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Union of Scientists in Bulgaria – Plovdiv
6 Metropolit Paisii Str., 4000 Plovdiv, BULGARIA
E-mail: ecologia_balkanica@abv.bg

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Cover photo: The mouth of Veleka River, Sinemorets, Strndzha Mts., photo: Ivelin Mollov.

BSB ECO MONITORING
Joint Monitoring for Environmental Protection in BSB countries
Project Number: BSB-884

Project "Joint Monitoring for Environmental Protection in BSB countries" is aimed at solving common problems of nature parks and protected areas in the Black Sea Basin (BSB). The overall project objective is to contribute to increasing the level of availability of cross-border compatible environmental monitoring data and information in nature parks and protected areas in BSB. The major project outcome will be the creation of an intelligent platform for the collection, processing and analysis of environmental data via Web-based cloud service for automatic data collection from wireless sensor networks and Web-based cloud service for video content. An Online Monitoring System (OMS) for environmental data in BSB will integrate the measurement data and will serve as a platform for the dissemination of the collected information and data. The developed smart technologies and intelligent wireless sensor networks will also be used for conducting a monitoring of the condition of natural habitats and the availability of invasive species, and for distance observation of territories which are most dependent on climate change and anthropogenic influences.

A cross-border team of researchers will develop a common methodology for monitoring the condition of natural habitats and the availability of invasive species and conduct the monitoring. The methodology will guarantee the collection of compatible data and topical information about the location and size of damaged areas, the types of pressure and the evaluation of potential sources and forms of threat. For each nature park or protected area, permanent sampling control sites will be designated in which experts and volunteers will perform annual field observations. Based on the collected monitoring information a report will be developed based on the assessed existing and potential sources and forms of pressure on key areas within protected territories of the Black Sea Basin and a List of proposed measures to be undertaken towards pollution preservation and restoration of the monitored key areas.

More information available at: https://bsbecomonitoring.net/ and https://aktorpus.eu.

Prof. Nevena Mileva, PhD
Project supervisor

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Macrophytes in the Veleka River, Bulgaria: Species Diversity and Assessment of the Ecological Status

Gana M. Gecheva[*], *Emil S. Yordanov, Silviya Y. Stankova*

University of Plovdiv "Paisii Hilendarski", Faculty of Biology, Department of Ecology and Environmental Conservation, 2 Todor Samodumov Str., 4000 Plovdiv, BULGARIA
[*]Corresponding author: ggecheva@uni-plovdiv.bg

Abstract. Thirty-seven aquatic macrophyte species from three taxonomic groups (pteridophytes, bryophytes, spermatophytes) were registered at four sites along Veleka River in the period 2009-2020. Hydrophytes and bryophytes dominated macrophyte assemblages. Macrophyte-based assessment resulted in good and high ecological status. Based on the results it was suggested the lower Veleka River to be regularly studied in order to maintain its good ecological status and to monitor the highly invasive *Elodea canadensis* and *Elodea nuttallii*.

Key words: aquatic macrophytes, invasive macrophytes, ecological status.

Introduction

Veleka River is the largest and the longest river in Strandzha Mountain, Southeastern part of Bulgaria. It springs into Turkish territory through many karst springs;, runs through primary forest ecosystems within the natural park Strandzha and flows into the Black Sea, near the village of Sinemorets. Its watershed covers an area of 1054.6 km^2 of which 788 km^2 on the territory of Bulgaria (Lizama-Rivas & Koleva-Lizama, 2017).

A strong reduction in river flow during 1991-2007 was reported with 44% decline in mean annual volumes (Lizama-Rivas & Koleva-Lizama, 2017). In addition, in the area of Veleka River the forecast for change in the flow is the spring flow to decrease to 30%, summer to 35% (Environmental Assessment Report of the draft Cross-Border Cooperation Programme 2021-2027, 2021).

Biological literature data for Veleka River canyon are scarce. Algae cenoses were studied in 2010–2012 (Velichkova & Kiryakov, 2014), as well as the two native freshwater turtles (*Emys orbicularis* and *Mauremys rivulata*) were studied in 2010–2014 (Popgeorgiev et al., 2017) and again in 2021 (Mollov et al., 2021).

Macrophytes – the major primary producers in rivers, food and refuge for macroinvertebrates and fish, are one of the biological elements for assessing the ecological status. There were no published data for macrophyte communities along Veleka River in Bulgaria and the current study aimed to contribute to the knowledge of aquatic flora in the river.

Material and Methods

The data was collected during the period 2009 to 2020 years and covered 3

different river types (R4, R10 and R16) and 4 sites (Fig.1). Aquatic macrophytes were studied along a 100 m sections and records were made at species level. The nomenclature followed Hill et al. (2006) for mosses and Euro + Med (Euro+Med PlantBase, 2022) for vascular plants. The abundance was registered using a five-level scale (Kohler, 1978): 1 = very rare, 2 = infrequent, 3 = common, 4 = frequent, 5 = abundant, predominant.

The database contained also abiotic data featuring site characteristics (altitude, channel width and level, flow velocity, etc.) and some basic physio-chemical characteristics (pH, temperature, electrical conductivity). Abiotic parameters flow velocity, shading, mean water level were determined in a semi-quantitative way as described in Gecheva et al. (2021).

Reference Index (RI) and ecological quality ratio (EQR) were calculated after Gecheva et al. (2013).

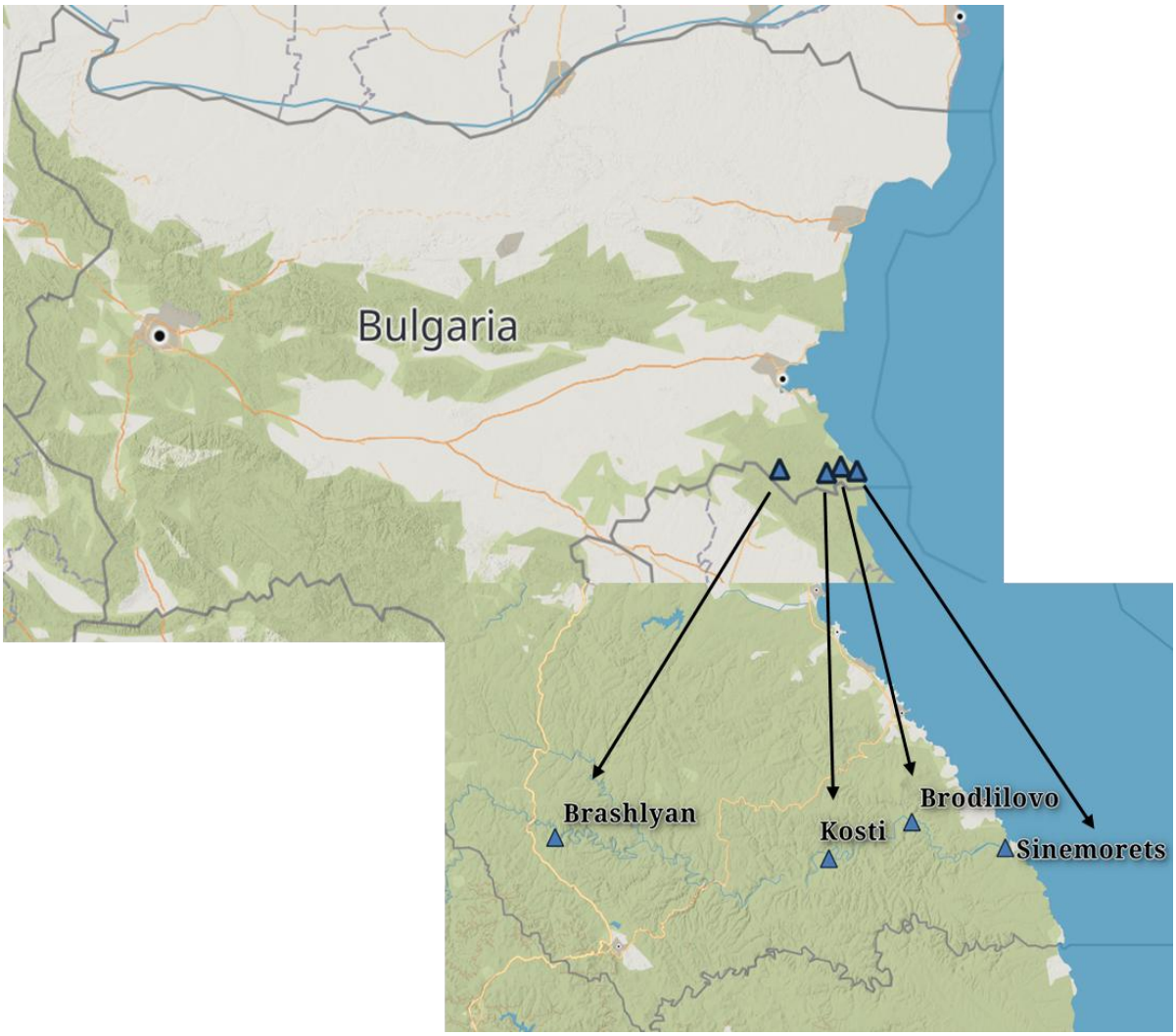

Fig. 1. Location of the studied sites.

Results and Discussion

Studied sites along the upper Veleka River were slightly alkaline and with moderate conductivity, while river water at the mouth was influenced by the Black Sea (Table 1).

Thirty-seven species from 3 taxonomic groups (bryophytes, pteridophytes, spermatophytes) were recorded (Table 2). Almost 40% of taxa were hydrophytes. Helophytes (n=15) were the second largest group. Only 3 aquatic moss species were registered but they were common for all river sites of the upper and middle Veleka River. *Platyhypnidium riparioides*, indicator of undisturbed habitats, dominated communities at sites close to Brashlyan and Kosti villages. *Myriophyllum spicatum* was the most common species along the river.

Species richness varied between 5 and 14 taxa. Sites with highest richness were those close to Brodilovo and Sinemorets villages. The macrophyte assemblage at the last site in 2020, was dominated by hornwort, naiads and waterweeds, and includes also endangered yellow waterlily and pondweeds. Two invasive aquatic macrophyte species *Elodea nuttallii* and *Elodea canadensis* were recorded during the last sampling campaign at the site. Both species tolerate disturbances, brackish water and salinity (Josefsson, 2011). Among the *Elodea* species negative effects are rapid development of dense monospecific stands, decreased light penetration and water movement. Thus, in the next years it should be monitored whether they will occur upstream and if they replace natural aquatic macrophytes.

The macrophyte-based ecological status was in the range from good to high for the studied 4 sites during the years 2009 to 2020 (Table 1). The assessed good status at the semi-mountain river site in 2009 can be linked to the slight deterioration of the water, particularly of nitrate nitrogen (Environmental Assessment Report of the draft Cross-Border Cooperation Programme 2021-2027, 2021). As pointed out above, the lower Veleka River has to be regularly studied in order to maintain its good ecological status and to monitor the highly invasive taxa development.

Table 1. List of the studied sites, coordinates, altitude, abiotic and physio-chemical parameters. Legend: R4 – semi-mountain rivers in Ecoregion 12 Pontic province; R10 – large Black Sea rivers; R16 – Balck Sea river firths in Ecoregion 12 Pontic province.

Site	**Brashlyan village**	**before Kosti village**	**Brodlilovo village**	**Sinemorets village**
National type	R4	R10	R10	R16
Latitude	42.068957	42.051667	42.0815	42.0605
Longitude	27.452058	27.765	27.85983333	27.96669
Altitude (m a.s.l.)	240	27	14	4
Mean width (m)	6	6	6	50
Velocity	rapidly running	slowly running	slowly running	barely visible
Shading	sunny	completely shaded	sunny	sunny
Water level	medium	low	low	low
pH	8.7	7.9	8.2	9.1
T (°C)	16.4	16.3	19.6	25.1
C (µS cm^{-1})	298	468	401	838
Macrophyte-based status	good	high	high	good

Table 2. List of the registered aquatic macrophte species and groups with regard the link to the water after Birk et al. (2007). Legend: BRm - mosses; PHe - helophytes ; PHg - hygrophytes; PHy - hydrophytes; PTE - pteridophytes.

Species	Group
Bidens tripartita L.	PHe
Bryum pallens Sw. ex anon.	BRm
Carex acuta L.	PHe
Ceratophyllum demersum L.	PHy
Cyperus fuscus L.	PHe
Cyperus longus L.	PHg
Elodea canadensis Michx.	PHy
Elodea nuttallii (Planch.) H.St.John	PHy
Equisetum arvense L.	PTE
Equisetum telmateia Ehrh.	PTE
Groenlandia densa (L.) Fourr.	PHy
Juncus effusus L.	PHe
Lemna minor L.	PHy
Leptodictyum riparium (Hedw.) Warnst.	BRm
Lycopus europaeus L.	PHe
Lythrum salicaria L.	PHe
Mentha aquatica L.	PHe
Myriophyllum spicatum L.	PHy
Najas marina L.	PHy
Najas minor All.	PHy
Nuphar lutea Sm.	PHy
Iris pseudacorus L.	PHe
Paspalum paspalodes (Michx.) Scribn.	PHg
Phragmites australis (Cav.) Trin. ex Steud.	PHe
Platyhypnidium riparioides (Hedw.) Dixon	BRm
Polygonum hydropiper L.	PHe
Polygonum lapathifolium L.	PHe
Polygonum mite Schrank	PHe
Potamogeton crispus L.	PHy
Potamogeton natans L.	PHy
Potamogeton nodosus Poir.	PHy
Potamogeton perfoliatus L.	PHy
Potamogeton polygonifolius Pourr.	PHy
Ranunculus repens L.	PHg
Sparganium erectum L.	PHe
Typha angustifolia L.	PHe
Typha latifolia L.	PHe

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Monitoring of Vascular Plant Species from the Southeastern Part of Strandzha Nature Park, Bulgaria

***Plamen S. Stoyanov*[1,2], *Rumen D. Mladenov*[1,2], *Nevena S. Mileva*[3], *Krasimir T. Todorov*[1*]**

[1]University of Plovdiv "Paisii Hilendarski", Faculty of Biology, Department of Botany andBiological Education, 24 Tzar Assen Str., Plovdiv 4000, BULGARIA
[2]Medical University of Plovdiv, Faculty of Pharmacy, Department of Bioorganic Chemistry,120 Bratya Bukston Blvd., Plovdiv 4000, BULGARIA
[3]University of Plovdiv "Paisii Hilendarski", Faculty of Physics and Technology, Department of Electronics, Communications and Information Technology, 24 Tzar Assen Str., Plovdiv 4000, BULGARIA
[*]Corresponding author: ktodorov@uni-plovdiv.bg

Abstract. The study presents data on some invasive and conservation-significant species in two protected areas of the Strandzha Nature Park – Protected Area "Marina Reka" and Protected Area "Silistar". There were monitored the protected species *Pancratium maritimum*, *Calluna vulgaris*, *Daphne pontica*, *Ilex colchica*, *Rhododendron ponticum*, *Mespilus germanica,* and *Taxus baccata*, as well as an invasive species – *Amorpha fruticosa*, whose population borders that of *Pancratium maritimum*. The projective coverage of species in the sample areas and the total projective coverage of the vegetation have been studied also measures for their protection have been indicated.

Key words: invasive and protected plants**,** Protected Area "Marina Reka", Protected Area "Silistar", Strandzha Nature Park.

Introduction

Strandzha Nature Park is one of the largest protected areas in Bulgaria. It is located in the southeastern part of the country and borders the Republic of Turkey. It was declared a national park by Order NoRD-30 from 24 January 1995, State Gazette number 15/1995. The goal is long-term conservation of the unique nature of Veleka River and Rezovska River watersheds and ensuring sustainable socio-economic development in the region (Zahariev, 2014).

The category of the park is changed in the natural park by Order NoRD-350 from 14 July 2000, State Gazette number 66/2000. In the park areas present their own status of nature conservation: 5 reserves, 19 protected areas and 7 landmarks. After twice reducing the area of the park in 2001 and 2013, its total area is 116054.21 ha.

The flora of the Nature Park is distinguished by its large number of species, which were widespread during the Tertiary (Tertiary relics) – 63 species. Among them, *Rhododendron ponticum*, *Daphne pontica,* and less often *Vaccinium arctostaphylos* are major participants and formers of plant communities

and the rest are among the species of greatest conservation importance, such as *Ilex colchica* and others (Zahariev, 2016).

The aim of the present research work is a pilot study on the status of some plant species of conservation importance in the two protected areas within the Strandzha Nature Park – "Marina Reka" and "Silistar", as well as to identify possible threats to their conservation that would serve as a basis for further monitoring studies.

Material and Methods

The subject of the study were the species *Amorpha fruticosa* Linnaeus, *Pancratium maritimum* Linnaeus, *Calluna vulgaris* (Linnaeus) Hull, *Daphne pontica* Linnaeus, *Ilex colchica* Pojark., *Rhododendron ponticum* Linnaeus, *Mespilus germanica* Linnaeus, and *Taxus baccata* Linnaeus; from the two protected localities: Silistar Protected Area, next to the road to the village of Sinemorets (*Amorpha fruticosa* and *Pancratium maritimum*) and Marina River Protected Area, on the road to the town of Malko Tarnovo, near the village of Bulgari (*Calluna vulgaris*, *Daphne pontica*, *Ilex colchica*, *Rhododendron ponticum*, *Mespilus germanica*, and *Taxus baccata*) (Fig. 1).

Fig. 1. Map of the study area in Strandzha Nature Park, SE Bulgaria.

The monitoring of higher plants followed the National biodiversity monitoring system, Environmental Executive Agency, Ministry of Environment and Water, Bulgaria (Gusev & Bancheva, 2016). The following parameters were be defined for each population: Location and floristic region; Sampling plot of the local population; GPS coordinates of the sampling plot of the local population with portable GPS receiver GARMIN 530; Different number of sampling sites will be defined depend on the size of the local population. Sampling sites will be approximately 20x20 m. When the total area of the studied habitat is small, then the size of the sampling sites will be smaller; In order to study the major part of the population and to receive reliable data, the sampling sites will be marked uniformly, at about 20 m intervals; Population density will be estimated as a number of individuals per m^2.

Inventory of the plants was carried out in 2021. The collected materials were

identified at the Department of Botany and Biological education of Plovdiv University "Paisii Hilendarski" using a stereo magnifying glass and identification keys. Nomenclature was according to Delipavlov & Cheshmedjiev (2011).

Results and Discussion

Eight plant species in the area of Strandzha Nature Park were studied. Table 1 presents data on the geographical coordinates of the localities in which the plant species studied were found.

Amorpha fruticosa is an invasive species; *Pancratium maritimum*, *Calluna vulgaris*, *Daphne pontica*, *Ilex colchica*, *Rhododendron ponticum*, *Mespilus germanica* and *Taxus baccata* are species with conservation status (Table 2). Here is a brief description of each of the species.

Table 1. List of studied taxa and localities of their establishment.

Species	Locality (latitude/longitude and altitude)	Floristic region and year ofsampling
Amorpha fruticosa L.	N 42º01`26.4``; E 028º00`35.1``/ 12 m	Black Sea coast (Southern), 2021
Calluna vulgaris L.	N 42º07`00.9``; E 027º45`57.5``/ 246 m	Strandzha, 2021
Daphne pontica L.	N 42º07`05.8``; E 027º45`59.5``/ 235 m	Strandzha, 2021
Ilex colchica Pojark.	N 42º06`43.4``; E 027º45`51.9``/ 180 m	Strandzha, 2021
Mespilus germanica L.	N 42º07`05.8``; E 027º45`59.5``/ 235 m	Strandzha, 2021
Pancratium maritimum L.	N 42º01`24.6``; E 028º00`36.9``/ 3 m N 42º01`22.0``; E 028º00`37.4``/ 3 m	Black Sea coast (Southern), 2021
Rhododendron ponticum L.	N 42º07`00.4``; E 027º45`57.5``/ 240 m N 42º06`50.9``; E 027º45`57.5``/ 240 m N 42º06`45.9``; E 027º51`23.1``/ 240 m N 42º06`45.9``; E 027º45`53.0``/ 240 m	Strandzha, 2021
Taxus baccata L.	N 42º06`43.4``; E 027º45`51.9``/ 185 m	Strandzha, 2021

Table 2. List of studied taxa and their conservation status. *Legend:* BDA (Biological Diversity Act), EN (Endangered), IUCN (IUCN Red List of Threatened Plants), VU (Vulnerable), RLBVP (Red List of Bulgarian vascular plants), LC (Least Concern), RB (Red Book of the Republic of Bulgaria), MPA (Medicinal Plants Act).

Species	Criteria for selection
Amorpha fruticosa	Invasive
Calluna vulgaris	BDA; RLBVP [VU]
Daphne pontica	BDA; RLBVP [EN]; RB [EN]
Ilex colchica	BDA; RLBVP [EN]; RB [EN]
Mespilus germanica	IUCN [LC]; RLBVP [LC]
Pancratium maritimum	BDA; RLBVP [EN]; RB [EN]
Rhododendron ponticum	BDA; RLBVP [VU]
Taxus baccata	BDA; IUCN [LC]; RLBVP [EN]; RB [EN]; MPA

***Amorpha fruticosa* L. (Fabaceae)** (Fig. 2)

Global distribution: The origin is from southeastern parts of North America (Petrova et al., 2013). It is naturalized in Europe and temperate parts of Asia. In Europe it was brought for the first time as an ornamental plant in England in 1724.

Distribution in Bulgaria: It is found throughout the country, from sea level to 1200 (1500) m asl. It was introduced in

culture in the early 19th century decorative and anti-erosion purposes. The first evidence of spontaneous distribution in natural habitats in the country was since 1898 (Petrova et al., 2013).

Morphology: Shrub up to 6m. Leaflets 5-12 pairs, 15-40 x 8-20 mm, ovate or elliptical, pubescent or subglabrous, glandular-punctate. Inflorescence 7-15 cm. Standart c. 6 mm, blue or purplish. Legume 7-9 mm, glandular-punctate (Tutin et al., 1980).

Population analysis: A population in an area of 500 m^2 was reported. The projective vegetation cover in the sample area is 95%, of which 90% are represented by the studied species, and 5% consist of the species *Cyonura erecta*, *Periploca graeca*, *Silene euxina*, *Melilotus alba*, *Salix* sp., *Fraxinus* sp. The invasive nature of the species requires control of the area of its population because it is located near the sandy strip along which *Pancratium maritimum* grows.

