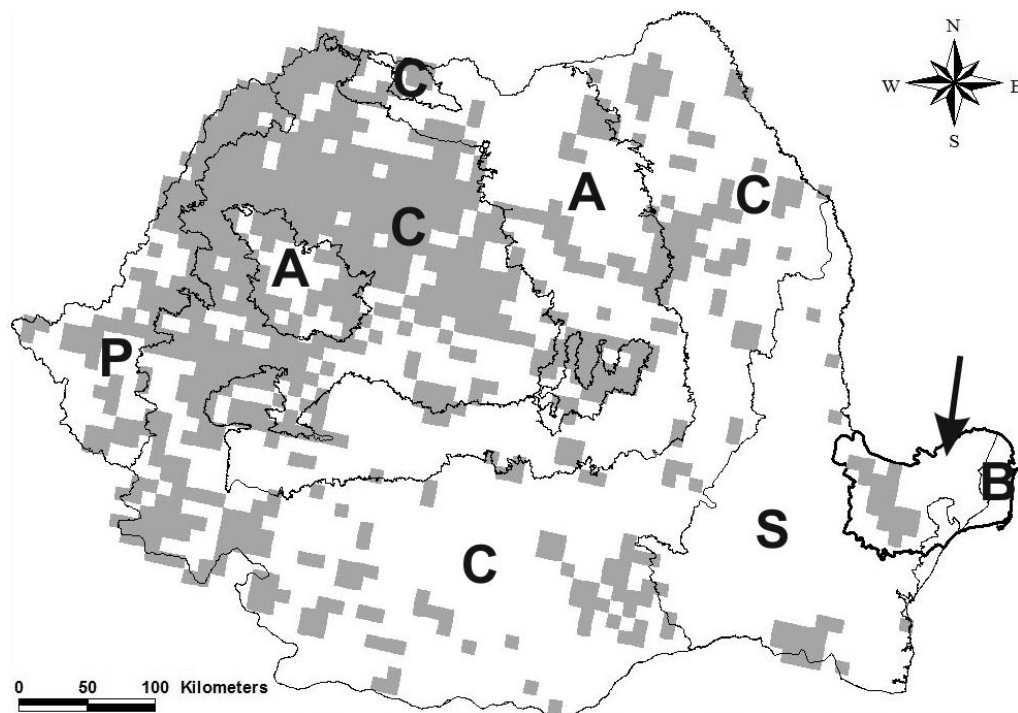


Fig. 2. Distribution area of the Agile Frog (*Rana dalmatina*) in Romania
Fig. 2. Aria de distribuție a broaștei roșii de pădure (*Rana dalmatina*) în România

Note: grey surfaces – parts of the distribution area of *Rana dalmatina*, resulted by merging the distribution of plots of 10 km x 10 km (ETRS LAEA 5210 grid) that overlap with record-sites of *R. dalmatina* populations; **A** – Alpine European Biogeographical Region; **B** – Black Sea (Pontic) European Biogeographical Region; **C** – Continental European Biogeographical Region; **P** – Pannonian European Biogeographical Region; **S** – Steppic European Biogeographical Region; **thin line** – limit of the European Biogeographical Regions; **thick line** – limit of Tulcea County; **arrow** indicates Tulcea County