***Pancratium maritimum* L. (Amaryllidaceae)** (Fig. 3)

Global distribution: Mediterranean region, Black Sea coast of Bulgaria, Turkey, Western Caucasus.

Distribution in Bulgaria: Southern Black Sea coast.

Morphology: Bulb very large, deeply sunk, tapered to a long neck. Leaves up to 50 cm x 20 mm, lorate, glaucous, appearing before anthesis. Scape stout compressed. Spathe 4-7 cm. Pedicels 5-10 mm, shorter than ovary. Hypanthial tube 60-80 mm, very slender. Perianth-segments 30-50 mm, linear-lanceolate, erecto-patent to patent. Corona c. 2/3 as long as perianth-segments; margin with 12 triangular teeth. Free part of filament about equaling anther. Flowering in mid-summer (Tutin et al., 1980).

Population analysis: A population in an area of 200 m^2 was reported, including four sites of reporting - A, B, C, and D (Fig. 4). The projective vegetation cover in the sample area is 20%, of which 10% are represented by the studied species, while 10% comprise the species *Anchusa leptophylla*, *Elymus* sp., *Silene euxina*, *Eryngium maritimum*, *Galilea mucronata*, *Medicago marina*, *Periploca graeca*. Threats: the locality is close to a camping site and a beach strip; the presence of competing plant species: *Silene euxina*, *Eryngium maritimum*, *Medicago marina*, *Periploca graeca*.

Fig. 2. General view of *Amorpha fruticosa*.

Fig. 3. General view of *Pancratium maritimum*.

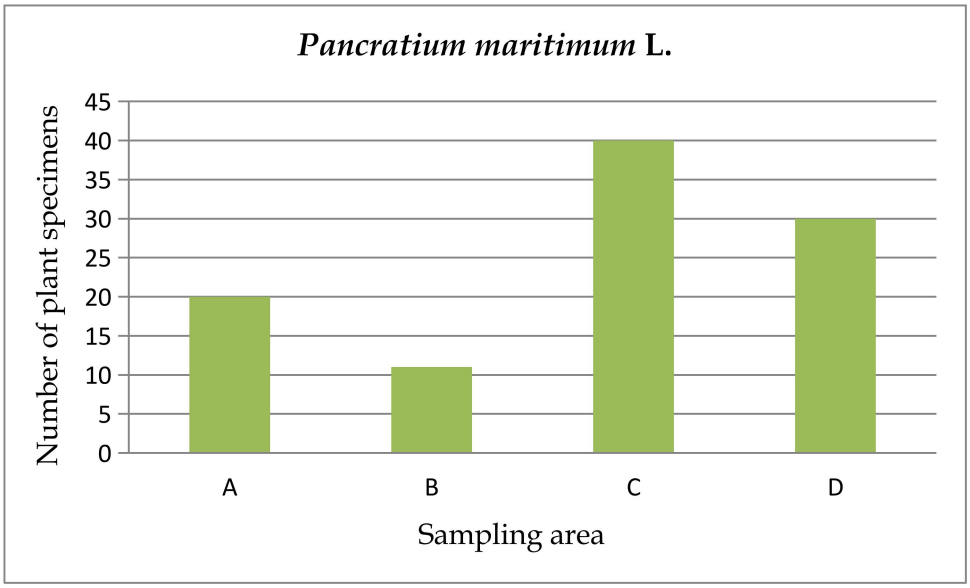

Fig. 4. Number of plant specimens in the sample areas.

***Calluna vulgaris* (L.) Hull (Ericaceae)** (Fig. 5)

Global distribution: Mainly in Europe.

Distribution in Bulgaria: Strandzha Mountain.

Morphology: Subglabrous to densely grey-pubescent. Stems 15-80(-150) cm, erect, freely branched. Leaves 2,5-3,5 mm (including auricles), closely appressed, widely spaced on leading shoots but densely imbricate on lateral, non-flowering branches, oblong-lanceolate, concave on adaxial, keeled on abaxial surface, amplexicaul, with proximally directed auricles. Flowers shortly pedicellate, in narrow racemes which are sometimes grouped into panicles; bracteoles usually 6-8, crowded together beneath the flower, the upper 4 simulating sepals. Sepals 3-4 mm, oblong, pinkish-lilac; corolla lobed nearly to the base, its lobes like the sepals but smaller; anthers included (Tutin et al., 1972).

Population analysis: A population in an area of 10 m^2 was reported. The projective cover of the vegetation in the sample area is 90%; only single specimens of the species (5 semi-shrubs) have been registered. The tree species *Quercus polycarpa*, *Fagus orientalis*, and *Sorbus aucuparia* predominate. Threats: growing species of the genus *Quercus polycarpa*, near a hiking trail.

***Daphne pontica* L. (Thymelaeaceae)** (Fig. 6)

Global distribution: Eastern Europe (Bulgaria, Turkey), Southwest Asia (along the Black Sea coast), Caucasus.

Distribution in Bulgaria: Strandzha Mountain; from 50 to 700 m asl. (Black Sea coast).

Morphology: Evergreen shrub with suberect branches; 50-100 cm or more, erect; leaves obovate, 2-2,5 times as long as wide; flowers in pairs on a common peduncle, arising from the axils of reduced, bract-like leaves at the base of the current year's growth; hypanthium 8-10 mm, slender; sepals pale yellow, almost as long as the hypanthium (Tutin et al., 1968).

Population analysis: A population of 10 m^2 was reported. The projective vegetation cover in the sample area is 50%, of which 40% are represented by the studied species, and 10% consist of the species *Quercus polycarpa*, *Fagus orientalis*, *Sorbus aucuparia*, *Crataegus monogina*, *Rubus* sp., *Pteridium aquilinum*, *Pyracantha coccinea*. Threats: near a hiking trail.

Fig. 5. General view of *Calluna vulgaris*.

Fig. 6. General view of *Daphne pontica*.

***Mespilus germanica* L. (Rosaceae)** (Fig. 7)

Global distribution: It is found across Southern Europe where it is generally rare

Distribution in Bulgaria: Strandzha Mountain.

Morphology: Shrub to small tree up to 6 m. Leaves 5-12 cm, lanceolate or oblanceolate to obovate, pubescent, but sometimes glabrous above, entire or serrulate towards the apex. Flowers 3-4 cm in diameter. Sepals 10-16 mm, linear-triangular. Petals white. Fruit 2-3 cm, brown, pyriform to depressed-globose. Cultivated for the fruit, which after incipient decay becomes soft and edible (Tutin et al., 1968).

Population analysis: A population of 10 m^2 was reported. The projective cover of the vegetation in the sample area is 90%; a single specimen of the species is registered. The area is represented by *Quercus polycarpa*. Threats: near a hiking trail, mass development of *Quercus polycarpa*.

***Rhododendron ponticum* L. (Ericaceae)** (Fig. 8)

Global distribution: Bulgaria, Georgia, Spain, Portugal, Lebanon

Distribution in Bulgaria: Strandzha Mts.

Morphology: Erect, evergreen shrub 2-5(-8) m, with spreading branches. Leaves 8-25 cm, entire, coriaceous, dark shining green above, paler beneath, glabrous. Racemes with 8-15 flowers; pedicels 2-6 cm. Calyx 1-2 mm; lobes rounded. Corolla 40-60 mm, campanulate, violet-purple; tube somewhat shorter than lobes. Stamens 10. Ovary glabrous (Tutin et al., 1972).

Population analysis: A population in an area of 100 m^2 was reported, including 5 sites of reporting. The projective vegetation cover in the sample area is 90%, of which 80% are represented by the studied species, while 20% comprise the species *Quercus polycarpa*, *Fagus orientalis*. Threats: near a hiking trail.

***Taxus baccata* L. (Taxaceae)** (Fig. 9)

Global distribution: In almost all Europe and in the mountains of the Mediterranean region, Southwest and Central Asia (Caucasus, Asia Minor) and North Africa.

Distribution in Bulgaria: Western and Central Stara Planina, Vitosha, Slavyanka, Pirin, Rila, Rhodopes and Strandzha Mts.

Morphology: Shrub or tree up to 20 m, with a wide, pyramidal crown. Leaves 10-30 mm, the margins recurved, dark, glossy green

above, with 2 pale green stomatal bands beneath. Seeds 6-7 mm. (Tutin et al., 1964).

Population analysis: A population of 10 m^2 was reported. The projective cover of the vegetation in the sample area is 80%; a single specimen of the species, about 500 years old, is registered. Among the tree species, *Fagus orientalis* predominates, and in herbaceous - *Asplenium scolopendrium*. Threats: near a hiking trail.

***Ilex colchica* Pojark. (Aquifoliaceae)** (Fig. 10)

Global distribution: Balkan Peninsula, Southwest Asia and the Caucasus.

Distribution in Bulgaria: Strandzha Mts.

Morphology: Shrub 1-3 m, glabrous except for puberulent young shoots and inflorescences; bark pale grey. Leaves oblong, c. 2,5 times as long as wide, all spinose-serrate and only slightly undulate, turning black on drying; petiole with a narrower and deeper groove (Tutin et al., 1968).

Population analysis: A population of 10 m^2 was reported. The projective cover of the vegetation in the sample area is 60%; two specimens of the species have been registered. Among the tree species, *Fagus orientalis* and *Laurocerasus officinalis* predominate. Threats: near a hiking trail.

Fig. 7. General view of *Mespilus germanica*.

Fig. 8. General view of *Rhododendron ponticum*.

Fig. 9. General view of *Taxus baccata*.

Fig. 10. General view of *Ilex colchica*.

Conclusions

The study presents data on monitoring of the species *Amorpha fruticosa*, *Pancratium maritimum*, *Calluna vulgaris*, *Daphne pontica*, *Ilex colchica*, *Rhododendron ponticum*, *Mespilus germanica*, and *Taxus baccata* in the two protected areas of Strandzha Nature Park – Marina River and Silistar. Relatively stable populations of the species *Pancratium maritimum* and *Rhododendron ponticum* have been found, while *Calluna vulgaris*, *Mespilus germanica*, *Ilex colchica*, and *Taxus baccata* are represented by a limited number of single specimens. For the species, it is necessary to take measures for their protection, since they are located in close proximity to tourist trails, and in some cases, their area is taken over by the young oak vegetation growing. In order to preserve the population of *Pancratium maritimum*, it is needed to control the population of the invasive species *Amorpha fruticosa* because it is located in the immediate vicinity. In our view, it is recommended urbanization along the sandy strip in this coastal zone to be limited.

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New Records of Terrestrial Gastropods (Gastropoda, Mollusca) from Strandzha Mts. (Bulgaria) and its Adjacent Coastal Area

Dilian Georgiev*[*1], Ivaylo Dedov[2]

[1]University of Plovdiv, Faculty of Biology, Department of Ecology and Environmental Conservation, 24 Tzar Assen Str., BG-4000 Plovdiv, BULGARIA
[2]Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, 2 Gagarin Street, 1113 Sofia, BULGARIA
[*]Corresponding author: diliangeorgiev@gmail.com

Abstract. We present a list with 131 terrestrial gastropod species considered to occur in the area with 18 species being new records. The new records are: *Carychium tridentatum* (Ellobiidae), *Vertigo antivertigo*, *V. pusilla* (Vertiginidae), *Vallonia costata*, *V. enniensis* (Valloniidae), *Cecilioides acicula* (Ferussaciidae), *Discus rotundatus* (Discidae), *Aegopinella* cf. *pura* (Gastrodontidae), *Oxychilus translucidus* (Oxychilidae), *Vitrea neglecta*, *V. vereae* (Pristilomatidae), *Deroceras* cf. *panormitanum*, *D.* cf. *reticulatum* (Agriolimacidae), *Tandonia budapestensis*, *T.* cf. *serbica* (Milacidae), *Fruticicola fruticum* (Bradybaenidae), and *Euomphalia strigella* (Hygromiidae). One species, *Paralaoma servilis* (Punctidae) is a new record for Bulgaria.

Key words: mollusks, distribution, species, diversity, Balkan Peninsula.

Introduction

Strandzha is a mountain in southeastern Bulgaria and the European part of Turkey. The highest point on Bulgarian territory is Golyamo Gradishte. The climate of the area is considerably influenced by the Black Sea and is predominantly humid continental in the mountains and humid subtropical at the coast. The biggest river in the area is Veleka (147 km), as well as the border river Rezovska (112 km) (Nature Park Strandzha, 2022).

The Strandzha Mountains have a rich and diverse flora and fauna, unique within Europe. One of the reasons for the high species richness (including terrestrial gastropods) is the area's location at a bio-geographical crossroad between the European and Asian continents (Damyanov & Liharev 1975). Land-ice never reached Strandzha during the ice-ages of the Pleistocene and the Holocene. This lack of glaciations helped create the circumstances in which flora characteristic for the Tertiary period on the European continent has been preserved in Strandzha (Kamburov, 2006).

The species list was constructed on the basis of a review of all the literature available, with an accent on the recent papers and synopses of Damyanov & Liharev (1975); Dedov & Subai (2012) and Irikov & Mollov (2015).

Material and Methods

The new collecting activities were perform in 17 localities presented in Table 1.

The species were hand-collected or by a standard soil-sampling procedure (Damyanov & Liharev 1975).

Abbreviations and symbols used in the text:

? – species found only as empty shells at the Black Sea coast or rivers' bank;

* and in bold - new record for the study area

** and in bold - new record for Bulgaria

Table 1. The localities in the Strandzha Mts. and adjacent coastal areas where the new materials were collected.

No.	Coordinates	Date	Locality	leg.
1.	N42 25 06.5 E27 41 31.0	18.09.2007	north of Sozopol town, scrubs and grasses along the hills at the coast, at the sea level	D. Georgiev
2.	N42 24 30.8 E27 40 11.3	18.09.2007	deposits of a small river at Dyuni Resort, at the sea level	D. Georgiev
3.	N42 03 34.0 E27 46 35.2	08.09.2008	Strandzha Mts, Kosti village, deposits of Veleka River, 24 m a.s.l.	D. Georgiev
4.	N42 10 32.6 E27 50 22.9	02.06.2016	Tsarevo town, mixed broad leaf forest dominated by *Fraxinus* sp., 18 m a.s.l.	D. Georgiev
5.	N42 07 22.3 E27 47 05.5	03.06.2016	Izgrev village, *Quercus* sp. forest west of the village, in leaf detritus, 224 m a.s.l.	D. Georgiev
6.	coordinates not known	23-29.05.1993	Strandzha Mts., Sinemorets village	P. Mitov
7.	coordinates not known	26.04.1998	near the road between the villages of Gramatikovo and Mladezhko	N. Kodzhabashev
8.	UTM: NG45	08.05.2008	floating debris 6 km N of Malko Tarnovo	I. Dedov, P. Subai
9.	N42 10 20.2 E27 51 08.3	01.10.2015	Tsarevo town, park near the sea-shore, deciduous forest	I. Dedov, U. Schneppat, R. Cornu, I. Stoyanov
10.	N42 03 57.0 E27 58 19.0	01.10.2015	mouth of the river Veleka, near the fresh water, meadows, sparse deciduous forest	I. Dedov, U. Schneppat, R. Cornu, I. Stoyanov
11.	N41 59 00.6 E28 01 41.6	02.10.2015	Rezovo village, meadow with single trees	I. Dedov, U. Schneppat, R. Cornu, I. Stoyanov
12.	N41 58 58.3 E28 01 28.8	02.10.2015	Rezovo village, meadow	I. Dedov, U. Schneppat, R. Cornu, I. Stoyanov
13.	N42 01 22.2 E27 59 56.0	02.10.2015	protected area Silistar, near the river, deciduous forest, soil sample	I. Dedov, U. Schneppat, R. Cornu, I. Stoyanov
14.	N42 25 17.8 E27 41 38.6	30.10.2015	Sozopol town, near the sea, meadows with single trees and bushes	I. Dedov, U. Schneppat, R. Cornu, I. Stoyanov
15.	N42 18 18.1 E27 43 33.3	31.10.2015	near Ropotamo river, deciduous forest, *Ulmus*, *Salix*, under logs	I. Dedov, U. Schneppat, R. Cornu, I. Stoyanov
16.	N41 58 44.3 E27 31 23.5	03.11.2015	Malko Tarnovo town, in the town, open grassy terrains near the road	I. Dedov, U. Schneppat, R. Cornu, I. Stoyanov
17.	N42 09 24.4 E27 51 23.4	09.07.2022	Deposits of Nestinarska River, near Tsarevo town	D. Georgiev

Species list

(localities numbers correspond with those in Table 1.)

Pomatiidae

Pomatias elegans (O.F. Müller, 1774)

Pomatias rivularis (Eichwald, 1829)

Aciculidae

Platyla polita (Hartmann, 1840)

Platyla similis (Reinchardt, 1880)

Platyla orthostoma (Jackiewicz, 1979)

Ellobiidae
Carychium minimum Müller, 1774
***Carychium tridentatum* (Risso, 1826): 3, 17**

Pyramidulidae
Pyramidula cephalonica (Westerlund, 1898)

Vertiginidae
Vertigo angustior (Jeffreys, 1830)
***Vertigo antivertigo* (Draparnaud, 1801): 10**
***Vertigo pusilla* Müller, 1774: 8, 13**
Vertigo pygmaea (Draparnaud, 1801)
Truncatellina claustralis (Gredler, 1856)
Truncatellina costulata (Nilsson, 1822)
Truncatellina cylindrica (Ferussac, 1821)

Lauriidae
Lauria cylindracea (Da Costa, 1778)
Leiostyla schweigeri Götting, 1963

Agardhiellidae
Agardhiella parreyssii (Pfeiffer, 1848)

Orculidae
Orcula zilchi Urbański, 1960
Orculella ignorata Hausdorf, 1996
Sphyradium doliolum (Bruguiere, 1792)

Valloniidae
Acanthinula aculeata (Müller, 1774)
***Vallonia costata* (Müller, 1774): 4, 8, 17**
***Vallonia enniensis* (Gredler 1856): 10**
Vallonia pulchella (O. F. Müller, 1774)

Enidae
Chondrula microtragus (Rossmässler, 1839)
Chondrula tricuspidata (Küster, 1841)
Chondrula tridens (Müller, 1774)
? *Chondrus tournefortianus* (Férussac, 1821)
Ena montana (Draparnaud, 1801)
? *Ena nogeli* (Roth, 1850)
Eubrephulus bicallosus (L. Pfeiffer, 1847)
Mastus carneolus (Mousson, 1863)
Mastus etuberculatus (Frauenfeld, 1867)
? *Mastus ponticus* (Retowski, 1887)
Mastus rossmaessleri (L. Pfeiffer, 1846)
Merdigera obscura (O. F. Müller 1774)
Multidentula ovularis (Olivier, 1801)
Pseudochondrula seductilis (Rossmässler, 1846)
Zebrina detrita (O. F. Müller, 1774)
Zebrina kindermanni (L. Pfeiffer, 1850)
Zebrina varnensis (Pfeiffer, 1847): This species thrives at the North Black Sea coast, and is rare and with not so numerous populations at the south. We found it in low numbers at Nesebar (not in the study area) and Sozopol towns.

Cochlicopidae
Cochlicopa lubrica (O. F. Müller, 1774)
Cochlicopa lubricella (Rossmassler, 1835)

Clausiliidae
Alinda biplicata orientalis Nordsieck, 2008
Bulgarica denticulata thessalonica (Rossmässler, 1839)
Bulgarica varnensis (Pfeiffer, 1848)
Cochlodina laminata (Montagu, 1803)
Dobatia goettingi (Brandt, 1961)
? *Elia huebneri* (Pfeiffer, 1848)
Euxina circumdata (Pfeiffer, 1848)
Euxina persica (Boettger, 1879)
Euxina promta (Schmidt, 1868)
Galeata schwerzenbachi (Pfeiffer 1848)
Laciniaria plicata (Draparnaud, 1801)
Mentissella rebeli (Sturany, 1897)
Serrulina serrulata (Pfeiffer, 1847)

Succineidae
Succinea oblonga Draparnaud, 1801
Oxyloma elegans (Rissso, 1826)

Ferussaciidae
***Cecilioides acicula* (Müller, 1774): 17**
Cecilioides janii (De Betta & Martinati, 1855)

Punctidae
****Paralaoma servilis* (Shuttleworth, 1852): 17** (Fig. 1) (widely distributed

species in the Mediterranean, found in many localities close to Bulgaria (Welter-Schultes, 2012))
Punctum pygmaeum (Draparnaud, 1801)

Discidae
***Discus rotundatus* (Müller, 1774): 3, 16**

Arionidae
Arion subfuscus (Draparnaud, 1805)

Euconulidae
Euconulus fulvus (Müller, 1774)

Vitrinidae
Oligolimax annularis (S. Studer, 1820)
Vitrina pellucida (Müller, 1774)

Gastrodontidae
Aegopinella minor (Stabile, 1864)
***Aegopinella* cf. *pura* (Alder 1830): 8**
Zonitoides nitidus (O. F. Müller, 1774)

Oxychilidae
Carpathica bielawskii A. Riedel, 1963
Carpathica stussineri (A. J. Wagner, 1895)
Daudebardia brevipes (Draparnaud, 1805)
Daudebardia rufa (Draparnaud, 1805)
Libania wiktori (Riedel, 1967): According Irikov & Mollov (2015) this species occurs only in Western Rhodopes and its finding in Strandzha Mts is doubtful. The report for the area of Ropotamo River by Körnig (1983) could due to mixed labels of materials from Western Rhodopes (?).
Mediterranea depressa (Sterki, 1880)
Mediterranea hydatina (Rossmässler, 1838)
Mediterranea inopinata (Uličný, 1887)
Morlina glabra (Rossmässler, 1835)
Morlina urbanskii (Riedel, 1963)
Oxychilus deilus (Bourguignat, 1857)
Oxychilus investigatus Riedel, 1993
Oxychilus moussoni (Kobelt, 1878)
***Oxychilus translucidus* (Mortillet, 1853): 2**

Pristilomatidae
Vitrea contracta (Westerlund, 1871)
Vitrea diaphana (Studer, 1829)
***Vitrea neglecta* Damjanov et Pinter, 1969: 5**
Vitrea pygmaea (O. Boettger, 1880)
Vitrea riedeli Damjanov & Pinter, 1969
***Vitrea vereae* Irikov, Georgiev & Riedel, 2004: 3, 4**

Limacidae
Ambigolimax nyctelius (Bourguignat, 1861)
Limax cinereoniger Wolf, 1803
Limax graecus (Simroth, 1889)
Limax maximus Linnaeus, 1758
Limacus flavus Linnaeus, 1758
Limacus maculatus (Kaleniczenko, 1851)

Agriolimacidae
Deroceras agreste (Linnaeus, 1758)
***Deroceras* cf. *panormitanum* (Lessona & Pollonera 1882): 15**
***Deroceras* cf. *reticulatum* (Müller, 1774): 12**
Deroceras sturanyi (Simroth, 1894)
Deroceras thersites (Simroth, 1886)
Deroceras turcicum (Simroth, 1894)
Krynickillus urbanskii (Wiktor, 1971)

Milacidae
Milax parvulus Wiktor, 1968
***Tandonia budapestensis* (Hazay, 1880): 1, 9, 11, 14**
Tandonia cristata (Kaleniczenko, 1851)
Tandonia kusceri (H. Wagner, 1931)
***Tandonia* cf. *serbica* (H. Wagner, 1931): 14**

Bradybaenidae
***Fruticicola fruticum* (Müller, 1774): 7**

Helicodontidae
Lindholmiola girva (Fivaldsky, 1835)

Hygromiidae
Cernuella cisalpina (Rossmässler, 1837)
Cernuella virgata (Da Costa, 1778)
***Euomphalia strigella* (Draparnaud, 1801): 6** (according Damyanov &

Liharev, 1975 this species is occurring all over the territory of Bulgaria)
Helicopsis striata (Müller, 1774)
Monacha carascaloides (Boutguignat, 1855)
Monacha cartusiana (Muller, 1774)
Monacha claustralis (Menke, 1828)
Monacha ocellata (Roth, 1839)
Monacha ovularis (Bourguignat, 1855)/*pilosa* Pintér & Pintér, 1970 – complex
Monacha solidior (Mousson, 1873)
Monacha venusta Pintér, 1968
Perforatella incarnata (O. F. Müller, 1774)
Trichia erjaveci (Brusina, 1870)
Xerolenta obvia (Menke, 1828)
? *Xerolenta pappi* (Schütt, 1962)
Xerolenta spiruloides (Wagner A., 1916)
Xeropicta derbentina (Krinicki, 1833)
Xeropicta krynickii (Krinicki, 1833)

Geomitridae
Cochlicella acuta (Müller, 1774)

Helicidae
Caucasotachea vindobonensis (Férussac, 1821)
Eobania vermiculata (Müller, 1774)
Helix figulina Rossmässler, 1839
Helix lucorum Linnaeus, 1758
Helix pomacella Mousson, 1854

Till now a total of 112 species of snails were known from Strandzha Mts, and additional 5 species were found only as empty shells at the Black Sea coast or rivers' bank in the region. After present study another 18 species were added to the list, and a total of 131 species are now known from the area (one of them a new record for Bulgaria). We were very careful about exclusions of species from the given list, knowing that it is very hard to prove that a species do not occur in a particular area.

The specific position of Strandzha Mountains at the bio-geographical crossroad between the European and Asian continents, lack of glaciation during the ice-age (Damyanov and Liharev 1975, Kamburov 2006), as well as the geographic proximity with the southern Black sea seashores formed rich and unique gastropods' fauna in the region (some in situ photos of species from Strandzha Mountains could be seen on Fig. 2). One of the species-rich family in the region Enidae (17 species in our list) penetrate in Europe from Asia in Pliocene, when the Balkan peninsula has been steppingstone connected both continents (Damyanov and Liharev 1975). Some species from other well present in the region families (Clausiliidae, Oxychilidae) were formed in wet forests around Black sea during the Neogene. The Strandzha Mountains has primary importance for the terrestrial gastropods diversity of Bulgaria. Totally thirty-one species from our check-list could be classified as related with the Pontic region. In this number are included four species with doubtful occurrence in Bulgarian part of Strandzha Mountains (*Ch. tournefortianus*, *E. huebneri*, *E. nogeli*, *M. ponticus*). Some of the species have much wider distribution around the sea and adjacent areas, both in Bulgarian and other countries in Black sea region (*Mult. ovularis*, *M. solidior*, *M. urbanskii*, *O. deilus*, *O. moussoni*, *X. krynickii*, *X. spiruloides*, *Z. kindermanni*, *Z. varnensis*). Other species with much wider distribution in the Pontic region, in Bulgaria could be find mainly (*E. bicallosus*, *E. circumdata*, *G. schwerzenbachi*, *K. urbanskii*, *L. maculatus*, *M. rebeli*, *V. riedeli*) or only (*D. goettingi*, *E. persica*, *E. promta*, *M. ocellata*, *L. schweigeri*, *O. zilchi*, *S. serrulata*) in Strandzha Mountains. Finally four species are endemic for the mountain: *C. bielawskii*, *Mon. ovularis*, *M. venusta*, *P. orthostoma*.

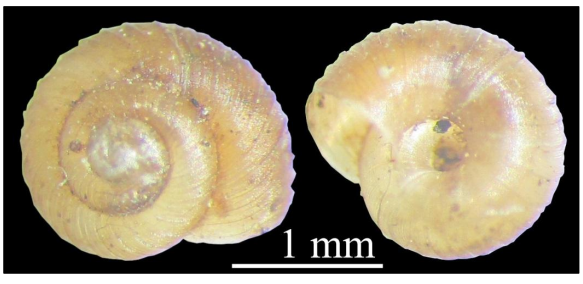

Fig. 1. Shell of *Paralaoma servilis* collected in the deposits of Nestinarska River near Tsarevo on 09.07.2022, a new record for Bulgaria.

Fig. 2. Terrestrial gastropods species from Strandzha Mountains, Bulgaria. A. *Krynickillus urbanskii*, Rezovo village; B. *Euxina persica* – terratological form, Beglik Tash; C. *Vitrea riedeli*, Rezovo; D. *Lauria cylindracea*, Malko Turnovo; E. *Limacus maculatus* in a resting possition, Beglik Tash.

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The Psocoptera of Strandzha Mts and its Adjacent Black Sea Coast: Published Data and New Records

*Dilian G. Georgiev**

University of Plovdiv, Faculty of Biology, Department of Ecology and Environmental Conservation, 24 Tzar Assen Str., BG-4000 Plovdiv, BULGARIA
*Corresponding author: diliangeorgiev@gmail.com

Abstract. After this study a total of 33 species of psocids are known to occur in Strandzha Mts and its adjacent Black Sea coastal area. The paper reports of 25 species as already published for the area with eight new species records. All psocids were found in or at the edge of forests or scrubs with scattered trees, dominated mainly by *Quercus* or *Pinus* species.

Key words: Psocoptera, Black Sea Coast, Strandzha Mts, distribution.

Introduction

A total of 25 species were known to occur in Strandzha Mts and its adjacent Black Sea coastal areas. The first record of Psocoptera in this area was the description of Trimerocaecilius popovi Meinander, 1978, a species named after the outstanding Bulgarian entomologist Associate Professor Dr Alexi Popov who collected the material (Meinander, 1978). Later Georgiev (2017) added 12 species for the region, and Georgiev & Todorov (2018) 12 more. Georgiev & Todorov (2017) added a new locality of Ectopsocus briggsi McLachlan, 1899 near Tsarevo town. The aim of this study is to provide a synopsis of all published data and to add some new species records for Strandzha Mts and its adjacent Black Sea coastal areas in Bulgaria.

Material and Methods

A literature synopsis was made including all published data for the Psocoptera of Strandzha Mts and its adjacent Black Sea coastal area (all included in the Results chapter). New collections were also carried out during 2021-2022 mainly by two methods: sieving with 1 mm mesh width sieve of detritus or crushed tree bark particles above white plastic container and by beating the vegetation above white plastic container. Specimens were then stored in 96% ethanol and after processing, deposited in the collection of the author. Species identifications followed Lienhard (1998).

Results

In this study eight newly recorded species for the area were found. Now the list of Psocoptera of Strandzha Mts and its adjacent coastal area consists of 33 species as follows:

Trogiidae

***Cerobasis guestfalica* (Kolbe, 1880)**

Published records: Georgiev (2017): "24.8.2017, Sinemorets village, yard of a

house, branches of *Cupressus* sp., N42 03 41.1 E27 58 42.4, N42 03 36.4 E27 58 24.5, 30 m a. s. l., 1 ♀, coll. by beating the vegetation; 25.8.2017, at the estuary of Veleka River, scattered trees and shrubs, branches of *Ulmus minor*, N42 03 53.5 E27 58 18.0, at the sea level, 1 ♀, coll. by beating the vegetation; 26.8.2017, Rezovo village, yard of a house, branches of *Cupressus* sp., N41 59 05.6 E28 01 48.9, 41 m a. s. l., 2 ♀, coll. by beating the vegetation; 27.8.2017, at the vicinities of Sinemorets village, near Butamyata Beach, *Quercus* sp. forest, on the bark of living *Quercus* sp., N42 03 30.1 E27 58 49.7, 27 m a. s. l., 1 ♂, coll. by hand."; Georgiev & Todorov (2018): "24.06.2018, 2 ♀, South Black Sea Coast, Tsarevo town, near Popski Beach, ruderal vegetation, from branches of *Cupressus* sp., N42 10 28.0 E27 50 38.4, 23 m a. s. l., collected by beating the vegetation, D. Georgiev leg."

New records: 11.6.2021, Strandzha Mts, at the entrance of Izvora Cave, near Mladezhko village, *Fagus orientalis* and *Carpinus* spp. forest, N42 09 03.7 E27 21 26.6, 219 m a. s. l., 1 ♀, from dry branches with leaves of *Hedera helix*, collected by beating the vegetation; 03.06.2022, Strandzha Mts, S of Sredets town, *Quercus* sp. and *Pinus nigra* forest, N42 18 19.0 E27 09 17.3, 144 m a. s. l., 3 ♀, from dry branches with leaves of *P. nigra*, collected by beating the vegetation; 06.07.2022, Strandzha Mts, S of Nestinarka, Tsarevo town, *P. nigra* forest, N42 09 11.4 E27 51 59.6, 33 m a. s. l., 1 ♀, from *P. nigra*, collected by beating the vegetation; 07.07.2022, Strandzha Mts, near Ahtopol town, *P. nigra* forest, N42 05 40.5 E27 56 39.5, 30 m a. s. l., 1 ♀, from dry branches with leaves of *P. nigra*, collected by beating the vegetation.

***Lepinotus reticulatus* Enderlein, 1905**

Published records: Georgiev & Todorov (2018): "18.6.2017, 2 ♀ nymphs, South Black Sea Coast, near Sozopol town, *Pinus sylvestris* plantation, in detritus of *P. sylvestris*, N42 24 31.3 E27 41 47.9, 35 m a. s. l., collected by sieving, D. Georgiev leg.; 25.6.2017, 1 ♀, South Black Sea Coast, near Tsarevo town, mixed forest plantation dominated by *Quercus rubra* and *Pinus* spp., under bark of live *Pinus pinaster*, collected by sieving, D. Georgiev leg."

New records: 06.07.2022, Strandzha Mts, S of Nestinarka, Tsarevo town, *P. nigra* forest, N42 09 11.4 E27 51 59.6, 33 m a. s. l., 1 ♀, from bark of *P. nigra*, collected by sieving; 07.07.2022, Strandzha Mts, near Ahtopol town, *P. nigra* forest, N42 05 40.5 E27 56 39.5, 30 m a. s. l., 1 ♀, from dry branches *P. nigra* on the ground, collected by beating.

Liposcelididae

***Liposcelis decolor* (Pearman, 1925)**

Published records: Georgiev & Todorov (2018): "27.8.2017, 1 ♀, South Black Sea Coast, near Sinemorets vill., *Quercus* sp. forest, in dead trunk of *Quercus* sp., N42 03 30.1 E27 58 49.7, 27 m a. s. l., collected by sieving, D. Georgiev leg.; 23.6.2018, 1 ♀, South Black Sea Coast, Tsarevo town, found living among dead insects in a lamp, N42 10 11.0 E27 50 21.6, 51 m a. s. l., collected by brush, D. Georgiev leg."

New records: 06.07.2022, Strandzha Mts, S of Nestinarka, Tsarevo town, *P. nigra* forest, N42 09 11.4 E27 51 59.6, 33 m a. s. l., 1 ♀, from bark of *P. nigra*, collected by sieving; 07.07.2022, Strandzha Mts, near Ahtopol town, *P. nigra* forest, N42 05 40.5 E27 56 39.5, 30 m a. s. l., 2 ♀, from a dry trunk of *P. nigra*, collected by sieving; 09.07.2022, Strandzha Mts, banks of Nestinarska River, *Fraxinus* sp. and *Salix* sp. forest, N42 09 24.4 E27 51 23.4, 10 m a. s. l., ♀, from bark of a dry trunk, collected by sieving.

***Liposcelis pearmani* Lienhard, 1990**

Published records: Georgiev & Todorov (2018): 18.6.2017, 1 ♀ nymph, South Black Sea Coast, near Sozopol town, *Pinus sylvestris* plantation, in detritus of *P. sylvestris*, N42 24 31.3 E27 41 47.9, 35 m a. s. l., collected by sieving, D. Georgiev leg.

New records: 03.06.2022, Strandzha Mts, S of Sredets town, *Quercus* sp. and *Pinus nigra* forest, N42 18 19.0 E27 09 17.3, 144 m a. s. l., 3 ♀, from dry branches with leaves of *P. nigra*, collected by beating the vegetation.

Caeciliusidae

***Valenzuela flavidus* (Stephens, 1836)**

Published records: Georgiev & Todorov (2018): "25.6.2017, 1 ♀, South Black Sea Coast, near Tsarevo town, mixed forest plantation dominated by *Quercus rubra* and *Pinus* spp., N42 10 21.8 E27 50 27.4, 52 m a. s. l., collected by beating the vegetation, D. Georgiev leg.; 25.8.2017, 1 ♀, South Black Sea Coast, at the estuary of Veleka River, grass and shrubs, from branches of *Ulmus minor*, N42 03 53.5 E27 58 18.0, 4 m a. s. l., collected by beating the vegetation, and 26.8.2017, 2 ♀, same area, *Fraxinus* sp. forest, found dead in a paddle, D. Georgiev leg."

***Valenzuela burmeisteri* (Brauer, 1876)**

Published records: Georgiev & Todorov (2018): "26.6.2017, 2 ♀, South Black Sea Coast, Tsarevo town, yard of the base of Plovdiv University, park vegetation – various grass, shrubs and trees, from branches of *Cupressus* sp., N42 10 11.0 E27 50 21.6, 51 m a. s. l., collected by sweep netting, D. Georgiev leg.; 26.6.2017, 2 ♂, South Black Sea Coast, Tsarevo town, near Popski Beach, ruderal vegetation, from branches of *Cupressus* sp., N42 10 28.0 E27 50 38.4, 23 m a. s. l., collected by sweep netting, D. Georgiev leg.; 24.06.2018, 1 ♀, same locality and habitat, D. Georgiev leg."

***Valenzuela piceus* (Kolbe, 1882)**

Published records: Georgiev & Todorov (2018): "26.6.2017, 1 ♂, South Black Sea Coast, yard of the base of Plovdiv University, park vegetation – various grass, shrubs and trees, from branches of *Cupressus* sp., N42 10 11.0 E27 50 21.6, 51 m a. s. l., collected by sweep netting, D. Georgiev leg."

Stenopsocidae

***Graphopsocus cruciatus* (Linnaeus, 1768)**

Published records: Georgiev & Todorov (2018): 27.6.2017, 1 ♀, South Black Sea Coast, near Lisovo Dere River, *Fraxinus* sp. forest, from branches of *Fraxinus* sp., N42 09 16.0 E27 50 56.1, 13 m a. s. l., collected by sweep netting, D. Georgiev leg.; 24.8.2017, 1 ♀, South Black Sea Coast, near Sinemorets vill., broadleaf forest, from branches of *Quercus* sp., N42 03 11.1 E27 59 04.1, at the sea level, collected by beating the vegetation, D. Georgiev leg.

***Stenopsocus immaculatus* (Stephens, 1836)**

Published records: Georgiev (2017): "27.8.2017, near the estuary of Veleka River, *Fraxinus* sp. forest, found in a paddle on a dirt road, N42 03 48.5 E27 58 11.0, 4 m a. s. l., 1 ♀."

Ectopsocidae

***Ectopsocus briggsi* McLachlan, 1899**

Published records: Georgiev (2017): "26.6.2017, north of Popski Beach near Tsarevo town, mixed broadleaf forest, branches of *Quercus* sp., N42 10 53.7 E27 50 32.0, 9 m a. s. l., 1 ♀, coll. by beating the vegetation; 25.8.2017, south of Sinemorets village, near Lipite Beach, *Quercus* sp. forest, branches of *Quercus* sp., N42 02 46.3 E27 59 27.7, 18 m a. s. l., 2 ♂, coll. by sweep netting; 25.8.2017, north of Sinemorets village, south part of Veleka Beach, from *Phragmites australis*, N42 03 54.6 E27 58 32.1, at the sea level, 1 ♀, coll. by sweep netting."; Georgiev & Todorov (2017): "28.6.2017, South Black Sea Coast, Arapya Beach, North of Tsarevo town, caught from the leg of O. Todorov at the beach, 1 ♂, coll. by hand, O. Todorov leg., D. Georgiev det., coll."

New records: 11.6.2021, Strandzha Mts, at the entrance of Izvora Cave, near Mladezhko village, *Fagus orientalis* and

Carpinus spp. forest, N42 09 03.7 E27 21 26.6, 219 m a. s. l., 3 ♂, from dry branches with leaves of *Hedera helix*, collected by beating the vegetation; 06.07.2022, Strandzha Mts, S of Nestinarka, Tsarevo town, *P. nigra* forest, N42 09 11.4 E27 51 59.6, 33 m a. s. l., 1 ♀, from dry branches with leaves of *Quercus rubra*, collected by beating the vegetation.

***Ectopsocus meridionalis* Ribaga, 1904**

Published records: Georgiev (2017): "24.8.2017, near Butamyata Beach, south of Sinemorets village, flood forest, branches of *Acer campestre* and *Ulmus minor*, N42 03 11.1 E27 59 04.1, at the sea level, 2 ♀, coll. by beating the vegetation."

New records: 10.6.2021, Strandzha Mts, E of Malko Tarnovo town, river bank forest, near Veleka River, N42 01 40.8 E27 37 18.5, 67 m a. s. l., 1 ♀, from *Salix* sp., collected by beating the vegetation; 03.06.2022, Strandzha Mts, near Fakiyska River at Fakia vill., tall grass, bushes and trees, N42 11 21.1 E27 05 19.2, 176 m a. s. l., 1 ♀, from a pile of dry branches with leaves of *Prunus cerasifera*, collected by beating the vegetation.

***Ectopsocus petersi* Smithers, 1978**

New record for the area: 03.06.2022, Strandzha Mts, S of Sredets town, *Quercus* sp. and *Pinus nigra* forest, N42 18 19.0 E27 09 17.3, 144 m a. s. l., 1 ♂, from dry branches with leaves of *P. nigra*, collected by beating the vegetation; 05.07.2022, Strandzha Mts, near Nestinarska River, *Fraxinus* sp. and *Salix* sp. forest, N42 09 25.5 E27 51 28.7, 5 m a. s. l., 1 ♀, from dry branches with leaves, collected by beating the vegetation; 06.07.2022, Strandzha Mts, S of Nestinarka, Tsarevo town, *P. nigra* forest, N42 09 11.4 E27 51 59.6, 33 m a. s. l., 1 ♀, from dry branches with leaves of *Quercus rubra*, collected by beating the vegetation; 07.07.2022, Strandzha Mts, near Ahtopol town, *P. nigra* forest, N42 05 40.5 E27 56 39.5, 30 m a. s. l., 3 ♀, from *Crataegus* sp., collected by beating the vegetation.

Lachesillidae

***Lachesilla bernardi* Badonnel, 1938**

New record for the area: 10.6.2021, Strandzha Mts, E of Malko Tarnovo town, river bank forest, near Veleka River, N42 01 40.8 E27 37 18.5, 67 m a. s. l., 1 ♀, from *Salix* sp., collected by beating the vegetation; 03.06.2022, Strandzha Mts, near Fakiyska River at Fakia vill., tall grass, bushes and trees, N42 11 21.1 E27 05 19.2, 176 m a. s. l., 4 ♂, 5 ♀, from a pile of dry branches with leaves of *Prunus cerasifera*, collected by beating the vegetation.

***Lachesilla quercus* (Kolbe, 1880)**

New record for the area: 03.06.2022, Strandzha Mts, S of Sredets town, *Quercus* sp. and *Pinus nigra* forest, N42 18 19.0 E27 09 17.3, 144 m a. s. l., 1 ♀, from dry branches with leaves of *Quercus* sp., collected by beating the vegetation.

***Lachesilla pedicularia* (Linnaeus, 1758)**

New record for the area: 03.06.2022, Strandzha Mts, near Fakiyska River at Fakia vill., tall grass, bushes and trees, N42 11 21.1 E27 05 19.2, 176 m a. s. l., 1 ♀, from a pile of dry branches with leaves of *Prunus cerasifera*, collected by beating the vegetation; 05.07.2022, Strandzha Mts, near Nestinarska River, *Fraxinus* sp. and *Salix* sp. forest, N42 09 25.5 E27 51 28.7, 5 m a. s. l., 1 ♂, 2 ♀, from dry branches with leaves, collected by beating the vegetation.

Peripsocidae

***Peripsocus alboguttatus* (Dalman, 1823)**

New record for the area: 03.06.2022, Strandzha Mts, near Fakiyska River at Fakia vill., tall grass, bushes and trees, N42 11 21.1 E27 05 19.2, 176 m a. s. l., 2 ♂, from a pile of dry branches with leaves of *Prunus cerasifera*, collected by beating the vegetation; 07.07.2022, Strandzha Mts, near Ahtopol town, *P. nigra* forest, N42 05 40.5 E27 56 39.5,

30 m a. s. l., 1 ♂, from *Paliurus spina-christi*, collected by beating the vegetation.