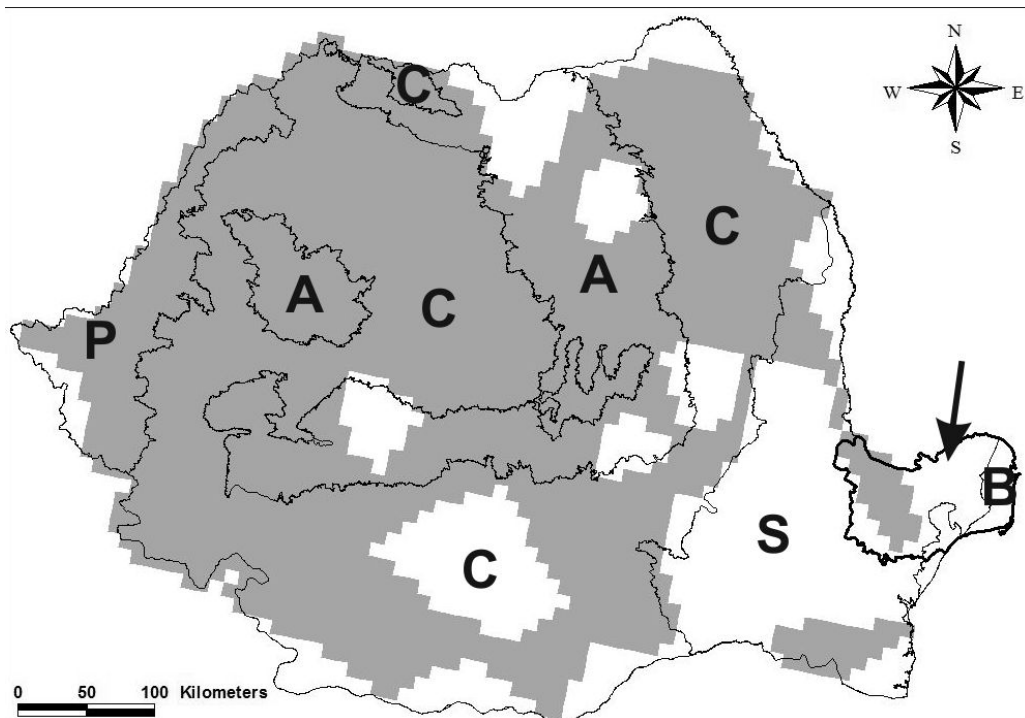


Fig. 3. Range of the Agile Frog (*Rana dalmatina*) in Romania
 Fig.3. Arealul broaștei roșii de pădure (*Rana dalmatina*) în România

Note: **grey surfaces** – parts of the range of *Rana dalmatina* in Romania, resulted after processing, with Article 17 Reporting Tool (version 1.9), the polygons representing the record-sites of *R. dalmatina* populations; **A** – Alpine European Biogeographical Region; **B** – Black Sea (Pontic) European Biogeographical Region; **C** – Continental European Biogeographical Region; **P** – Pannonian European Biogeographical Region; **S** – Steppic European Biogeographical Region; **thin line** – limit of the European Biogeographical Regions; **thick line** – limit of Tulcea County; **arrow** indicates Tulcea County

During the study period, *R. dalmatina* was recorded in 14 sites (Table 3). None of the record sites was inside the primary target plots (indicated with X in Fig. 4) selected in the frame of the nation-wide monitoring program. Out of the 14 record-sites, two areas were outside of the distribution area calculated for the national report from 2013: site 3 (from Capaclia area, located in plot coded as 10kmE575N263 in the ETRS LAEA 5210 grid) and site 4 (from Isaccea-Revărsarea area, located in plot coded as 10kmE575N264 in the ETRS LAEA 5210 grid) (Fig. 4 and Table 3). Due to these two new record-sites the area of distribution of *R. dalmatina* in Tulcea County increased with 119.85 km². Consequently, the total surface of the area of distribution of *R. dalmatina* in

Tulcea County increased to 1,718.67 km² (with 7.5% bigger than the area of distribution reported in 2013 to the European Commission). Furthermore, due to these two new record-sites, the total surface of the area of distribution of *R. dalmatina* in the Steppic European Biogeographical Region increased to 3,456.59 km² (with 3.59% bigger than the area of distribution reported in 2013 to the European Commission).