***Peripsocus didymus* Roesler, 1939**

Published records: Georgiev (2017): "27.8.2017, at the vicinities of Sinemorets village, near Butamyata Beach, *Quercus* sp. and *Carpinus betulus* forest, N42 03 27.3 E27 59 02.4, 25 m a. s. l., 1 ♂, found dead in a small stream."; Georgiev & Todorov (2018): "23 and 26.6.2018, 1 ♀, 8 ♂, South Black Sea Coast, Tsarevo town, yard of the base of Plovdiv University, park vegetation – various grass, shrubs and trees, found dead inside lamps in the park, and from white plastic collector situated below lamp, N42 10 11.0 E27 50 21.6, 51 m a. s. l., D. Georgiev leg.; 26.6.2018, 1 ♂, South Black Sea Coast, near Tsarevo town, foothills of Strandzha Mts., shrub and grass vegetation, from branches of *Crataegus* sp., N42 10 07.4 E27 50 13.4, 41 m a. s. l., collected by beating the vegetation, D. Georgiev leg."

***Peripsocus phaeopterus* (Stephens, 1836)**

Published records: Georgiev & Todorov (2018): "26.6.2017, 1 ♀, South Black Sea Coast, Tsarevo town, near Popski Beach, ruderal vegetation, from branches of *Cupressus* sp., N42 10 28.0 E27 50 38.4, 23 m a. s. l., collected by sweep netting, D. Georgiev leg.; 23.6.2018, 1 ♂, South Black Sea Coast, Tsarevo town, yard of the base of Plovdiv University, park vegetation – various grass, shrubs and trees, N42 10 11.0 E27 50 21.6, 51 m a. s. l., found dead inside a lamp in the park, D. Georgiev leg."

Pseudocaeciliidae

***Trimerocaecilius becheti* Meinander, 1978**

Published records: Georgiev & Todorov (2018): "22.6.2018, 2 ♀, South Black Sea Coast, vicinities of Tsarevo town, *Quercus rubra* plantation, on a bark of live *Q. rubra*, N42 10 13.2 E27 50 23.6, 47 m a. s. l., collected during night by head torch, and using a dry grass straw and saliva, O. Todorov leg."

***Trimerocaecilius popovi* Meinander, 1978**

Published records: Meinander (1978): "Bulgaria, Sinemoretz, 1968-06-15, A. Popov, *Quercus*, *Acer*; Holotype ♀; Paratypes: 1 ♂, 2 ♀♀"; Georgiev (2017): "24.8.2017, Sinemorets village, found beneath window of a hotel room, N42 03 35.5 E27 58 46.5, 13 m a. s. l., 1 ♀, found dead; 25.8.2017, south of Sinemorets village, near Lipite Beach, *Quercus* sp. forest, branches of *Quercus* sp., N42 02 46.3 E27 59 27.7, 18 m a. s. l., 1 ♂, coll. by sweep netting; 26 and 27.8.2017, at the estuary of Veleka River, *Fraxinus* sp. forest, N42 03 48.5 E27 58 11.0, at the sea level, 3 ♀, 2 ♂, found drowned in paddles, and 4 adults observed among lichens *Xanthoria* sp. on trunk of living *Fraxinus* sp.; 27.8.2017, near Sinemorets village, *Quercus* sp. forest, among lichens *Xanthoria* sp. on trunk of living *Quercus* sp., N42 03 30.1 E27 58 49.7, 27 m a. s. l., 3 adults observed and photographed."; Georgiev & Todorov (2018): "26.6.2018, 1 ♀, South Black Sea Coast, Tsarevo town, yard of the base of Plovdiv University, park vegetation – various grass, shrubs and trees, under stones, N42 10 11.0 E27 50 21.6, 51 m a. s. l., collected by brush, D. Georgiev leg.; 26.6.2018, 1 ♀, South Black Sea Coast, near Tsarevo town, foothills of Strandzha Mts., shrub and grass vegetation, from branches of *Corylus avellana*, N42 10 07.4 E27 50 13.4, 41 m a. s. l., collected by beating the vegetation, D. Georgiev leg."

Trichopsocidae

***Trichopsocus dalii* (McLachlan, 1867)**

Published records: Georgiev (2017): "26.8.2017, Rezovo village, yard of a house, branches of Cupressus sp., N41 59 05.6 E28 01 48.9, 41 m a. s. l., 1 ♀, 1 ♂, 5 nymphs, coll. by beating the vegetation."; Georgiev &

Todorov (2018): "22.6.2018, 1 ♂, Tsarevo town, yard of the base of Plovdiv University, park vegetation – various grass, shrubs and trees, N42 10 11.0 E27 50 21.6, 51 m a. s. l., O. Todorov leg."

Philotarsidae

***Aaroniella badonneli* (Danks, 1950)**

Published records: Georgiev & Todorov (2018): "22.6.2018, 1 ♀, South Black Sea Coast, vicinities of Tsarevo town, *Quercus rubra* and *Pinus* spp. plantation, on a bark of live *Q. rubra*, N42 10 13.2 E27 50 23.6, 47 m a. s. l., collected during night by head torch, and using a dry grass straw and saliva, O. Todorov leg.; 24.6.2018, 1 ♀, same locality and habitat, collected by brush, D. Georgiev leg.; 23.6.2018, 1 ♀, South Black Sea Coast, Tsarevo town, yard of the base of Plovdiv University, park vegetation – various grass, shrubs and trees, N42 10 11.0 E27 50 21.6, 51 m a. s. l., in white plastic collector situated below lamp, and 26.6.2018, 1 ♀, same locality, under stones, collected by brush, D. Georgiev leg.; 26.6.2018, 1 ♀, South Black Sea Coast, near Tsarevo town, foothills of Strandzha Mts., shrub and grass vegetation, from branches of *Crataegus* sp., N42 10 07.4 E27 50 13.4, 41 m a. s. l., collected by beating the vegetation, D. Georgiev leg."

New records: 07.07.2022, Strandzha Mts, near Ahtopol town, *P. nigra* forest, N42 05 40.5 E27 56 39.5, 30 m a. s. l., 3 ♀, from *Paliurus spina-christi*, collected by beating the vegetation.

Elipsocidae

***Elipsocus hyalinus* (Stephens, 1836)**

Published records: Georgiev & Todorov (2018): "23.6.2018, 1 ♀, South Black Sea Coast, Tsarevo town, yard of the base of Plovdiv University, park vegetation – various grass, shrubs and trees, N42 10 11.0 E27 50 21.6, 51 m a. s. l., in white plastic collector situated below lamp, D. Georgiev leg."

***Elipsocus moebiusi* Tetens, 1891**

New record for the area: 03.06.2022, Strandzha Mts, S of Sredets town, *Quercus* sp. and *Pinus nigra* forest, N42 18 19.0 E27 09 17.3, 144 m a. s. l., 1 ♀, from dry branches with leaves of *P. nigra*, collected by beating the vegetation; 07.07.2022, Strandzha Mts, near Ahtopol town, *P. nigra* forest, N42 05 40.5 E27 56 39.5, 30 m a. s. l., 1 ♀, from the arm of the author.

***Cuneopalpus cyanops* (Rostock, 1876)**

Published records: Georgiev & Todorov (2018): "26.6.2018, 1 ♀, South Black Sea Coast, near Tsarevo town, mixed forest plantation dominated by *Quercus rubra* and *Pinus* spp., N42 10 13.2 E27 50 23.6, 47 m a. s. l., collected still living from a plastic remain full of rainwater, D. Georgiev leg."

New records: 03.06.2022, Strandzha Mts, S of Sredets town, *Quercus* sp. and *Pinus nigra* forest, N42 18 19.0 E27 09 17.3, 144 m a. s. l., 1 ♀, from dry branches with leaves of *P. nigra*, collected by beating the vegetation; 07.07.2022, Strandzha Mts, near Ahtopol town, *P. nigra* forest, N42 05 40.5 E27 56 39.5, 30 m a. s. l., 1 ♀, from *P. nigra*, collected by beating the vegetation.

Mesopsocidae

***Mesopsocus* sp.**

New record for the area: 03.06.2022, Strandzha Mts, S of Sredets town, *Quercus* sp. and *Pinus nigra* forest, N42 18 19.0 E27 09 17.3, 144 m a. s. l., 1 nymph, from dry branches with leaves of *Quercus* sp., collected by beating the vegetation.

Psocidae

***Amphigerontia contaminata* (Stephens, 1836)**

Published records: Georgiev (2017): "18.6.2017, between Sozopol town and Ravadinovo village, mixed broadleaf forest, branches of Ulmus sp., N42 24 28.7 E27 41 48.6, 33 m a. s. l., 1 ♀, coll. by beating the vegetation."

***Blaste conspurcata* (Rambur, 1842)**

Published records: Georgiev (2017): "18.6.2017, between Sozopol town and Ravadinovo village, shrub land, branches of *Crataegus* sp., N42 24 28.7 E27 41 48.6, 53 m a. s. l., 1 ♀, coll. by beating the vegetation."; Georgiev & Todorov (2018): "26.6.2018, 1 ♀, South Black Sea Coast, near Tsarevo town, foothills of Strandzha Mts., shrub and grass vegetation, from branches of *Crataegus* sp., N42 10 07.4 E27 50 13.4, 41 m a. s. l., collected by beating the vegetation, D. Georgiev leg.; 26.6.2018, 1 ♀, South Black Sea Coast, Tsarevo town, yard of the base of Plovdiv University, park vegetation – various grass, shrubs and trees, N42 10 11.0 E27 50 21.6, 51 m a. s. l., found dead inside a lamp in the park, D. Georgiev leg."

New records: 03.06.2022, Strandzha Mts, S of Sredets town, *Quercus* sp. and *Pinus nigra* forest, N42 18 19.0 E27 09 17.3, 144 m a. s. l., 1 ♂, 1 ♀ from dry branches with leaves of *P. nigra*, collected by beating the vegetation.

***Loensia pearmani* Kimmins, 1941**

New record for the area: 03.06.2022, Strandzha Mts, S of Sredets town, *Quercus* sp. and *Pinus nigra* forest, N42 18 19.0 E27 09 17.3, 144 m a. s. l., 1 ♂, from dry branches with leaves of *P. nigra*, collected by beating the vegetation.

***Loensia variegata* (Latreille, 1799)**

Published records: Georgiev & Todorov (2018): "22.6.2018, 1 ♀, South Black Sea Coast, vicinities of Tsarevo town, Quercus rubra plantation, on a green leaf of live Q. rubra, N42 10 13.2 E27 50 23.6, 47 m a. s. l., collected during night by head torch, and using a dry grass straw and saliva, O. Todorov leg."

***Psococerastis gibbosa* (Sulzer, 1776)**

Published records: Georgiev (2017): "27.8.2017, near the estuary of Veleka River, Fraxinus sp. forest, found in a paddle on a dirt road, N42 03 48.5 E27 58 11.0, 4 m a. s. l., 2 ♀."

***Trichadenotecnum majus* (Kolbe, 1880)**

Published records: Georgiev (2017): "27.8.2017, near the estuary of Veleka River, *Fraxinus* sp. forest, found in a paddle on a dirt road, N42 03 48.5 E27 58 11.0, 4 m a. s. l., 1 ♀."

***Trichadenotecnum innuptum* Betz, 1983**

Published records: Georgiev (2017): "27.8.2017, near the estuary of Veleka River, *Fraxinus* sp. forest, on a trunk of living *Fraxinus* sp., N42 03 48.5 E27 58 11.0, 4 m a. s. l., 1 ♀, coll. by hand."

Discussion

All species were found in or at the edge of forests or scrubs with scattered trees. In this area the native forests are represented mainly by different *Quercus* spp. and *Fagus orientalis*, and tree plantations mainly of *Pinus nigra* and *Quercus rubra*. At the river bank formations the tree species *Fraxinus* sp., *Salix* sp. and *Alnus glutinosa* dominate. Very few species were found in yards and parks such as *Cerobasis guestfalica*, *Trichopsocus dalii* and *Valenzuela burmeisteri*. No species were found in the open grasslands. The only species which was found in a patch of *Phragmites australis* near a small creek in a relatively open habitat was *Ectopsocus briggsi*.

Most of the specimens were associated with trees from the genera *Pinus*, *Cupressus*, *Crataegus* and *Quercus*, even with the introduced *P. pinaster* and *Q. rubra*. A few of them were found in other trees as: *Acer* sp., *Fraxinus* sp., *Salix* sp., *Ulmus* sp., *Prunus cerasifera* and *Corylus avellana*. Psocid species were collected and from bushes of *Paliurus spina-christi*.

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Comparing Two Models of UAVs (drones) as a Monitoring Tool for Freshwater Turtles

Emil S. Yordanov*, Ivelin A. Mollov

University of Plovdiv, Faculty of Biology, Department of Ecology and Environmental Conservation, 24 Tzar Assen Str., 4000 Plovdiv, BULGARIA
*Corresponding author: gorataem@gmail.com

Abstract. Nowadays, drone models are becoming more and more diverse with many different shapes and features. Some of them are more compact in shape, others are more stable in flight and with different camera qualities. In our study, we compare two drone models – "Phantom 4 Pro + v2.0" and "Mavic Pro Platinum" as a monitoring tool for freshwater turtles. Total flight covered area is approximately 114 decares (11.4 ha) above two rivers in Strandzha Mts. - Veleka River and Silistar River. The current study has shown that "Phantom 4 Pro + v2.0" is very suitable for wide rivers, where there are no overhanging trees over the riverbed and "Mavic Pro Platinum" is more suitable for narrow riverbeds with overhanging crowns of trees above them.

Key words: drones, freshwater turtles, Phantom 4 Pro + v2.0, Mavic Pro Platinum.

Introduction

The slow but effective entry of unmanned aerial vehicles (UAVs) and especially so-called drones into environmental research is starting to become an increasingly important and effective method that opens new horizons in scientific research. In a relatively short time, it has become an affordable and cost-effective tool with many emerging applications. Remote sensing technology is increasingly used to assess changes in forest cover, species distribution and carbon stocks (Koh & Wich, 2012). Both in the field of agriculture, for monitoring and evaluation of crops, orchards and forests, and in the field of environmental monitoring and biodiversity maintenance. Many institutions, such as non-governmental organizations and universities working in the field of environmental protection, are starting to use more and more different types of UAVs (drones), as their possibilities are growing. UAVs can cover a large distance, to reach remote areas that can be inaccessible to researchers for monitoring of target species (Bevan et al., 2016). Nowadays, using drones as a remote monitoring method in the area of biodiversity is becoming more common. They are used mainly in studies of birds and mammals (Hodgson et al., 2013; Vermeulen et al., 2013; Wilson et al., 2017), also of plant species (Cruzan et al., 2016). Herpetofauna studies including common methods can be quite difficult due to reptile-specific and environmental variables, also a differing capture probability for capture techniques (Vogt and Hine, 1982; MacKenzie et al., 2002; Williams

& Berkson, 2004). The use of UAVs for monitoring herpetofauna along roads and small paths can be a passive and suitable method of determining the presence of herpetofauna species in an area, causing much less disturbance (Chabot & Bird, 2015) in comparison to the traditional methods. However, the success rate of the study, depends on the studied species (size, peculiarities of its biology, etc.) and the technical characteristics of the drones used for monitoring.

Our goal is to establish what are the advantages and disadvantages of two types of drones: "Phantom 4 Pro + v2.0" and "Mavic Pro Platinum", and to determine which of the two models of drones is more suitable as a tool for monitoring of freshwater turtles. What flight characteristics are suitable to be performed without disturbing the individuals and to determine whether capturing video or photos is more effective for subsequent analysis.

Materials and Methods

In the present study, we used two different models of drones "Phantom 4 Pro + v2.0" and "Mavic Pro Platinum". Drone specifications are given in Table 1.

Table 1. Drone specifications of "Phantom 4 Pro + v2.0" and "Mavic Pro Platinum".

Camera	Phantom 4 Pro+ v2.0	Mavic Pro Platinum
Sensor	1-inch 20-megapixel Sony Exmor R CMOS	1/2.3" (CMOS), effective pixels: 12.35 M (Total pixels:12.71M)
Lens	FOV (Field of View) 84 °, 8.8 mm / 24 mm (35 mm equivalent), f / 2.8 - f / 11	FOV 78.8° 26 mm (35 mm format equivalent) f/2.2 distortion < 1.5%, focus from 0.5 m to ∞ ISO
Mechanical Shutter Speed	8 - 1/2000 s	
Electronic Shutter Speed	8-1/8000 s	8s -1/8000 s
Maximum Image Resolution	16: 9 - 5472 × 3078	4000×3000
Video Recording	4K, 30 / fps with H.265 compression	4K: 4096×2160 24p
Max Video Bitrate	100 Mbps	60 Mbps
Remote Controller		
Operating Frequency	2.400 - 2.483 GHz and 5.725 - 5.825 GHz	2.4 GHz to 2.483 GHz
Max Transmission Distance	FCC: 10000 m CE: 6000 m SRRC: 6000 m MIC: 6000 m (Unobstructed, free of interference)	FCC – 4.3 mi (7 km) CE – 2.5 mi (4 km) SRRC – 2.5mi (4 km) MIC – 2.5 mi (4 km) (Unobstructed, free of interference)
Remote Controller Screen	LCD 5.5-inch 1080p (1920×1080)	
Battery	LiPo 4S, 5870 mAh / 15.2 V / 89.2	liPo 3S 3830 mAh /11.4 V / 43.6 Wh
Max Flight Time	30 minutes (no wind at a consistent)	30 minutes (no wind at a consistent)
Maximum Lifting Speed	S-mode – 6 m / s P-mode: 5 m / s	S-mode – 5 m / s
Maximum Lowering Speed	S-mode – 4 m / s P-mode: 3 m / s	S-mode – 3 m / s
Maximum Speed	72 km / h (S-mode) 58 km / h (A-mode) 50 km / h (P-mode)	65 km / h (s-mode)
Maximum Take-off Height Altitude (a.s.l.)	6000 m	5000 m
Satellite Positioning Systems	GPS / GLONASS	GPS / GLONASS
Hover Accuracy Range	Vertical: ±0.1 m (with Vision Positioning) ±0.5 m (with GPS Positioning) Horizontal: ±0.3 m (with Vision Positioning) ±1.5 m (with GPS Positioning)	Vertical: +/- 0.1 m (when Vision Positioning is active) or +/-0.5 m Horizontal: +/- 0.3 m (when Vision Positioning is active) or +/-1.5 m

The flights with both models of drones were performed in the period June-August 2021 in a territory of "Strandzha" Nature Park. The territory of the park overlaps with NATURA 2000 protected area "1007 Strandzha" (EEA, 2022). The flights were executed above the mouths of the rivers Silistar (Fig. 1) and Veleka (Fig. 2). The total area of the covered territory is approximately 114 decares (11.4 ha) respectively: Veleka River - 98.8 dca (9.8 ha) and Silistar River - 15.1 dca (1.5 ha). The flights were performed in two periods: the beginning of July (13.07.2021) and in the end of July and the beginning of August (30.07 - 01.08.2021), in good meteorological conditions for the purpose (e.g. gentle breeze/no rain and good visibility). In total of 11 flights, 6 were made between 13:00 and 16:00, three in the morning between 8:00 and 10:10 and two in the evening at 18:35 and 19:25. The flights are performed over the water surface near the shore, so that turtles can be photographed coming out on fallen trees and branches in the water, basking in the sun, also sinking and floating turtles on the surface of the water. The riverbed of the Silistar River is narrow, the width in the surveyed areas varies between 10m to 20m and in the most part the banks are covered with dense trees and shrubs. A significant part of the crowns of the riparian trees overhangs the riverbed, occupying a significant part of it, which is why drone flights in these places were made with avoid obstacles sensors turned off (Enable Obstacle Avoidance / off). The Veleka River has a wide riverbed - in the places of overflights it is between 76m-40m, where it is not necessary to turn off the sensors for obstacles (Enable Obstacle Avoidance / on). The average flight altitude is 4.18m (SD=3.2), with a maximum of 12m and a minimum of 0.5m. In this case, there is no adherence to a certain height, as the purpose is to check what is the lowest height the drone can descend without disturbing the turtles and other river dwellers. After finishing the field work, all recordings (photos and videos) were reviewed on a computer to account for individuals who were not seen during the flight, and to establish whether capturing video or photos is more effective for subsequent analysis. The screen of the "Phantom 4 Pro + v2.0" remote is 5.5 inches (DJI, 2022a), due to the small size of the screen on the remote control, the probability of missing objects at the time of flight is very high.

Fig. 1. Flights above Silistar River with "Phantom 4 Pro + v2.0".

Fig. 2. Flights above Veleka river with "Mavic Pro Platinum".

Results and Discussion

During the flights we found out both types of drones are resistant to air currents, the drones are very stable in the air when they hang, the cameras of the drones are suitable for the purposes of the methodology.

During the flights, 9 aquatic turtles (*Emys orbicularis*) were recorded: 8 in Silistar River and 1 in Veleka River. The reason we observed only one aquatic turtle in the Veleka River is the all-day flow of tourists in July and August. There was not much opportunity to get very close to the water surface, as well as to operate calmly with the drone, in a way which avoids collision with tourists on kayaks. After reviewing the photos and videos, 5 more aquatic turtles from the Silistar River and two aquatic snakes (*Natrix sp.*) were found. At a height of 6 meters above the water surface and with the drone positioned above the turtles, they are not disturbed, but between 6 and 4 meters the probability of disturbing increases progressively, while below 4 meters it is certain that they will jump back in the water. The results show that photos are much more effective than videos. There is much more detail in the photos than in the videos. When reviewing the photos, there is an option to zoom in, you can aqurately identify species of the herpetofauna hidden among the aquatic vegetation or swimming underwater up to a depth of 10 to 20 cm.

Both types of drones are suitable for monitoring of freshwater turtles and even other representatives of freshwater herpetofauna that emerge on the water surface to breathe, such as aquatic snakes and frogs. "Phantom 4 Pro + v2.0" has more powerful rotors than "Mavic Pro Platinum", which makes it very stable in sudden and strong changes in air currents. Therefore, longer distance can be covered in a shorter time and it is very stable when it is necessary to hang on one place in windy conditions. Due to its larger size and bulky shape "Phantom 4 Pro + v2.0" is very suitable for wide riverbeds such as the Veleka River, where there are no overhanging trees over the entire riverbed. Due to the greater stability when hanging in the air, there is better visibility (no shaking or other camera interference) even when there is a strong wind. On the Veleka River the remote control of "Phantom 4 Pro + v2.0" started to lose signal with the drone at a distance of more than 500 m. Between the drone and the remote control there were tall trees and a small river bend. On the Silistar River, the loss of signal appeared at a distance of about 300m, but there was very dense bush vegetation between the remote control and the drone, trees with overhanging crowns, covering part of the

riverbed. The quality of the "Phantom 4 Pro + v2.0" camera is very good, the pictures are with more detail, wherefore in the subsequent review of the photos many more details could be found in them. That allows taking photos from a greater height - 7-8 m (Fig. 3a,b, 4) and the pictures will be detailed enough to detect not only freshwater turtles, but other freshwater inhabitants.

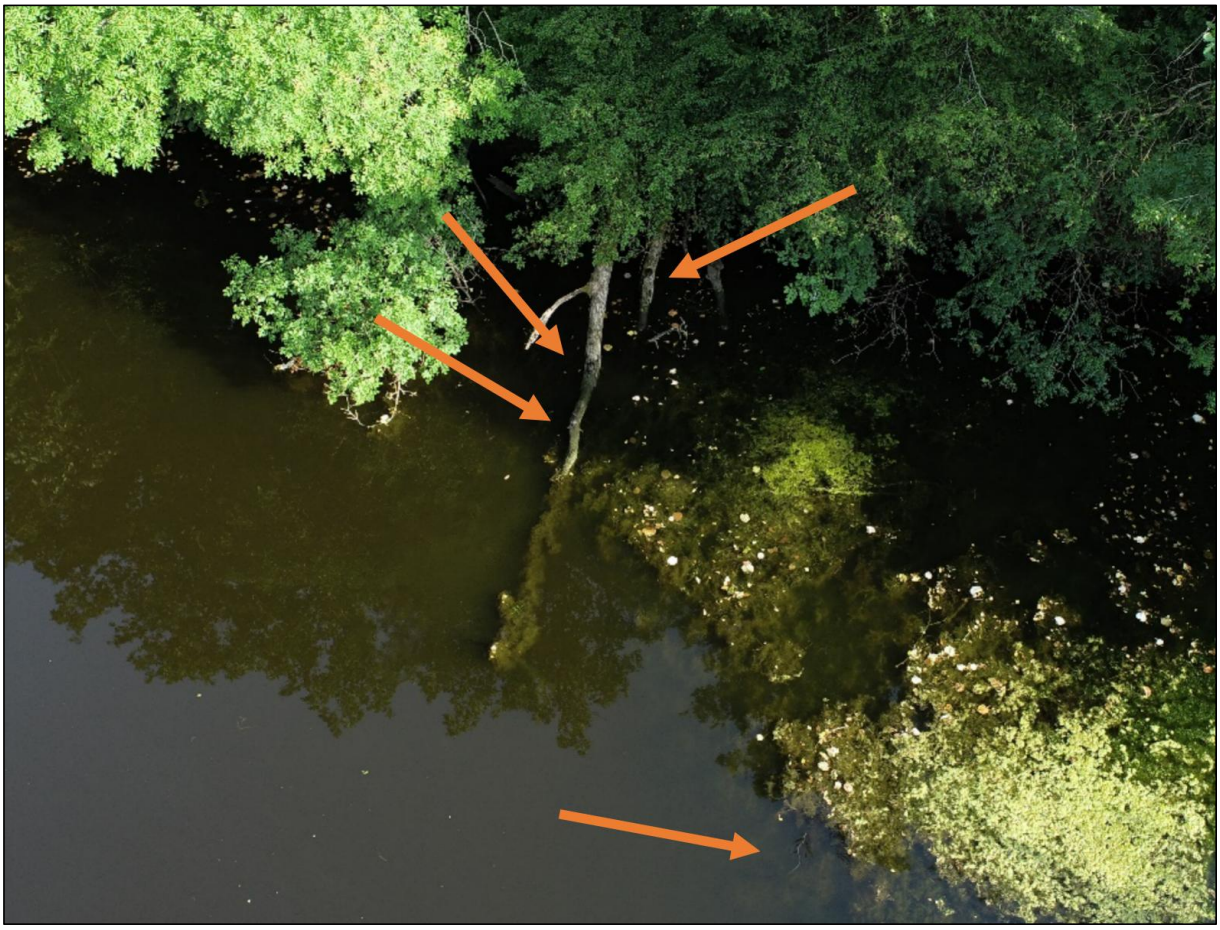

Fig. 3a. Three freshwater turtle and one water snake captured with "Phantom 4 Pro + v2.0" in Silistar River from a distance of 7 m.

Fig. 3b. Zoomed and cropped parts of Fig. 3a with clearly visible freshwater inhabitants (*Emys orbicularis* - 3 ind. and *Natrix natrix* - 1 ind.).

Fig. 4. Juvenile freshwater turtle captured in the water with "Phantom 4 Pro + v2.0" in Silistar River from a distance of 5 m.

"Mavic Pro Platinum" is a smaller, more compact, drone than the "Phantom 4 Pro + v2.0". Due to its compactness and aerodynamic shape, it is much more maneuverable, it can effectively avoid obstacles and it can pass through quite narrow spaces which makes it very suitable for narrow riverbeds with overhanging crowns of trees above them, such as Silistar River. However, this also depends to a large extent on the pilot's skills. "Mavic Pro Platinum" is much more susceptible to stronger air currents, especially if they are sudden. It is relatively stable in the air, but in narrow riverbeds it should be borne in mind that strong and sudden gusts of wind can displace the drone and it can crash in overhanging branches from the treetops or in tall riparian vegetation.

With the "avoid obstacles" sensors on, the drone detects everything in distance of 10 m around it as an obstacle, and when the drone is 3 m away from the obstacle, it stops in one place and does not allow you to continue your flight. This type of flying requires a lot of experience, as in a significant part of the flights there is no visual contact with the drone and the orientation is only based on the camera. The camera has visibility only forward and downward (in case the drone turns laterally, it is possible to check for obstacles, sideways and behind it), but there is no way to see obstacles upwards, such as hanging branches of trees which is a typical characteristic of this habitat type. The signal loss between the remote control and the "Mavic Pro Platinum" is almost the same like with "Phantom 4 Pro + v2.0", the difference is insignificant. The camera quality of the "Mavic Pro Platinum" is not so good, it is suitable for the purpose of the study, but the pictures are not so detailed and they have to be taken from lower distance (5 m or lower - Fig. 6), in order not to miss some objects on the water surface (Fig. 7).

According to Biserkov & Lukanov (2017), the optimal height for drone observation is 10 m, and above this height the turtles are not well visible, but they used "Phantom 3 Professional" drone with 12MP camera, which is a quite old model. Also, in their study they mention, that when piloting the UAV below 10 m, the noise from the drone rotors causes disturbance to the turtles and they jump back in the water from their basking sites. In our study, the anxiety of turtles was observed between 7 to 4 m in flight height. The reason

for this difference most likely is because "Phantom 4 Pro + v2.0" features new ESCs, low-noise propellers, "OcuSync", and a redesigned controller, which makes it less noisy than the "Phantom 3 Professional", according to DJI's official website (DIJ, 2022a). Also, "Mavic Pro Platinum" is a less noisy than "Phantom 4 Pro + v2.0" (Table 2). That allows us to descend below 10 m without causing disturbance (Fig. 3, 4 and 8). We managed to approach to 4.5 m before causing noticeable disturbance. Due to the good resolution of the "Phantom 4 Pro + v2.0" camera, it is not necessary to go less than 7 m. After analyzing video and photo materials from all flights, we concluded that, photos are much more effective than videos. There is much more detail in the photos than in the videos. When reviewing the photos, there is an option to zoom in, you can see species of the herpetofauna hidden among the aquatic vegetation or swimming underwater up to a depth of 10 cm (it also depends on the transparency of the water surface) (Fig. 4, 6 and 8). In most cases we were able to identify the species of freshwater turtles or at least the genus of aquatic snakes. However, it also depends on the size of the photo and the height from which it was taken (lower height + higher resolution = more detailed photo). Also, viewing photos is somewhat faster than viewing videos. Even if you capture a photo from a video, the photo will be with much lower quality and zooming is involved, the objects in it, would not be clearly visible (Fig. 4 and 8). When we compare the pictures and the videos from both types of drones it is obvious that "Phantom 4 Pro + v2.0" takes better pictures and videos with much higher quality than the "Mavic Pro Platinum".

Table 2. The range of acoustic footprints of the DJI drones according to Airborne Drones (drone noise level, January 13, 2020).

DJI models	
Mavic Platinum	70dB
Spark	74dB
Phantom 4 Pro 2.0	76,5dB
Mavic Air	76dB
Mavic Pro	79dB
Phantom 4 Pro	81dB

Fig. 5. *Emys orbicularis* captured with "Mavic Pro Platinum" in Silistar River from a distance of 4,5 m.

Fig. 6. Picture taken from a video record from "Mavic Pro Platinum", on the picture is visible two freshwater turtles and two frogs.

Fig. 7. Picture taken from a video record from "Mavic Pro Platinum", freshwater turtle Veleka River captured from a distance of 5 m.

Fig. 8. A water snake (*Natrix* sp.) above the water surface captured with "Phantom 4 Pro + v2.0" in Silistar River from a distance of 6 m.

Using "Phantom 4 Pro", Huerta et al. (2020) conducted an experiment for using UAVs, for detecting herpetofauna species and their results showed that the use of UAVs for monitoring reptiles along roads can be a passive, convenient method with lower disturbance to determine the presence of herpetofauna in an area. The image quality of "Pahntom 4 Pro" may not be sufficient to positively identify herpetofauna to the species level, but with the future development of UAVs and camera quality this method could be an essential tool for future detection and monitoring of herpetofauna in open environments.

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Distribution of the Amphibians and Reptiles along the Southern Black Sea Coast and Strandzha Nature Park (SE Bulgaria)

Ivelin A. Mollov[1]*, Nikolay D. Natchev[2], Teodora V. Koynova[2], Ivan Z. Kambourov[3], Milen H. Rashkov[3], Dimityr A. Dimitrov[1], Ognyan B. Todorov[4], Tsvetelina D. Petrova[4], Kristian B. Vladov[4], Spas G. Uzunov[5]

[1]University of Plovdiv "Paisii Hilendarski", Faculty of Biology, Department of Ecology and Environmental Conservation, 2 Todor Samodumov Str., BG-4000 Plovdiv, BULGARIA
[2]University of Shumen, Faculty of Natural Sciences, Department of Biology, 115 Universitetska Str., BG-9700 Shumen, BULGARIA
[3]Strandzha Nature Park Directorate, 1 Yanko Maslinkov Str., Malko Tarnovo, BULGARIA
[4]Regional Natural History Museum – Plovdiv, 34 Hristo G. Danov Str., BG-4000 Plovdiv, BULGARIA
[5]Bulgarian Biodiversity Foundation, 53 Gourko Str., bl.1 fl.1, BG-8000 Bourgas, BULGARIA
*Corresponding author: mollov_i@uni-plovdiv.bg

Abstract. The present study is a review of the herpetofauna of the sourtheastern part of the Black Sea Coast and Strandzha Nature Park. A total of thirty nine species were recorded for both regions (12 amphinian species, 27 - reptiles), of which two newt species (*Lissotriton vulgaris, Triturus ivanbureshi*), ten species of anurans (*Bombina bombina, B. variegata, Bufo bufo, Bufotes viridis, Pelobates syriacus, Hyla orientalis, Rana dalmatina, Pelophylax ridibundus, P.* cf. *esculentus, P. bedriage*), eleven species of lizards (*Mediodactylus daniliewskii, Angius colchicus, Pseudopus apodus, Ablepharus kitaibelii, Lacerta agilis, L. trilineata, L. viridis, Podarcis muralis, P. tauricus, P. erhardii, Darevskia praticola*), four species of native turtles and tortoises (*Testudo graeca, T. hermanni, Emys orbicularis, Mauremys rivulata*) and twelve species of snakes (*Xerotyphlops vermicularis, Platyceps najadum, P. collaris, Natrix natrix, N. tessellata, Dolichophis caspius, Elaphe sauromates, Zamenis longissimus, Zamenis situla, Coronella austriaca, Malpolon insignitus, Vipera ammodytes*). A comparison between the species compositon of the herpetofauna between South Black Sea Coast and Strandzha NP is made and analyzed.

Key words: amphibians, reptiles, conservation, Bulgaria.

Introduction

The current paper aims to review all published data about the distribution of the amphibians and reptiles in the Southern Black Sea Coast and Strandzha Nature Park and supplement it with new data records.

According to Beshkov (1993) the tight stretch of the Black Sea Coast (5-10 km) south-east of Burgas City is one of the richest herpetofaunal regions in Bulgaria. Strandzha Nature Park is the biggest protected territory in Bulgaria, occupying an area of 1161 km^2, conserving great biodiversity (Kamburov, 2009). Although, there are numerous studies, conducted in both study regions, some of which are quite extensive (see Appendix 1 & 2), but so far there is no complete study on the distribution of the amhibians and reptiles in the study regions.

Material and Methods

The study area in SE Bulgaria (Fig. 1) includes the territory of Strandzha Nature Park and the area of the Southern Black Sea Coast (from Burgas City to the village of Rezovo) covering 14 whole and 20 partial squares of the 10×10 km Universal Transverse Mercator coordinate system grid (UTM). Both study regions, of course, overlap in the area from Varvara Village to Rezovo Village in the quadrats along the coast.

Unpublished locality data

The field data is collected by the authors and colleagues (see Acknowledgements) for the period 2002–2022, as the precise presence records (collected with a GPS, presented in decimal degrees) were given where available. Generally, the search effort has been uneven and sampling was biased, with favoured herpetological regions and habitats in proximity to roads being visited more often. The field work was carried out by multiple researchers (often independently) through an extended period and was performed to serve different goals. The amphibians and reptiles were searched for, usually through visual surveys, focusing on suitable habitats. Each recorded individual was identified to the species level. Precise geographic coordinates (error ±10 m) were obtained with a hand-held GPS units (Garmin Inc.) or with smartphones with integrated GPS, where possible. Sex and age group (adult, subadult or juvenile) are also determined, where possible.

Published locality data

We reviewed all available herpetological publications related to Bulgaria (over 850 publications from 1892–2022) for the amphibian and reptile distributional records in the study region. In most sources the names of settlements or geographic objects were given as reference points for the locations; we assigned these as best as possible to a UTM 10×10 km grid (UTM zone 35N, datum WGS 1984). Publications, which only repeat already published localities, whithout giving new data were excluded.

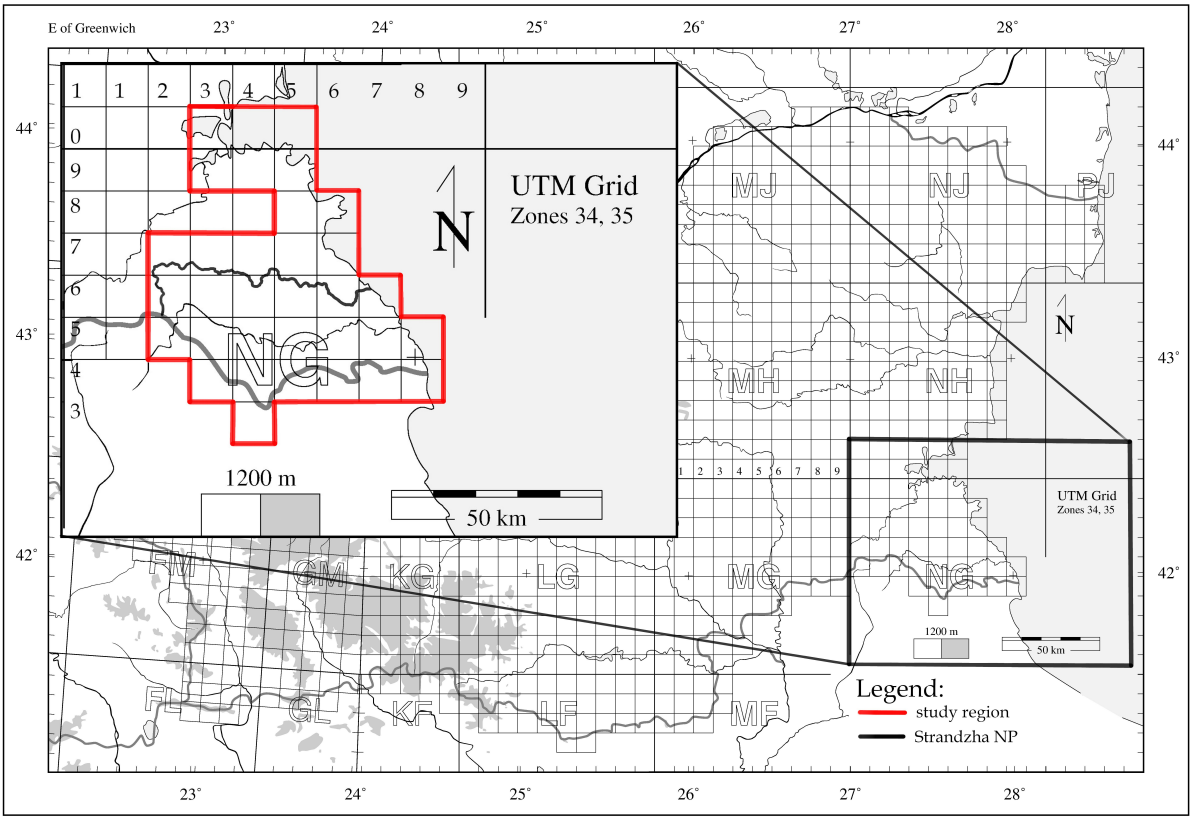

Fig. 1. UTM map of the location of the studied sites.

Results and Discussion

For the Southern Black Sea Coast we recorded a total of 11 amphibian species, which represents 47.83% of the Bulgarian batrachofauna and 25 reptiles (71.43% of the Bulgarian herpetofauna[1], respectively). For Strandzha Nature Park, the recorded amphibian species are 7, representing 30.43% of the Bulgarian batrachofauna and 23 reptiles (65.71% of the Bulgarian herpetofauna, respectively).

All previously published localities, registered by us, from the available herpetological literature are presented in Appendix 1 and 2. Table 1 presents the species richness of the southern Black Sea Coast (from Burgas to Rezovo Village) and Strandzha NP. Our original distributional records are given in Table 2.

Table 1. Current species richness of the Southern Black Sea Coast and Strandzha NP.

Species	S Black Sea Coast	Strandzha NP
Lissotriton vulgaris	+	+[2]
Triturus ivanbureshi	+	-
Bombina bombina	+	-
Bombina variegata	-	+
Bufo bufo	+	+
Bufotes viridis	+	+
Pelobates syriacus	+	-
Hyla orientalis	+	+
Rana dalmatina	+	+
Pelophylax ridibundus	+	+
P. cf. esculentus	+	-
Pelophylax bedriage	+	-
Testudo graeca	+	+
Testudo hermanni	+	+
Emys orbicularis	+	+
Mauremys rivulata	+	+
Mediodactylus daniliewskii	+	+
Angius colchicus	+	+
Pseudopus apodus	+	+
Ablepharus kitaibelii	+	+
Lacerta agilis	-	+
Lacerta trilineata	-	+
Lacerta viridis	+	+
Podarcis muralis	+	+
Podarcis tauricus	+	+
Podarcis erhardii	+	+[3]
Darevskia praticola	+	+
Xerotyphlops vermicularis	+	-
Platyceps najadum	+	-
Platyceps collaris	+	-
Natrix natrix	+	+
Natrix tessellata	+	+
Dolichophis caspius	+	+
Elaphe sauromates	+	+
Zamenis longissimus	+	+
Zamenis situla	+	-
Coronella austriaca	+	+
Malpolon insignitus	+	+
Vipera ammodytes	+	+
Total Amphibia	**11**	**7**
Total Reptilia	**25**	**23**

Combined analysis of amphibian and reptile species richness in both study regions clearly indicate that the protected areas in the study region are of primary importance for the herpetofauna protection. Not only the nature park, but all reserves, protected areas and nature monuments in its territoty and along the Southern Black Sea Coast. Both areas are herpetologically important areas, containing high species richnes with many conservationally significant species. Habitat destruction in the last decade impacts directly amphibians and reptiles. For example the abandoned untill recently "Zname na mira" Assembly at Arkutino Beach is privatized and its construction is in progress. Many important herpetofauna species are reported from that same locality and finishing these buildings and their exploitations as hotels will inevitable impact negatively the aphibians and reptiles in the area. There are similar processes currently in progress in Silistar Vi-

[1] The invasive turtle (*Trachemys scripta)* and the considered extinct for Bulgaria marine turtles (Caretta caretta, Chelonia mydas) and the vipers (Vipera ursinii, Vipera aspis) are excluded from the analysys.

[2] Only at Varvara Village (see Table 2).

[3] Only at Varvara Village (see Table 2).

Table 2. Original distributional records, collected in the period (2002-2022) from the study region. The order of the registered species is alphabetical. New localities are given in bold. *Observers:* A.A. - A. Angelov; E.Y. - E. Yordanov; D.D. - D. Dimitrov; I.K. - I. Kamburov; I.M. - I. Mollov; I.T. - I. Telenchev; K.V. - K. Vladov; M.R. - M. Rashkov; N.N. - N. Natchev; O.T. - O. Todorov; P.M. - P. Marinova; T.K. - T. Koynova; T.P. - Ts. Petrova; S.U. - S. Uzunov.