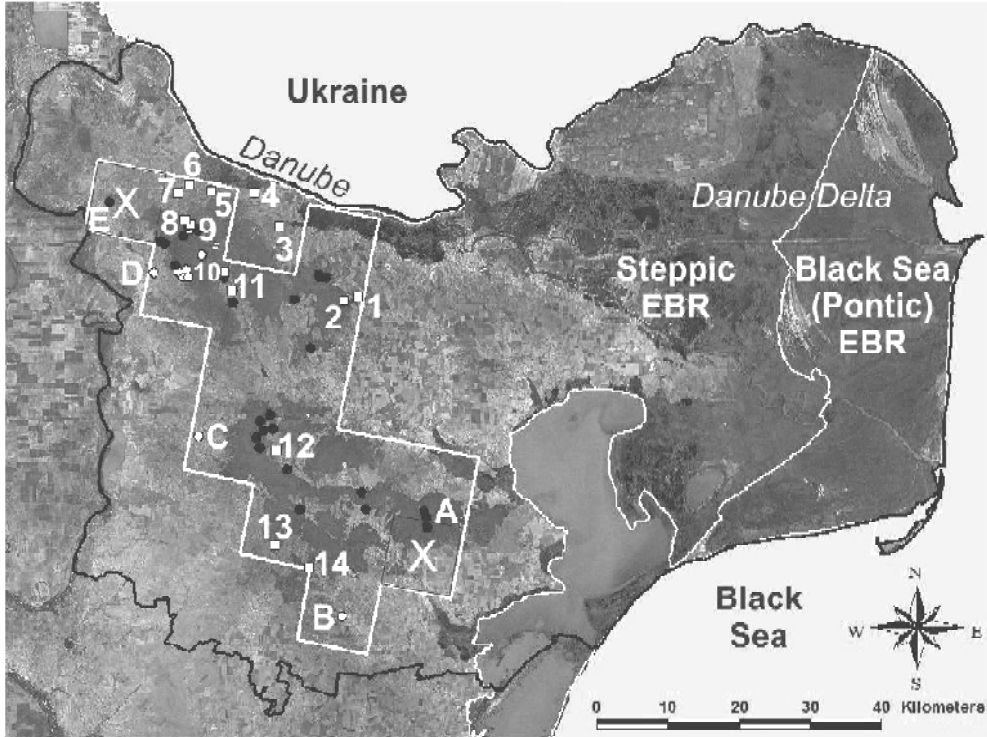


Fig. 4. Distribution area of the Agile Frog (*Rana dalmatina*) in Tulcea County
Fig. 4. Aria de distribuție a broaștei roșii de pădure (*Rana dalmatina*) în județul Tulcea

Note: **black dots** – record-sites mentioned in various works published before 2013; **white dots** – sites where the author recorded the species before 2013; **white squares** – sites where *R. dalmatina* was recorded by the author in the study period; **thin white lines** – limits of the European Biogeographical Regions; **thick white line** – limit (in Tulcea County) of the distribution area of *R. dalmatina*, indicated in the national report of Romania, submitted in 2013 to the European Commission; numbers indicate the record-sites listed in Table 3; **A** – Babadag Forest; **B** – Beidaud area; **C** – Dorobanțu area; **D** – Greci area; **E** – Măcin area; **EBR** – European Biogeographical Region, **X** – squares of 10km x 10km (delimited by the thin black line), in ETRS LAEA 5210 grid, selected as primary target plots where periodical assessment of the presence and status of native, Romanian amphibians and reptiles of Community Interest.

Table 3. Location and short characterization of sites from Tulcea County where *R. dalmatina* specimens/populations were recorded in 2013 – 2014 period

No in Fig. 4	Name of area with the record site	Type of habitats where <i>Rana dalmatina</i> was recorded
1.	Telita – Posta area	temporary pond along the county road
2.	Celic river valley	pond at the edge of the compact forest
3.	Capaclia area	temporary ponds in agricultural fields
4.	Isaccea – Revărsarea area	temporary pond along a permanent rivulet
5.	Revarsarea – Rachelu area	ponds along a permanent rivulet
6.	Bozului Valley	ponds along a permanent rivulet
7.	Luncavita area	man-made, permanent lake
8.	Cetatuia area (northern lake)	man-made, permanent, shallow lake
9.	Cetatuia area (southern lake)	man-made, permanent, deep lake
10.	Curaturi and Taita rivers	temporary and permanent ponds along rivers
11.	Nifon area	ponds in agricultural fields
12.	Atmagea area	man-made pond (filled with water only during springtime)
13.	Cerbu area	temporary, small ponds nearby the edge of the forest
14.	Vasile Alecsandri area	temporary, large pond in a pasture