Species	Locality	Latitude N	Longitude E	Count	Age group	UTM	Date	Observer(s)
Ablepharus kitaibelii	**Brashlyan Village**	**42.0551459**	**27.4348349**	**1**	**adult**	**NG35**	**25/03/2017**	**I.T.**
Ablepharus kitaibelii	**Marina Reka**	**42.109666**	**27.757622**	**1**	**adult**	**NG65**	**07/07/2019**	**D.D.**
Ablepharus kitaibelii	Stoilovo Village	42.04240986	27.51059465	1	adult	NG45	13/10/2019	I.T.
Ablepharus kitaibelii	Malko Tarnovo	41.990438	27.561781	3	adult	NG44	22/05/2021	N.N., T.K.
Ablepharus kitaibelii	Malko Tarnovo	41.987419	27.564014	1	adult	NG44	22/05/2021	N.N., T.K.
Ablepharus kitaibelii	Malko Tarnovo	41.987175	27.56452	5	adult	NG44	22/05/2021	N.N., T.K.
Ablepharus kitaibelii	Malko Tarnovo	41.987815	27.569613	2	adult	NG44	22/05/2021	N.N., T.K.
Ablepharus kitaibelii	Malko Tarnovo	41.987176	27.572031	2	adult	NG44	22/05/2021	N.N., T.K.
Ablepharus kitaibelii	Malko Tarnovo	41.986751	27.573251	1	adult	NG44	22/05/2021	N.N., T.K.
Ablepharus kitaibelii	Malko Tarnovo	41.991302	27.57712	1	adult	NG44	22/05/2021	N.N., T.K.
Ablepharus kitaibelii	**Stoilovo Village**	**42.060756**	**27.529211**	**1**	**adult**	**NG45**	**23/05/2021**	**N.N., T.K.**
Ablepharus kitaibelii	**Stoilovo Village**	**42.069519**	**27.524698**	**1**	**adult**	**NG45**	**23/05/2021**	**N.N., T.K.**
Ablepharus kitaibelii	Ahtopol	42.078039	27.960468	1	adult	NG76	29/05/2021	N.N., T.K., P.M.
Ablepharus kitaibelii	**Sinemorets Village**	**42.050502**	**27.987265**	**2**	**adult**	**NG85**	**29/05/2021**	**N.N., T.K., P.M.**
Ablepharus kitaibelii	**Sinemorets Village**	**42.048428**	**27.968117**	**4**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Ablepharus kitaibelii	**Sinemorets Village**	**42.048225**	**27.968265**	**1**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Ablepharus kitaibelii	**Sinemorets Village**	**42.047869**	**27.968395**	**1**	**juv.**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Ablepharus kitaibelii	**Sinemorets Village**	**42.048467**	**27.968269**	**5**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Ablepharus kitaibelii	**Sinemorets Village**	**42.049394**	**27.968422**	**11**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Ablepharus kitaibelii	**Sinemorets Village**	**42.050602**	**27.96794**	**1**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Ablepharus kitaibelii	**Sinemorets Village**	**42.046942**	**27.962137**	**2**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Ablepharus kitaibelii	**Sinemorets Village**	**42.046399**	**27.962112**	**2**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Ablepharus kitaibelii	**Sinemorets Village**	**42.046138**	**27.962165**	**3**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Ablepharus kitaibelii	**Sinemorets Village**	**42.045712**	**27.962787**	**3**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Ablepharus kitaibelii	**Sinemorets Village**	**42.04549**	**27.963279**	**1**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Ablepharus kitaibelii	**Sinemorets Village**	**42.045087**	**27.963723**	**1**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Ablepharus kitaibelii	**Sinemorets Village**	**42.043981**	**27.964225**	**1**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Ablepharus kitaibelii	**Sinemorets Village**	**42.043775**	**27.964028**	**2**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Ablepharus kitaibelii	**Sinemorets Village**	**42.040095**	**27.943162**	**1**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Ablepharus kitaibelii	**Sinemorets Village**	**42.039493**	**27.942878**	**2**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Ablepharus kitaibelii	**Sinemorets Village**	**42.039246**	**27.942736**	**2**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Ablepharus kitaibelii	**Sinemorets Village**	**42.03837**	**27.942608**	**2**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Ablepharus kitaibelii	**Sinemorets Village**	**42.040257**	**27.942788**	**1**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Ablepharus litaibelii	**Silkosia Reserve**	**n/a**	**n/a**	**1**	**adult**	**NG65**	**09/05/2008**	**O.T.**
Ablepharus litaibelii	**Marina Reka, near Bulgari Village**	**42.111310**	**27.763451**	**1**	**adult**	**NG66**	**04/08/2008**	**I.M.**
Anguis colchica	Mladezhko Village	42.14851446	27.3970356	2	subad.	NG36	25/05/2015	I.T.
Anguis colchica	Mladezhko Village	42.14318157	27.42887878	1	subad.	NG36	25/05/2015	I.T.
Anguis colchica	**Rezovo Village**	**41.98804389**	**28.0243324**	**1**	**adult**	**NG84**	**16/08/2015**	**I.T.**
Anguis colchica	Mladezhko Village	42.14473439	27.42445421	1 ♂	adult	NG36	11/05/2016	I.T.
Bufo bufo	**Tsarevo, cemetary**	**42.176378**	**27.838529**	**1**	**adult**	**NG66**	**06/06/2017**	**I.M., O.T.**
Bufo bufo	roadkill near the bridge of Veleka River	42.061144	27.969669	1	adult	NG85	02/06/2021	I.M.
Bufo bufo	roadkill on dirt road near the	42.023777	28.007898	1	adult	NG85	01/07/2021	I.M.

	beach of Silistar							
Bufo bufo	**Marina Reka, near Bulgari Village**	**42.110704**	**27.76188**	**1**	**adult**	**NG65**	**02/06/2022**	**K.V.**
Bufo bufo	Rosenska River, near Veselie Village	42.31371	27.61886	20	adult	NG58	03/06/2022	K.V.
Bufo bufo	Diavolska River, near Primorsko	42.25889	27.73414	2	adult	NG67	05/06/2022	K.V.
Bufotes viridis	Silistar	42.02332	28.00232	1	adult	NG85	02/07/2021	T.P., I.M., E.Y.
Bufotes viridis	Silistar	42.02340	28.00877	1	adult	NG85	31/07/2021	T.P., E.Y.
Coronela austriaca	**Bulgari Village**	**n/a**	**n/a**	**1**	**adult**	**NG65**	**11/06/2002**	**S.U.**
Coronela austriaca	**Kosti Village**	**n/a**	**n/a**	**1**	**adult**	**NG65**	**02/08/2002**	**S.U.**
Coronela austriaca	**Brodilovo Village**	**n/a**	**n/a**	**1**	**adult**	**NG75**	**17/08/2003**	**S.U.**
Coronela austriaca	**Varvara Village**	**n/a**	**n/a**	**1**	**adult**	**NG76**	**29/05/2004**	**S.U.**
Coronela austriaca	**roadkill on the road from Tsarevo to Arapya Beach**	**42.179169**	**27.835660**	**1**	**juv.**	**NG67**	**22/06/2004**	**I.M.**
Coronela austriaca	**Ahtopol**	**n/a**	**n/a**	**1**	**adult**	**NG76**	**21/07/2005**	**S.U.**
Coronela austriaca	**Tsarevo**	**n/a**	**n/a**	**1**	**adult**	**NG76**	**11/06/2006**	**S.U.**
Coronella austriaca	**Malko Tarnovo**	**41.987346**	**27.567508**	**1**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Darevskia praticola	**Marina Reka, near Bulgari Village**	**n/a**	**n/a**	**1**	**adult**	**NG66**	**13/07/2010**	**O.T.**
Darevskia praticola	**Brashlyan Village**	**42.0550825**	**27.4348859**	**2**	**adult**	**NG35**	**25/03/2017**	**I.T.**
Darevskia praticola	**Malko Tarnovo**	**41.987699**	**27.563758**	**2**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Darevskia praticola	**Malko Tarnovo**	**41.987536**	**27.564022**	**1**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Darevskia praticola	**Malko Tarnovo**	**41.987419**	**27.564014**	**1**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Darevskia praticola	**Malko Tarnovo**	**41.987288**	**27.564347**	**3**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Darevskia praticola	**Malko Tarnovo**	**41.987175**	**27.56452**	**3**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Darevskia praticola	**Malko Tarnovo**	**41.988661**	**27.562469**	**1**	**juv.**	**NG44**	**22/05/2021**	**N.N., T.K.**
Darevskia praticola	**Malko Tarnovo**	**41.987114**	**27.567332**	**1♀**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Darevskia praticola	**Malko Tarnovo**	**41.987517**	**27.568038**	**1♂**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Darevskia praticola	**Malko Tarnovo**	**41.987517**	**27.568038**	**1**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Darevskia praticola	**Malko Tarnovo**	**41.987256**	**27.571315**	**1**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Darevskia praticola	**Malko Tarnovo**	**41.987577**	**27.574433**	**1**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Darevskia praticola	**Malko Tarnovo**	**41.988676**	**27.576691**	**1**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Darevskia praticola	**Malko Tarnovo**	**41.991511**	**27.576743**	**3**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Darevskia praticola	**Malko Tarnovo**	**41.990814**	**27.577048**	**1**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Darevskia praticola	**Malko Tarnovo**	**41.988418**	**27.570392**	**1**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Darevskia praticola	**Malko Tarnovo**	**41.988024**	**27.568298**	**1**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Darevskia praticola	**Stoilovo Village**	**42.06135**	**27.535735**	**1**	**subad.**	**NG45**	**23/05/2021**	**N.N., T.K.**
Darevskia praticola	**Stoilovo Village**	**42.060517**	**27.538194**	**1**	**juv.**	**NG45**	**23/05/2021**	**N.N., T.K.**
Darevskia praticola	**Sinemorets Village**	**42.049185**	**27.968507**	**1**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Darevskia praticola	**Sinemorets Village**	**42.049394**	**27.968422**	**1**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Darevskia praticola	**Sinemorets Village**	**42.046138**	**27.962165**	**1**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Darevskia praticola	**Sinemorets Village**	**42.045712**	**27.962787**	**1**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Darevskia praticola	**Sinemorets Village**	**42.04549**	**27.963279**	**4**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Darevskia praticola	**Sinemorets Village**	**42.044626**	**27.964111**	**1**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Darevskia praticola	**Sinemorets Village**	**42.043981**	**27.964225**	**1**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Darevskia praticola	**Sinemorets Village**	**42.043189**	**27.96431**	**2**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Darevskia praticola	**Sinemorets Village**	**42.04365**	**27.964648**	**2**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Darevskia praticola	**Sinemorets Village**	**42.045459**	**27.96542**	**1**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Darevskia praticola	**Sinemorets Village**	**42.046392**	**27.965128**	**5**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Darevskia praticola	**Sinemorets Village**	**42.039246**	**27.942736**	**2**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Darevskia praticola	**Sinemorets Village**	**42.038819**	**27.94238**	**4**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Darevskia praticola	**Sinemorets Village**	**42.03837**	**27.942608**	**3**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**

Darevskia praticola	**Sinemorets Village**	**42.038422**	**27.942986**	**1**	**juv.**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Darevskia praticola	**Sinemorets Village**	**42.038422**	**27.942986**	**5**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Darevskia praticola	**Sinemorets Village**	**42.037276**	**27.941989**	**4**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Darevskia praticola	**Sinemorets Village**	**42.037503**	**27.941486**	**6**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Darevskia praticola	**Sinemorets Village**	**42.037785**	**27.941675**	**2**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Darevskia praticola	**Sinemorets Village**	**42.038367**	**27.941978**	**2**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Darevskia praticola	**near the mouth of Silistar River**	**42.021956**	**28.006137**	**1**	**subad.**	**NG85**	**01/07/2021**	**I.M.**
Dolichophis caspius	Tsarevo, base of University of Plovdiv	n/a	n/a	1	adult	NG66	10/06/2007	I.M.
Dolichophis caspius	**south of Arapya Beach**	**n/a**	**n/a**	**1**	**adult**	**NG67**	**07/06/2016**	**I.M.**
Dolichophis caspius	forest near Popski Beach, Tsarevo	n/a	n/a	1	adult	NG67	30/06/2019	I.M.
Dolichophis caspius	Sinemorets Village	42.047797	27.967377	1	adult	NG85	30/05/2021	N.N., T.K., P.M.
Dolichophis caspius	Sinemorets Village	42.047561	27.967256	1	adult	NG85	30/05/2021	N.N., T.K., P.M.
Dolichophis caspius	roadkill on the road from Tsarevo to Malko Tarnovo	n/a	n/a	2	adult	NG66	10/06/2021	I.M.
Dolichophis caspius	roadkill at 2-3 km north from Sinemorets Village	n/a	n/a	1	adult	NG75	12/06/2021	I.M.
Dolichophis caspius	roadkill, Burgas, Southern Industrial Zone	42.497881	27.456086	1	adult	NH30	13/06/2021	I.M.
Dolichophis caspius	**Varvara Village**	**42.110685**	**27.9136483**	**1**	**adult**	**NG76**	**16/04/2022**	**N.N., I.T.**
Dolichophis caspius	**Pevtich Area, near Brodilovo Village**	**42.088795**	**27.839652**	**1**	**adult**	**NG75**	**15/05/2022**	**M.R.**
Dolichophis caspius	Ropotamo River, near Veselie Village	42.30989	27.62524	1	skin shed	NG58	04/06/2022	K.V.
Elaphe sauromates	Atanasovsko ezero Lake, Burgas	n/a	n/a	1	adult	NH30	2002	S.U.
Elaphe sauromates	Vaya Lake, Burgas	n/a	n/a	1	adult	NH30	2002	S.U.
Elaphe sauromates	Poda	n/a	n/a	1	adult	NG39	2003	S.U.
Elaphe sauromates	**Kraymorie Village**	**n/a**	**n/a**	**1**	**adult**	**NG39**	**2003**	**S.U.**
Elaphe sauromates	**Chernomorets Village**	**n/a**	**n/a**	**1**	**adult**	**NG59**	**2004**	**S.U.**
Elaphe sauromates	Gradina Camp, Sozopol	n/a	n/a	1	adult	NG59	2004	S.U.
Elaphe sauromates	**near the mouth of Ropotamo River**	**n/a**	**n/a**	**1**	**adult**	**NG68**	**2005**	**S.U.**
Elaphe sauromates	Alepu Swamp	n/a	n/a	1	adult	NG59	2005	S.U.
Elaphe sauromates	Arkutino Swamp	n/a	n/a	1	adult	NG58	2006	S.U.
Elaphe sauromates	**Primorsko**	**n/a**	**n/a**	**1**	**adult**	**NG68**	**2006**	**S.U.**
Elaphe sauromates	**Lozenets Village**	**n/a**	**n/a**	**1**	**adult**	**NG67**	**2006**	**S.U.**
Elaphe sauromates	**near Arapya Beach**	**n/a**	**n/a**	**1**	**adult**	**NG67**	**2010**	**S.U.**
Elaphe sauromates	**Varvara Village**	**n/a**	**n/a**	**1**	**adult**	**NG76**	**2010**	**S.U.**
Elaphe sauromates	**Brodilovo Village**	**n/a**	**n/a**	**1**	**adult**	**NG75**	**2011**	**S.U.**
Elaphe sauromates	**Kondolovo Village**	**n/a**	**n/a**	**1**	**adult**	**NG56**	**2012**	**S.U.**
Elaphe sauromates	**Bulgari Village**	**n/a**	**n/a**	**1**	**adult**	**NG65**	**2013**	**S.U.**
Elaphe sauromates	Kosti Village	n/a	n/a	1	adult	NG65	2014	S.U.
Elaphe sauromates	Ahtopol	n/a	n/a	1	adult	NG76	2015	S.U.
Elaphe sauromates	**Malko Tarnovo**	**n/a**	**n/a**	**1**	**adult**	**NG44**	**2015**	**S.U.**
Elaphe sauromates	**Rezovo Village**	**n/a**	**n/a**	**1**	**adult**	**NG84**	**2018**	**S.U.**
Elaphe sauromates	**Mladezhko Village**	**42.146073**	**27.421322**	**1**	**adult**	**NG36**	**14/05/2016**	**N.N.**
Elaphe sauromates	**Tsarevo**	**n/a**	**n/a**	**1**	**juv.**	**NG76**	**07/07/2019**	**O.T.**
Elaphe sauromates	roadkill between Lozenets and Kiten Villages	n/a	n/a	1	adult	NG67	12/06/2021	I.M.
Emys orbicularis	Arkutino Swamp	n/a	n/a	1	adult	NG59	04/06/2005	I.M.
Emys orbicularis	Gramatikovo Village	42.032507	27.636425	1	juv.	NG55	27/04/2014	N.N.
Emys orbicularis	small river flowing into the sea at Arapya Beach	n/a	n/a	>10	adult	NG67	24/06/2017	I.M.

Emys orbicularis	Sinemorets, Veleka river	42.062952	27.956376	4	adult	NG85	06/07/2019	D.D.
Emys orbicularis	Ahtopol	42.079009	27.960071	3	adult	NG76	29/05/2021	N.N., T.K., P.M.
Emys orbicularis	Ahtopol	42.078509	27.961306	3	adult	NG76	29/05/2021	N.N., T.K., P.M.
Emys orbicularis	Ahtopol	42.078509	27.961306	2	juv.	NG76	29/05/2021	N.N., T.K., P.M.
Emys orbicularis	roadkill near the bridge of Karaagach reka River (south of Lozenets)	n/a	n/a	1	juv.	NG67	10/06/2021	I.M.
Emys orbicularis	roadkill 2-3 km north of Primorsko Town	n/a	n/a	1	adult	NG68	03/07/2021	I.M.
Emys orbicularis	roadkill 2-3 km north of Atia Village	n/a	n/a	1	subad.	NG49	03/07/2021	I.M.
Emys orbicularis	Brodilovo Village	42.08204	27.86255	1	adult	NG75	01/08/2021	T.P.
Emys orbicularis	Brodilovo Village	42.08204	27.86285	2	subad.	NG75	01/08/2021	T.P.
Emys orbicularis	the mouth of Veleka River	42.060656	27.966117	1	adult	NG85	29/05/2022	M.R.
Emys orbicularis	Tsarevo	n/a	n/a	2	adult	NG76	03/06/2022	A.A.
Emys orbicularis	Ropotamo River, near Veselie Village	42.31024	27.6245	1	adult	NG58	03/06/2022	K.V.
Emys orbicularis	Kiten Village	42.061713	27.960535	2	adult	NG67	26/06/2022	N.N.
Emys orbicularis	Kiten Village	42.061806	27.960264	2	juv.	NG67	26/06/2022	N.N.
Emys orbicularis	Kiten Village	42.062011	27.95965	1	adult	NG67	26/06/2022	N.N.
Emys orbicularis	Kiten Village	42.063637	27.954247	3	adult	NG67	26/06/2022	N.N.
Emys orbicularis	Kiten Village	42.064028	27.953023	1	adult	NG67	26/06/2022	N.N.
Emys orbicularis	Kiten Village	42.064099	27.948537	1	adult	NG67	26/06/2022	N.N.
Emys orbicularis	Kiten Village	42.062993	27.95576	1	adult	NG67	26/06/2022	N.N.
Emys orbicularis	Kiten Village	42.066047	27.970498	2	adult	NG67	26/06/2022	N.N.
Emys orbicularis	Silistar	42.024086	28.008963	1♂,1♀	adult	NG85	20/07/2022	I.K.
Hyla orientalis	Arkutino Swamp	42.331577	27.725758	1	adult	NG59	04/06/2005	I.M.
Hyla orientalis	**Ahtopol**	**n/a**	**n/a**	**1♂**	**adult**	**NG76**	**07/07/2022**	**I.M.**
Lacerta agilis	**Brashlyan Village**	**42.0551801**	**27.4347189**	**1♂**	**adult**	**NG35**	**25/03/2017**	**I.T.**
Lacerta viridis	Tsarevo, mixed forest near the base of University of Plovdiv	42.170342	27.839567	1	adult	NG66	10/06/2007	I.M.
Lacerta viridis	Brashlyan Village	42.0551282	27.4348506	1♂	adult	NG35	25/03/2017	I.T.
Lacerta viridis	Brashlyan Village	42.0546995	27.4339949	1	juv.	NG35	25/03/2017	I.T.
Lacerta viridis	Tsarevo, cemetary	42.176378	27.838529	1	adult	NG66	06/06/2017	I.M., O.T.
Lacerta viridis	Ropotamo Reserve, forest near the mouth of Ropotamo River	n/a	n/a	1	adult	NG68	27/06/2017	I.M.
Lacerta viridis	**Cape Korakya (north of Primorsko)**	**n/a**	**n/a**	**1**	**juv.**	**NG68**	**27/06/2020**	**I.M.**
Lacerta viridis	**Cape Korakya (north of Primorsko)**	**n/a**	**n/a**	**1♀**	**adult**	**NG68**	**27/06/2020**	**I.M.**
Lacerta viridis	**Malko Tarnovo**	**41.990438**	**27.561781**	**1**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.989738**	**27.560873**	**1**	**juv.**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.98951**	**27.561698**	**1**	**juv.**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.989134**	**27.562268**	**1♀**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.988461**	**27.562745**	**2**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.988171**	**27.562993**	**1♂**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.988171**	**27.562993**	**1♀**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.987419**	**27.564014**	**4**	**juv.**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.987419**	**27.564014**	**1**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.987288**	**27.564347**	**2**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.987288**	**27.564347**	**3**	**juv.**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.987175**	**27.56452**	**1**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.986175**	**27.562298**	**1♂**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**

Lacerta viridis	**Malko Tarnovo**	**41.987255**	**27.562675**	**1♂**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.988661**	**27.562469**	**2**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.989011**	**27.562311**	**3**	**juv.**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.989253**	**27.562062**	**1♂**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.989253**	**27.562062**	**1♀**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.98686**	**27.566713**	**1**	**juv.**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.987114**	**27.567332**	**1♀**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.987769**	**27.568467**	**1**	**juv.**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.987769**	**27.568467**	**1**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.987707**	**27.570202**	**3**	**juv.**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.987707**	**27.570202**	**1♀**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.987256**	**27.571315**	**2**	**juv.**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.98725**	**27.571579**	**1♀**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.98725**	**27.571579**	**1♂**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.987176**	**27.572031**	**1**	**juv.**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.986693**	**27.573015**	**1♂**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.987577**	**27.574433**	**1♀**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.988458**	**27.575422**	**2♂s**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.988439**	**27.576453**	**1♂**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.991302**	**27.57712**	**6**	**juv.**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.991835**	**27.576581**	**2**	**juv.**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.992506**	**27.576629**	**1♀**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.992506**	**27.576629**	**1♂**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.990814**	**27.577048**	**2♀s**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.990814**	**27.577048**	**1♂**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.991103**	**27.575185**	**2♂s**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.986994**	**27.573769**	**1♂**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.988418**	**27.570392**	**3**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.988418**	**27.570392**	**1♂**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Malko Tarnovo**	**41.988583**	**27.569504**	**1♂**	**adult**	**NG44**	**22/05/2021**	**N.N., T.K.**
Lacerta viridis	**Stoilovo Village**	**42.062077**	**27.531951**	**1♂**	**adult**	**NG45**	**23/05/2021**	**N.N., T.K.**
Lacerta viridis	**Stoilovo Village**	**42.058359**	**27.529437**	**1**	**juv.**	**NG45**	**23/05/2021**	**N.N., T.K.**
Lacerta viridis	**Varvara Village**	**42.110586**	**27.91371**	**1**	**juv.**	**NG76**	**29/05/2021**	**N.N., T.K., P.M.**
Lacerta viridis	Ahtopol	42.101526	27.926892	1♂	adult	NG76	29/05/2021	N.N., T.K., P.M.
Lacerta viridis	Ahtopol	42.10174	27.924671	1♀	adult	NG76	29/05/2021	N.N., T.K., P.M.
Lacerta viridis	Ahtopol	42.10144	27.924997	1	adult	NG76	29/05/2021	N.N., T.K., P.M.
Lacerta viridis	Ahtopol	42.101254	27.925189	2♂s	adult	NG76	29/05/2021	N.N., T.K., P.M.
Lacerta viridis	Ahtopol	42.099772	27.933127	1♀	adult	NG76	29/05/2021	N.N., T.K., P.M.
Lacerta viridis	Ahtopol	42.099372	27.933277	1	juv.	NG76	29/05/2021	N.N., T.K., P.M.
Lacerta viridis	Ahtopol	42.101777	27.934776	1	juv.	NG76	29/05/2021	N.N., T.K., P.M.
Lacerta viridis	Ahtopol	42.078396	27.960861	1♂	adult	NG76	29/05/2021	N.N., T.K., P.M.
Lacerta viridis	Ahtopol	42.078039	27.960468	1	juv.	NG76	29/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.049707	27.98134	1	adult	NG85	29/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.051699	27.968225	1	juv.	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.050996	27.967909	1	adult	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.049918	27.968034	1	juv.	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.048433	27.96808	1♀	adult	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.047869	27.968395	2	juv.	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.049185	27.968507	2♂s	adult	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.049546	27.968124	1	adult	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.045712	27.962787	2♂s	adult	NG85	30/05/2021	N.N., T.K., P.M.

Lacerta viridis	Sinemorets Village	42.045712	27.962787	1♀	adult	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.044626	27.964111	1♀	adult	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.043775	27.964028	1♂	adult	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.043189	27.96431	2	adult	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.043189	27.96431	1	juv.	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.043189	27.96431	1	subad.	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.04365	27.964648	1♀	adult	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.04365	27.964648	1♂	adult	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.045459	27.96542	1	adult	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.045459	27.96542	2	juv.	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.046392	27.965128	1♂	adult	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.048275	27.964587	1♂	adult	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.048122	27.963898	1	juv.	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.04029	27.943453	1	adult	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.038819	27.94238	1	juv.	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.03837	27.942608	1	juv.	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Sinemorets Village	42.037785	27.941675	1♂	adult	NG85	30/05/2021	N.N., T.K., P.M.
Lacerta viridis	Silistar	42.022539	28.002664	1	adult	NG85	03/06/2021	I.M.
Lacerta viridis	"St. Paleyntemon" Chapel, near Brodilovo Village	42.041396	27.434017	1	adult	NG75	13/05/2022	M.R.
Lissotriton vulgaris	**Varvara Village**	**42.125938**	**27.897653**	**1**	**adult**	**NG76**	**24/04/2016**	**M.R.**
Malpolon insignitus	**Razvaya River, near Slivarovo Village**	**n/a**	**n/a**	**1**	**adult**	**NG54**	**12/06/2001**	**S.U.**
Malpolon insignitus	**Gogovo Area, Brashlyan Village**	**n/a**	**n/a**	**1**	**adult**	**NG35**	**18/07/2004**	**S.U.**
Malpolon insignitus	**Bulgari Village**	**n/a**	**n/a**	**1**	**adult**	**NG66**	**24/08/2011**	**O.T.**
Malpolon insignitus	**Stoilovo Village**	**42.068651**	**27.523996**	**1**	**adult**	**NG45**	**23/05/2021**	**N.N., T.K.**
Malpolon insignitus	**Stoilovo Village**	**42.069519**	**27.524698**	**1**	**adult**	**NG45**	**23/05/2021**	**N.N., T.K.**
Malpolon insignitus	**Sinemorets Village**	**42.05139**	**27.987954**	**1**	**adult**	**NG85**	**29/05/2021**	**N.N., T.K., P.M.**
Malpolon insignitus	**Sinemorets Village**	**42.050602**	**27.96794**	**2**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Mauremys rivulata	Brodilovo Village	42.08139	27.860650	1	adult	NG75	01/08/2021	T.P.
Mauremys rivulata	**Kiten Village**	**42.060321**	**27.963666**	**1**	**adult**	**NG67**	**26/06/2022**	**N.N.**
Mauremys rivulata	**Kiten Village**	**42.060843**	**27.962658**	**1**	**adult**	**NG67**	**26/06/2022**	**N.N.**
Mauremys rivulata	**Kiten Village**	**42.062011**	**27.95965**	**1**	**adult**	**NG67**	**26/06/2022**	**N.N.**
Mauremys rivulata	**Kiten Village**	**42.062286**	**27.958566**	**1**	**adult**	**NG67**	**26/06/2022**	**N.N.**
Mauremys rivulata	**Kiten Village**	**42.064028**	**27.953023**	**2**	**subad.**	**NG67**	**26/06/2022**	**N.N.**
Mauremys rivulata	**Kiten Village**	**42.063279**	**27.942906**	**1**	**adult**	**NG67**	**26/06/2022**	**N.N.**
Mauremys rivulata	**Kiten Village**	**42.062429**	**27.941838**	**1**	**adult**	**NG67**	**26/06/2022**	**N.N.**
Mauremys rivulata	**Kiten Village**	**42.0618**	**27.941202**	**1**	**subad.**	**NG67**	**26/06/2022**	**N.N.**
Mauremys rivulata	**Kiten Village**	**42.061031**	**27.939355**	**1**	**adult**	**NG67**	**26/06/2022**	**N.N.**
Mauremys rivulata	**Kiten Village**	**42.06341**	**27.943587**	**1**	**subad.**	**NG67**	**26/06/2022**	**N.N.**
Mauremys rivulata	**Kiten Village**	**42.064297**	**27.94654**	**1**	**adult**	**NG67**	**26/06/2022**	**N.N.**
Mauremys rivulata	**Kiten Village**	**42.063703**	**27.953801**	**1**	**adult**	**NG67**	**26/06/2022**	**N.N.**
Mauremys rivulata	**Kiten Village**	**42.062993**	**27.95576**	**2**	**adult**	**NG67**	**26/06/2022**	**N.N.**
Mauremys rivulata	**Kiten Village**	**42.063026**	**27.967606**	**1**	**adult**	**NG67**	**26/06/2022**	**N.N.**
Mauremys rivulata	**Kiten Village**	**42.060777**	**27.966275**	**1**	**adult**	**NG67**	**26/06/2022**	**N.N.**
Mauremys rivulata	Ustieto na Nakovo dere, Ahtopol	42.101496	27.924689	1♂,1♀	adult	NG76	05/07/2022	I.K.
Mauremys rivulata	Silistar	42.024086	28.008963	1♂,1♀	adult	NG85	20/07/2022	I.K.
Mediodactylus danilievskii	**Malko Tarnovo**	**41.979864**	**27.524664**	**1**	**adult**	**NG44**	**10/08/2016**	**M.R.**
Mediodactylus danilievskii	Tsarevo, base of University of Plovdiv	42.169296,	27.839326	1	adult	NG66	30/06/2019	I.M.
Natrix natrix	Arkutino Swamp	n/a	n/a	1	adult	NG59	04/06/2005	I.M.

Natrix natrix	Ropotamo Reserve, the mouth of Ropotamo River	n/a	n/a	1	adult	NG68	05/06/2012	I.M.
Natrix natrix	**small river flowing into the sea at Arapya Beach**	**n/a**	**n/a**	**>10**	**adult**	**NG67**	**24/06/2017**	**I.M.**
Natrix natrix	Malko Tarnovo	42.013153	27.505863	1	adult	NG44	22/05/2021	N.N., T.K.
Natrix natrix	mouth of small creek south of Ahtopol	n/a	n/a	1	subad.	NG76	09/06/2021	I.M.
Natrix natrix	mouth of Veleka River	n/a	n/a	1	juv.	NG85	01/07/2021	I.M.
Natrix natrix	Silistar	42.02354	28.00364	1	adult	NG85	02/07/2021	T.P., I.M., E.Y.
Natrix natrix	Silistar River	n/a	n/a	1	adult	NG85	02/07/2021	I.M.
Natrix natrix	Silistar	42.02391	28.00876	1	adult	NG85	31/07/2021	T.P., E.Y.
Natrix tessellata	Arkutino Swamp	n/a	n/a	1	adult	NG59	04/06/2005	I.M.
Natrix tessellata	Ropotamo Reserve, the mouth of Ropotamo River	n/a	n/a	1	adult	NG68	05/06/2012	I.M.
Natrix tessellata	small river flowing into the sea at Arapya Beach	n/a	n/a	>10	adult	NG67	24/06/2017	I.M.
Natrix tessellata	Popski Beach, Tsarevo	n/a	n/a	1	adult	NG67	30/06/2019	I.M.
Natrix tessellata	Poda	42.44312548 19452	27.46853403 74708	1	adult	NG39	04/07/2019	D.D.
Natrix tessellata	Tsarevo	42.179473	27.845243	1	adult	NG76	06/07/2019	D.D.
Natrix tessellata	Tsarevo	n/a	n/a	1	adult	NG76	08/07/2019	O.T.
Natrix tessellata	rocky beach north of Rezovo Village	n/a	n/a	1	adult	NG84	29/06/2020	I.M.
Natrix tessellata	Ahtopol	42.078244	27.961091	1	adult	NG76	29/05/2021	N.N., T.K., P.M.
Natrix tessellata	mouth of small creek in Ahtopol (central beach)	n/a	n/a	2	subad.	NG76	08/06/2021	I.M.
Natrix tessellata	roadkill on dirt road near the beach of Silistar	42.023612	28.007087	1	adult	NG85	01/07/2021	I.M.
Natrix tessellata	mouth of Veleka River	n/a	n/a	2	adult	NG85	01/07/2021	I.M.
Natrix tessellata	Silistar	42.02224	28.00416	1	adult	NG85	02/07/2021	T.P., I.M., E.Y.
Natrix tessellata	Silistar	42.02163	28.00601	1	adult	NG85	31/07/2021	T.P., E.Y.
Natrix tessellata	Arkutino Swamp	n/a	n/a	1	adult	NG58	02/06/2022	A.A.
Natrix tessellata	a rver at Arapia Beach	n/a	n/a	1	adult	NG67	02/06/2022	A.A.
Natrix tessellata	**Rosenska River, near Veselie Village**	**42.31371**	**27.61886**	**1**	**adult**	**NG58**	**03/06/2022**	**K.V.**
Pelophylax ridibundus	Ropotamo Reserve, the mouth of Ropotamo River	n/a	n/a	>10	adult	NG68	05/06/2012	I.M.
Pelophylax ridibundus	near St. Paraskeva Beach (north of Primorsko)	42.320752	27.771227	1	adult	NG68	28/07/2014	I.M.
Pelophylax ridibundus	small river flowing into the sea at Arapya Beach	n/a	n/a	>10	adult	NG67	24/06/2017	I.M.
Pelophylax ridibundus	the river in Mladezko Village	n/a	n/a	>10	adult	NG36	30/06/2020	I.M.
Pelophylax ridibundus	mouth of Veleka River	n/a	n/a	>10	adult	NG85	01/06/2021	I.M., T.P.
Pelophylax ridibundus	mouth of small creek north of Varvara Village	n/a	n/a	>10	adult	NG76	01/06/2021	I.M., T.P.
Pelophylax ridibundus	mouth of small creek at Delfin Camping site	n/a	n/a	>10	adult	NG76	01/06/2021	I.M., T.P.
Pelophylax ridibundus	mouth of small creek in Ahtopol	n/a	n/a	>10	adult	NG76	01/06/2021	I.M., T.P.
Pelophylax ridibundus	mouth of Silistar River	n/a	n/a	>10	adult	NG85	01/06/2021	I.M., T.P.
Pelophylax ridibundus	mouth of small creek in Ahtopol (central beach)	n/a	n/a	>10	adult	NG76	08/06/2021	I.M.
Pelophylax ridibundus	Silistar River	n/a	n/a	>10	adult	NG85	01/07/2021	I.M.
Pelophylax ridibundus	mouth of Veleka River	n/a	n/a	>10	adult	NG85	01/07/2021	I.M.
Pelophylax ridibundus	Rosenska River, near Veselie Village	42.31182	27.6214	3	adult	NG58	03/06/2022	K.V.
Pelophylax ridibundus	Ropotamo River, near Veselie Village	42.31024	27.6245	1	adult	NG58	03/06/2022	K.V.
Pelophylax ridibundus	Veleka River (the bridge), Sinemorets Village	42.06345	27.96863	1	adult	NG85	06/06/2022	K.V.

Pelophylax ridibundus	Arkutino Swamp	n/a	n/a	>10	adult	NG59	12/07/2022	I.M.
Pelophylax sp.	Stoilovo Village	42.060532	27.537955	15	adult	NG45	23/05/2021	N.N., T.K.
Pelophylax sp.	Stoilovo Village	42.060983	27.54031	15	adult	NG45	23/05/2021	N.N., T.K.
Pelophylax sp.	Varvara Village	42.111081	27.912769	50	adult	NG76	29/05/2021	N.N., T.K., P.M.
Pelophylax sp.	Varvara Village	42.111055	27.907549	15	adult	NG76	29/05/2021	N.N., T.K., P.M.
Pelophylax sp.	Ahtopol	42.10246	27.924446	15	adult	NG76	29/05/2021	N.N., T.K., P.M.
Pelophylax sp.	Ahtopol	42.10174	27.924671	50	adult	NG76	29/05/2021	N.N., T.K., P.M.
Pelophylax sp.	Ahtopol	42.101916	27.933661	1	subad.	NG76	29/05/2021	N.N., T.K., P.M.
Pelophylax sp.	Ahtopol	42.078509	27.961306	30	adult	NG76	29/05/2021	N.N., T.K., P.M.
Pelophylax sp.	Ahtopol	42.078509	27.961306	15	juv.	NG76	29/05/2021	N.N., T.K., P.M.
Pelophylax sp.	Sinemorets Village	42.052924	27.983833	8	adult	NG85	29/05/2021	N.N., T.K., P.M.
Pelophylax sp.	Sinemorets Village	42.049707	27.98134	1	adult	NG85	29/05/2021	N.N., T.K., P.M.
Pelophylax sp.	Sinemorets Village	42.063268	27.980043	5	adult	NG85	29/05/2021	N.N., T.K., P.M.
Pelophylax sp.	Sinemorets Village	42.065147	27.97557	3	adult	NG85	30/05/2021	N.N., T.K., P.M.
Pelophylax sp.	Sinemorets Village	42.047249	27.964868	15	adult	NG85	30/05/2021	N.N., T.K., P.M.
Pelophylax sp.	Sinemorets Village	42.047639	27.964689	2	adult	NG85	30/05/2021	N.N., T.K., P.M.
Podarcis erhardii	Varvara Village	42.111081	27.912769	1	adult	NG76	29/05/2021	N.N., T.K., P.M.
Podarcis erhardii	Varvara Village	42.1124421	27.913205	3	adult	NG76	16/04/2022	N.N., I.T.
Podarcis erhardii	Varvara Village	42.110685	27.9136483	1♀	adult	NG76	16/04/2022	N.N., I.T.
Podarcis muralis	**Silistar**	**n/a**	**n/a**	**1**	**adult**	**NG85**	**04/08/2012**	**I.M.**
Podarcis muralis	Malko Tarnovo	41.979783	27.524801	1	adult	NG44	04/06/2018	M.R.
Podarcis muralis	**rocks near the mouth of Veleka River**	**n/a**	**n/a**	**1**	**adult**	**NG85**	**14/09/2019**	**I.M.**
Podarcis muralis	**near Mladezko Village**	**n/a**	**n/a**	**1**	**adult**	**NG36**	**30/06/2020**	**I.M.**
Podarcis muralis	NM "Kamenna byrchia", near Malko Tarnovo	42.008723	27.590059	1	adult	NG44	06/09/2020	I.M.
Podarcis muralis	Malko Tarnovo	41.986271	27.562585	2	adult	NG44	22/05/2021	N.N., T.K.
Podarcis muralis	Malko Tarnovo	41.98686	27.566713	1	adult	NG44	22/05/2021	N.N., T.K.
Podarcis muralis	Malko Tarnovo	41.986751	27.573251	1	adult	NG44	22/05/2021	N.N., T.K.
Podarcis muralis	**Stoilovo Village**	**42.062034**	**27.530102**	**1**	**adult**	**NG45**	**23/05/2021**	**N.N., T.K.**
Podarcis muralis	**Stoilovo Village**	**42.061817**	**27.541052**	**1**	**adult**	**NG45**	**23/05/2021**	**N.N., T.K.**
Podarcis muralis	**Stoilovo Village**	**42.053624**	**27.52741**	**1**	**adult**	**NG45**	**23/05/2021**	**N.N., T.K.**
Podarcis muralis	Ahtopol	42.078509	27.961306	6	adult	NG76	29/05/2021	N.N., T.K., P.M.
Podarcis muralis	Ahtopol	42.078064	27.961642	2	adult	NG76	29/05/2021	N.N., T.K., P.M.
Podarcis muralis	Ahtopol	42.078244	27.961091	1	adult	NG76	29/05/2021	N.N., T.K., P.M.
Podarcis muralis	**Sinemorets Village**	**42.045459**	**27.96542**	**3**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Podarcis muralis	**Sinemorets Village**	**42.038441**	**27.942905**	**4**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Podarcis muralis	**Sinemorets Village**	**42.037276**	**27.941989**	**1**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Podarcis muralis	**"St. Paleyntemon" Chapel, near Brodilovo Village**	**42.041396**	**27.434017**	**1**	**adult**	**NG75**	**23/05/2022**	**M.R.**
Podarcis muralis	**"St. Paleyntemon" Chapel, near Brodilovo Village**	**42.041799**	**27.433896**	**2**	**adult**	**NG75**	**24/06/2022**	**M.R.**
Podarcis tauricus	**Stoilovo Village**	**42.061351**	**27.53336**	**1♀**	**adult**	**NG45**	**23/05/2021**	**N.N., T.K.**
Podarcis tauricus	**Sinemorets Village**	**42.040734**	**27.944887**	**2**	**adult**	**NG85**	**30/05/2021**	**N.N., T.K., P.M.**
Podarcis tauricus	Ropotamo Reserve, forest near the mouth of Ropotamo River	n/a	n/a	1	adult	NG68	27/06/2017	I.M.
Podarcis tauricus	Popski Beach, Tsarevo	n/a	n/a	1	adult	NG67	30/06/2019	I.M.
Podarcis tauricus	Arkutino Beach	42.326340	27.737183	1	juv.	NG58	05/07/2019	D.D.
Pseudopus apodus	Primorsko	n/a	n/a	1	adult	NG68	25/04/2008	O.T.
Pseudopus apodus	Tsarevo, base of University of Plovdiv	n/a	n/a	1	adult	NG66	04/08/2008	I.M.
Pseudopus apodus	**Arkutino Beach**	**n/a**	**n/a**	**1**	**adult**	**NG59**	**05/06/2012**	**I.M.**
Pseudopus apodus	**south of Arapya Beach**	**n/a**	**n/a**	**1**	**adult**	**NG67**	**07/06/2016**	**I.M.**