According to the available data, the Agile Frog (*R. dalmatina*) is distributed in Tulcea County in an area delimited by the following elements:

- **Northern limit** is represented practically by the Northern border of the North-Dobrogean mainland (continental plateau) along the Danube river valley, where the species was recorded:

- at Capaclia area (site 3 in Fig. 4) on 12th March, 26th March and 3rd April 2014;
- between Isaccea and Revărsarea localities (site 4 in Fig. 4) on 7th March 2013;
- between Revărsarea and Rachelu localities (site 5 in Fig. 4) on 7th March and 23rd July 2013, respectively on 19th March, 26th March, 8th October and 15th October 2014;
- at Bozului Valley (site 6 in Fig. 4) on 12th March 2014;
- at the man-made lake located at the Southern limit of Luncavița locality (site 7 in Fig. 4) on 7th March 2013.

- **North-Eastern limit** is represented by the limit of the compact forests, between Telița and Poșta localities (site 1 in Fig. 4), where the species was

recorded on 7th March 2013 and on 19th February, 12th March, 19th March, 26th March, 3rd April, 16th April and 23rd July 2014;

- **South-Eastern limit** is represented by the compact forest located southward of Babadag town (COVACIU-MARCOV *et alii*, 2006) (site A in Fig. 4);

- **Southern limit** is along the Southern border of the forested area, where the species was recorded:

- at Cerbu village (site 13 in Fig. 4) on 11th June and 6th July 2014;
- at Vasile Alecsandri village (site 14 in Fig. 4) on 26th March 2014;
- nearby Beidaud locality, at Carabalâc valley (site B in Fig. 4), on 25th March 2009 (personal observation).

- **Western limit** is along the Western border of the forested area (of the Babadag Plateau, respectively of the Măcin Mountains), where the species was recorded:

- nearby Dorobanțu locality, at Vărărie area (site C in Fig. 4) in early autumn of 2005 (personal observation);
- at the Southern limit of Greci locality (site D in Fig. 4) in summer of 2005 (personal observation).

- **North-Western limit** is represented by the neighbourhood of Măcin town (COVACIU-MARCOV *et alii*, 2006) (site E in Fig. 4).

In the inner parts of the distribution area we recorded *R. dalmatina* in most of the cases in sites where the species was reported before:

- in the valley of Celic river (westward of Celic-Dere monastery) on 12th February and 26th March 2014;

- at Cetățuia area (sites 8 and 9 in Fig. 4) on 7th March and 13th March 2013, 12th March, 19th March, 26th March, 4th April, 23rd April, 28th May, 18th June and 30th July 2014. The species was previously reported from this area by COVACIU-MARCOV *et alii*, 2006;

- in the valleys of Curățuri and Taița rivers (site 10 in Fig. 4) on 13th March 2013. The species was previously reported from this area by POPESCU, 1977;

- at Nifon village, southward of the locality (site 11 in Fig. 4) on 13th March 2013. The species was previously reported from this area by COVACIU-MARCOV *et alii* (2006) and by POPESCU (1977);

- at Atmagea village, southward of the locality (site 12 in Fig. 4) on 3rd April 2014. The species was previously reported from this area by POPESCU (1977).

Conclusions

In 7th March 2013-29th October 2014 period *Rana dalmatina* was recorded in 14 sites, out of which in nine sites the species was reported for the first time. None of the record sites was inside the primary target plots selected in the frame of the nation-wide monitoring program developed in 2012-2015 period. Two of the record sites that were outside of the distribution area

calculated for the national report from 2013 increased the area of distribution of *R. dalmatina* in Tulcea County to 1,718.67 km² (with 7.5% bigger than the area of distribution included into the national report submitted by Romanian authorities in 2013 to the European Commission) and, consequently the total surface of the area of distribution of *R. dalmatina* in the Steppic European Biogeographical Region increased to 3,456.59 km² (with 3.59% bigger than the area of distribution included into the national report submitted by Romanian authorities in 2013 to the European Commission)

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