Pseudopus apodus	Tsarevo, cemetary	42.176378	27.838529	1	adult	NG66	06/06/2017	I.M., O.T.
Pseudopus apodus	Ropotamo Reserve, dunes near the mouth of Ropotamo River	n/a	n/a	1	adult	NG68	27/06/2017	I.M.
Pseudopus apodus	Tsarevo	n/a	n/a	1	adult	NG76	08/07/2019	O.T.
Pseudopus apodus	**Silistar**	**42.022539**	**28.002664**	**2**	**adult**	**NG85**	**03/06/2021**	**I.M.**
Pseudopus apodus	**roadkill near the bridge of Diavolska reka River (south of Primorsko Town)**	**n/a**	**n/a**	**1**	**adult**	**NG67**	**08/06/2021**	**I.M.**
Pseudopus apodus	Izvorska Reka River	42.3568	27.46368	1	adult	NG39	03/06/2022	K.V.
Pseudopus apodus	**Tsarevo**	**42.175770**	**27.843347**	**1**	**adult**	**NG76**	**06/07/2019**	**D.D.**
Pseudopus apodus	Sinemorets Village	42.050813	27.982408	1	adult	NG85	29/05/2021	N.N., T.K., P.M.
Pseudopus apodus	Sinemorets Village	42.050438	27.98997	1	adult	NG85	29/05/2021	N.N., T.K., P.M.
Pseudopus apodus	Sinemorets Village	42.049938	27.989412	1	adult	NG85	29/05/2021	N.N., T.K., P.M.
Pseudopus apodus	Sinemorets Village	42.050965	27.988589	2	adult	NG85	29/05/2021	N.N., T.K., P.M.
Pseudopus apodus	Sinemorets Village	42.05139	27.987954	1	adult	NG85	29/05/2021	N.N., T.K., P.M.
Pseudopus apodus	Sinemorets Village	42.047666	27.967656	1♂	adult	NG85	30/05/2021	N.N., T.K., P.M.
Pseudopus apodus	Sinemorets Village	42.047797	27.967377	2	adult	NG85	30/05/2021	N.N., T.K., P.M.
Pseudopus apodus	Sinemorets Village	42.051858	27.96846	1	adult	NG85	30/05/2021	N.N., T.K., P.M.
Pseudopus apodus	**Varvara Village**	**42.1126167**	**27.9132617**	**1♂**	**adult**	**NG76**	**16/04/2022**	**N.N., I.T.**
Pseudopus apodus	**Varvara Village**	**42.1106564**	**27.9136559**	**2**	**adult**	**NG76**	**16/04/2022**	**N.N., I.T.**
Rana dalmatina	Ropotamo Reserve, forest near the mouth of Ropotamo River	n/a	n/a	1	adult	NG68	02/08/2011	I.M.
Rana dalmatina	**Marina Reka**	**42.109946**	**27.757414**	**1**	**adult**	**NG65**	**07/07/2019**	**D.D.**
Rana dalmatina	**near the mouth of Silistar River**	**42.021888**	**28.007001**	**1**	**adult**	**NG85**	**01/07/2021**	**I.M.**
Rana dalmatina	**Silistar**	**42.02223**	**28.00677**	**1**	**adult**	**NG85**	**02/07/2021**	**T.P., I.M., E.Y.**
Rana dalmatina	**Brashlyan Village**	**42.036123**	**27.427030**	**1**	**adult**	**NG35**	**24/06/2022**	**M.R.**
Testudo graeca	**forest near the bridge of Ropotamo River**	**n/a**	**n/a**	**1**	**juv.**	**NG58**	**02/08/2011**	**I.M.**
Testudo graeca	**Varvara Village**	**42.120412**	**27.866764**	**1**	**adult**	**NG76**	**27/05/2015**	**M.R.**
Testudo graeca	Ropotamo Reserve, dunes near the mouth of Ropotamo River	n/a	n/a	1	adult	NG68	27/06/2017	I.M.
Testudo graeca	**near Brashlyan Village**	**42.073455**	**27.420268**	**1**	**adult**	**NG35**	**22/06/2018**	**M.R.**
Testudo graeca	Arkutino Beach	42.326558	27.734075	1	juv.	NG58	05/07/2019	D.D.
Testudo graeca	**Cape Korakya (north of Primorsko)**	**n/a**	**n/a**	**1**	**adult**	**NG68**	**27/06/2020**	**I.M.**
Testudo graeca	north of Rezovo Village	n/a	n/a	1	adult	NG84	29/06/2020	I.M.
Testudo graeca	**near Brashlyan Village**	**42.0416**	**27.420926**	**1**	**adult**	**NG35**	**25/05/2021**	**M.R.**
Testudo graeca	Ahtopol	42.10174	27.924671	1	subad.	NG76	29/05/2021	N.N., T.K., P.M.
Testudo graeca	Ahtopol	42.10144	27.924997	1	juv.	NG76	29/05/2021	N.N., T.K., P.M.
Testudo graeca	Ahtopol	42.078562	27.951683	1♀	adult	NG76	29/05/2021	N.N., T.K., P.M.
Testudo graeca	Sinemorets Village	42.05113	27.987133	1♀	adult	NG85	29/05/2021	N.N., T.K., P.M.
Testudo graeca	Sinemorets Village	42.047666	27.967656	1	adult	NG85	30/05/2021	N.N., T.K., P.M.
Testudo graeca	Sinemorets Village	42.051858	27.96846	1♀	adult	NG85	30/05/2021	N.N., T.K., P.M.
Testudo graeca	Sinemorets Village	42.039433	27.942179	1	subad.	NG85	30/05/2021	N.N., T.K., P.M.
Testudo graeca	Arkutino Beach	42.328374	27.738107	2	adult	NG68	09/06/2021	I.M.
Testudo graeca	**behind Lukoil Gasstation, at the entrance of Tsarevo**	**42.169508**	**27.838486**	**1**	**adult**	**NG66**	**13/06/2021**	**I.M.**
Testudo graeca	**near Brashlyan Village**	**42.038809**	**27.420339**	**1**	**adult**	**NG35**	**24/06/2021**	**M.R.**
Testudo graeca	**Tsarkvata, Brodilovo**	**42.089109**	**27.858574**	**1♂**	**adult**	**NG75**	**15/03/2022**	**I.K.**
Testudo graeca	**Sv. Ilia, Brodilovo**	**42.091917**	**27.847410**	**1♂**	**adult**	**NG75**	**03/04/2022**	**I.K.**
Testudo graeca	**Varvara Village**	**42.1129415**	**27.9132248**	**1♂**	**adult**	**NG76**	**16/04/2022**	**N.N., I.T.**
Testudo graeca	**Pazlakat nad Sv. Petka,**	**42.095512**	**27.846963**	**1♀**	**adult**	**NG75**	**28/04/2022**	**I.K.**

	Brodilovo							
Testudo graeca	**"St. Paleyntemon" Chapel, near Brodilovo Village**	**42.091355**	**27.855368**	**1**	**adult**	**NG75**	**15/05/2022**	**M.R.**
Testudo graeca	Karierata, Rezovo	41.985532	28.023857	1♀	adult	NG75	15/06/2022	I.K.
Testudo graeca	**Varvara Village**	**42.120997**	**27.887382**	**1♂**	**adult**	**NG76**	**21/06/2022**	**I.K.**
Testudo graeca	**Kastrich, Rezovo**	**42.007943**	**28.018701**	**1♂**	**adult**	**NG85**	**02/07/2022**	**I.K.**
Testudo graeca	Ahtopol	42.078715	27.950386	1	adult	NG35	05/07/2022	M.R.
Testudo graeca	the mouth of Veleka River	42.069407	27.968096	1	adult	NG85	05/07/2022	M.R.
Testudo hermanni	Tsarevo	n/a	n/a	2	adult	NG76	03/06/2022	A.A.
Testudo hermanni	sand dunes at Arkutino Beach	42.328374	27.738107	1	adult	NG59	05/06/2012	I.M.
Testudo hermanni	**near Arapya Beach**	**42.183721**	**27.839839**	**1**	**adult**	**NG67**	**03/08/2012**	**I.M.**
Testudo hermanni	**Varvara Village**	**42.120131**	**27.870943**	**1**	**adult**	**NG76**	**16/05/2015**	**M.R.**
Testudo hermanni	Tsarevo	42.145322	27.873289	1	adult	NG76	16/05/2015	M.R.
Testudo hermanni	Ropotamo Reserve, dunes near the mouth of Ropotamo River	42.325972	27.753485	1	adult	NG68	27/06/2017	I.M.
Testudo hermanni	Ropotamo Reserve, forest near the mouth of Ropotamo River	42.325007	27.750817	1	adult	NG68	28/06/2019	I.M.
Testudo hermanni	Arkutino Beach	42.324715	27.734739	2	adult	NG58	05/07/2019	D.D.
Testudo hermanni	Arkutino Beach	42.325452	27.736909	1	juv.	NG58	05/07/2019	D.D.
Testudo hermanni	Arkutino Beach	42.325811	27.736693	1♂,1♀	adult	NG58	05/07/2019	D.D.
Testudo hermanni	**Cape Korakya (north of Primorsko)**	**42.334811**	**27.784211**	**1**	**adult**	**NG68**	**27/06/2020**	**I.M.**
Testudo hermanni	Ahtopol	42.079548	27.958932	1♀	adult	NG76	29/05/2021	N.N., T.K., P.M.
Testudo hermanni	Sinemorets Village	42.047561	27.967256	1	juv.	NG85	30/05/2021	N.N., T.K., P.M.
Testudo hermanni	Sinemorets Village	42.047586	27.967405	1♂	adult	NG85	30/05/2021	N.N., T.K., P.M.
Testudo hermanni	**near the road east of Atia Village**	**42.443052**	**27.601089**	**1**	**juv.**	**NG49**	**13/06/2021**	**I.M.**
Testudo hermanni	**Malko Tarnovo**	**41.973558**	**27.453383**	**1♀**	**adult**	**NG44**	**05/04/2022**	**I.K.**
Testudo hermanni	**Sv. Bogoroditsa, Brodilovo**	**42.077601**	**27.842035**	**1♀**	**adult**	**NG75**	**14/05/2022**	**I.K.**
Testudo hermanni	**Brodilovo Village**	**42.096335**	**27.841869**	**1♂**	**adult**	**NG75**	**16/06/2022**	**I.K.**
Vipera ammodytes	**Brodilovo Village**	**n/a**	**n/a**	**1**	**adult**	**NG75**	**17/06/2015**	**O.T.**
Vipera ammodytes	Kachul Area, Gramatikovo Village	42.028946	27.630279	1	adult	NG55	15/07/2018	M.R.
Vipera ammodytes	Sinemorets Village	42.079116	27.959832	1	adult	NG85	29/05/2021	N.N., T.K., P.M.
Vipera ammodytes	**Brashlyan Village**	**42.043605**	**27.421042**	**1**	**adult**	**NG35**	**24/06/2021**	**M.R.**
Vipera ammodytes	**"St. Paleyntemon" Chapel, near Brodilovo Village**	**42.038839**	**27.431813**	**1**	**adult**	**NG75**	**24/06/2021**	**M.R.**
Vipera ammodytes	**Silkosia Reserve**	**42.082452**	**27.739662**	**1**	**adult**	**NG65**	**22/06/2022**	**M.R.**
Vipera ammodytes	Ahtopol	42.069559	27.955675	1	adult	NG76	05/07/2022	M.R.
Zamenis longissimus	Sinemorets Village	n/a	n/a	1	juv.	NG85	10/05/2012	O.T.
Zamenis longissimus	**near Kondolovo Village**	**42.095457**	**27.684496**	**1**	**adult**	**NG56**	**14/06/2015**	**M.R.**
Zamenis longissimus	**Brodilovo Village**	**n/a**	**n/a**	**2**	**adult**	**NG75**	**17/06/2015**	**O.T.**
Zamenis longissimus	**Stoilovo Village**	**42.06158**	**27.530657**	**1**	**adult**	**NG45**	**23/05/2021**	**N.N., T.K.**
Zamenis longissimus	**Stoilovo Village**	**42.053975**	**27.527818**	**1**	**adult**	**NG45**	**23/05/2021**	**N.N., T.K.**
Zamenis longissimus	Silistar	42.02276	27.99943	1	juv.	NG85	03/06/2021	T.P., I.M.
Zamenis longissimus	Silistar	42.022539	28.002664	2	adult	NG85	03/06/2021	I.M.
Zamenis longissimus	**between Lozenets and Kiten Villages**	**n/a**	**n/a**	**1**	**adult**	**NG67**	**10/06/2021**	**I.M.**
Zamenis longissimus	the mouth of Veleka River	42.060754	27.965549	1	adult	NG85	29/05/2022	M.R.
Zamenis longissimus	**Marina Reka, near Bulgari Village**	**42.111256**	**27.762653**	**1**	**adult**	**NG65**	**02/06/2022**	**M.R.**
Zamenis situla	**near Alepu Swamp**	**n/a**	**n/a**	**1**	**adult**	**NG59**	**13/05/2021**	**S.U.**

lage, Alepu and many other places along the Southern Black Sea Coast.

Further studies are needed to clarify the presence of *Lissotriton vulgaris, Triturus ivanbureshi, Bombina variegata* and *Podarcis erhardii* in Strandzha NP. Also further bioacustic studies are needed to clarify the distriction and species composition of the green frogs (*Pelophylax* sp.) in the area, as well as the distribution of *Platyceps najadum* and *Zamenis sutula* on the Southern Black Sea Coast.

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Appendix 1. Published amphibian distributional records (1905-2015) in the Southern Black Sea Coast and Strandzha Nature Park, registered in the current study based on UTM grid (10x10 km).

Lissotriton vulgaris - **NH30**: "Vaya Lake, Bourgas" (Stoyneva & Michev, 2007); **NG58**: "Arkutino Swamp" (Buresch & Zonkow, 1941; Speybroeck, 2005; Schlüter, 2006b; Stoyneva & Michev, 2007); **NG68**: "Stomoplou Swamp", "wetlands at the mouth of Dyavolska River" (Stoyneva & Michev, 2007); **NG85**: "the mouth of Silistar River"(Stoyneva & Michev, 2007).

Triturus ivanbureshchi - **NH30**: "Vaya Lake, Bourgas" (Stoyneva & Michev, 2007); **NG58**: "Arkutino Swamp" (Speybroeck, 2005; Schlüter, 2006b; Stoyneva & Michev, 2007; KLOOIPLEK, 2007); **NG59**: "Alepou Swamp" (Stoyneva & Michev, 2007); **NG68**: "Primorsko" (Buresch & Zonkow, 1941; Speybroeck, 2005), "the mouth of Ropotamo River" (Speybroeck, 2005), "Stomoplou Swamp", "wetlands at the mouth of Dyavolska River" (Stoyneva & Michev, 2007).

Bombina bombina - **NH30**: "Burgas" (Beshkov & Nanev, 2002), "Vaya Lake, Bourgas" (Stoyneva & Michev, 2007); **NG39**: "Poda" (Stoyneva & Michev, 2007); **NG58**: "Arkutino Swamp" (Beshkov, 1961; Beshkov & Nanev, 2002; Speybroeck, 2005; Schlüter, 2006b; KLOOIPLEK, 2007); **NG68**: "the mouth of Ropotamo River" (Beshkov & Nanev, 2002; Stoyneva & Michev, 2007).

Bombina variegata - **NG36**: "Moryane PA" (Uzunova & Uzunov, 2004); **NG65**: "Kosti Village" - unconfirmed locality (after Uzunova & Uzunov, 2004).

Bufo bufo - **NH30**: "Burgas" (Batchvarov, 1963); **NG36**: "Mladezhka river" (Natchev et al., 2015), "Zvezdets Village" (Batchvarov, 1963); **NG55**: "Gramatikovo Village" (Batchvarov, 1984); **NG57**: "Fazanovo Village, Pismenovo Village" (Batchvarov, 1984); **NG58**: "Arkutino Swamp" (Beškov, 1972; Speybroeck, 2005; Schlüter, 2006b), "Ropotamo" (Schlüter, 2006b); "Veselie Village" (Batchvarov, 1984); **NG59**: "Sozopol" (Batchvarov, 1963), "Alepou Swamp" (Stoyneva & Michev, 2007); **NG65**: "Kosti Village" (Buresch & Zonkow, 1942; Batchvarov, 1963; 1984; Speybroeck, 2005; Schlüter, 2006b); "Silkosia Reserve" (Schlüter, 2006b); **NG66**: "Izgrev Village" (Buresch & Zonkow, 1942; Batchvarov, 1984; Schlüter, 2006b); **NG67**: "Kiten" (Beškov, 1972), "Velika Village" (Batchvarov, 1984), "Karaagach wetlands" (Stoyneva & Michev, 2007); **NG68**: "Primorsko" (Batchvarov, 1963; 1984), "Stomoplou Swamp", "the mouth of Ropotamo River", "wetlands at the mouth of Dyavolska River" (Stoyneva & Michev, 2007); **NG75**: "Brodilovo Village" (Batchvarov, 1963); **NG76**: "Tsarevo" (Batchvarov, 1984), "Varvara Village" (Schlüter, 2006b); "Ahtopol" (Beshkov, 1993); **NG85**: "wetlands at the mouth of Boutamyata (Botamyata) River, Sinemorets Village", "waterspill at the mouth of Veleka River" (Stoyneva & Michev, 2007).

Bufotes viridis - **NH30**: "Burgas", "Vaya Lake, Bourgas" (Stoyneva & Michev, 2007); **NG36**: "Mladezhka river" (Natchev et al., 2015), "Zvezdets Village", (Batchvarov, 1963); **NG39**: "Poda" (Stoyneva & Michev, 2007; Nachev et al., 2016); **NG44**: "Malko Tarnovo" (Buresch & Zonkow, 1942); **NG55**: "Gramatikovo Village" (Batchvarov, 1984); **NG57**: "Fazanovo Village, Pismenovo Village" (Batchvarov, 1984); **NG58**: "Arkutino Swamp" (Nöllert et al., 1986a; Stoyneva & Michev, 2007), "Veselie Village" (Batchvarov, 1984); **NG59**: "Sozopol" (Batchvarov, 1963), "Alepou Swamp" (Stoyneva & Michev, 2007); **NG65**: "Kosti Village" (Batchvarov, 1963; 1984; Speybroeck, 2005); **NG66**: "Izgrev Village" (Batchvarov, 1984); **NG67**: "Velika Village"

(Batchvarov, 1984), "Karaagach wetlands" (Stoyneva & Michev, 2007); **NG68**: "Primorsko" (Batchvarov, 1963; 1984), "Stomoplou Swamp", "the mouth of Ropotamo River", "wetlands at the mouth of Dyavolska River" (Stoyneva & Michev, 2007); **NG75**: "Brodilovo Village" (Batchvarov, 1963); **NG76**: "Tsarevo" (Buresch & Zonkow, 1942; Batchvarov, 1984); **NG85**: "wetlands at the mouth of Boutamyata (Botamyata) River, Sinemorets Village", "waterspill at the mouth of Veleka River", "the mouth of Silistar River" (Stoyneva & Michev, 2007), "the mouth of Veleka River" (Speybroeck, 2005).

Pelobates syriacus - **NH30**: "Burgas" (Milchev & Kovachev, 2005); "Vyrli Bryag, Burgas" (Beshkov, 1961; 1984; 1985), "Vaya Lake, Bourgas" (Stoyneva & Michev, 2007); **NG39**: "Poda" and "Mandra wetlands" (Stoyneva & Michev, 2007); **NG49**: "Rosenets Park" (Džukić et al, 2008); **NG57**: "the area around Pismenovo and Fazanovo Villages" (Milchev & Kovachev, 2005); **NG58**: "Arkutino Swamp" (Nöllert et al., 1986a; Speybroeck, 2005; Stoyneva & Michev, 2007), "the area near Veselie Village" (Milchev & Kovachev, 2005); **NG59**: "Alepou Swamp" (Stoyneva & Michev, 2007; Džukić et al, 2008); **NG67**: "Kiten" (Beškov, 1972); **NG68**: "near Arkutino" (Beškov, 1972; 1984 1985; Belcheva et al., 1977; KLOOIPLEK, 2007; Džukić et al, 2008), "the mouth of Ropotamo River" (Beshkov, 1961; 1984; 1985), "wetlands at the mouth of Dyavolska River", "Stomoplou Swamp", (Stoyneva & Michev, 2007; Džukić et al, 2008), "Maslen Nos Cape" (Beshkov, 1985; Beshkov & Nanev, 2002), "Primorsko" (Beshkov, 1984; 1985); **NG76**: "Tsarevo" (Džukić et al, 2008); **NG85**: "waterspill at the mouth of Veleka River" (Stoyneva & Michev, 2007), "Sinemorets" (Džukić et al, 2008), "Silistar Beach" (Mollov et al., 2007).

Pelophylax ridibundus - **NH30**: "Burgas" (Batchvarov, 1963), "Vaya Lake, Bourgas" (Stoyneva & Michev, 2007); **NG36**: "fish farm near Mladezhko Village" and "Mladezhka River" (Natchev et al., 2015), "Zvezdets Village" (Batchvarov, 1963); **NG39**: "Poda" (Stoyneva & Michev, 2007); **NG49**: "Germitsa water basin, near Atia" (Stoyneva & Michev, 2007); **NG55**: "Gramatikovo Village" (Batchvarov, 1984); **NG57**: "Fazanovo Village, Pismenovo Village" (Batchvarov, 1984); **NG58**: "Arkutino Swamp" (Nöllert et al., 1986a; Speybroeck, 2005; Stoyneva & Michev, 2007; KLOOIPLEK, 2007), "Veselie Village" (Batchvarov, 1984), "Yasna Poliana Village" (Dimitrova, 1966); **NG59**: "Sozopol" (Batchvarov, 1963), "Alepou Swamp" (Stoyneva & Michev, 2007); **NG65**: "Kosti Village" (Batchvarov, 1963; 1984); **NG66**: "Izgrev Village" (Batchvarov, 1984); **NG67**: "Velika Village" (Batchvarov, 1984), "Karaagach wetlands" (Stoyneva & Michev, 2007); **NG68**: "Cape Korakya (north of Primorsko)" (Mollov, 2020), "Primorsko" (Batchvarov, 1963; 1984; Dimitrova, 1966), "Ropotamo" (Müller, 1939), "the forest near Ropotamo River" (Dimitrova, 1966; Speybroeck, 2005), "near Arkutino" (Speybroeck, 2005; KLOOIPLEK, 2007), "Stomoplou Swamp", "the mouth of Ropotamo River", "wetlands at the mouth of Dyavolska River" (Stoyneva & Michev, 2007); **NG75**: "Brodilovo Village" (Batchvarov, 1963); **NG76**: "Tsarevo" (Batchvarov, 1984), "Ahtopol" (Gvoždík & Šnajdr, 2001; Jablonski, 2006); **NG84**: "Rezovska River" (Gvoždík & Šnajdr, 2001); **NG85**: "Sinemorets Village" (Dimitrova, 1966; Gvoždík & Šnajdr, 2001), "wetlands at the mouth of Boutamyata (Botamyata) River, Sinemorets Village", "waterspill at the mouth of Veleka River" (Stoyneva & Michev, 2007), "the mouth of Veleka River" (Speybroeck, 2005; Jablonski, 2006).

P. cf. esculentus - **NG58**: "Arkutino Swamp" (Stojanov et al., 2011). Except this locality on Fig. 235 the authors give three more localities, which fall into quadrats: **NG39, NG59, NG85**.

Pelophylax bedriage **-** **NG58**: "Arkutino Swamp" (Lukanov et al., 2018).

Rana dalmatina - **NH30**: "Vaya Lake, Bourgas" (Stoyneva & Michev, 2007); **NG36**: "Mladezhka River" (Natchev et al., 2015); **NG55**: "Gramatikovo Village" (Batchvarov, 1984); **NG57**: "Fazanovo Village, Pismenovo Village" (Batchvarov, 1984); **NG58**: "Arkutino Swamp" (Stoyneva & Michev, 2007); **NG59**: "Alepou Swamp" (Stoyneva & Michev, 2007); **NG66**: "Izgrev Village" (Batchvarov, 1984); **NG67**: "Velika Village" (Batchvarov, 1984), "Karaagach wetlands" (Stoyneva & Michev, 2007); **NG68**: "near Arkutino Beach" (Nöllert et al., 1986a; Schlüter, 2006b; KLOOIPLEK, 2007), "Primorsko" (Cyren, 1941; Speybroeck, 2005; Schlüter, 2006b), "the mouth of Ropotamo River" (Speybroeck, 2005; Stoyneva & Michev, 2007), "Stomoplou Swamp", "wetlands at the mouth of Dyavolska River" (Stoyneva & Michev, 2007); **NG76**: "Tsarevo" (Cyren, 1941; Buresch & Zonkow, 1942; Batchvarov, 1984; Balej, 2006; Schlüter, 2006b); **NG84**: "Rezovo Village" (Buresch & Zonkow, 1942; Schlüter, 2006b); **NG85**: "near Sinemorets Village" (Jablonski, 2006; Schlüter, 2006b), "the lower reach of Veleka River" (Buresch & Zonkow, 1942; Schlüter, 2006b), "wetlands at the mouth of Boutamyata (Botamyata) River, Sinemorets Village", "waterspill at the mouth of Veleka River" (Balej, 2006; Stoyneva & Michev, 2007).

Hyla orientalis - **NH30**: "Burgas" (Batchvarov, 1963), "Vaya Lake, Bourgas" (Stoyneva & Michev, 2007); **NG36**: "Zvezdets Village" (Batchvarov, 1963); **NG39**: "Poda" (Stoyneva & Michev, 2007; Dufresnes et al., 2015); **NG55**: "Gramatikovo Village" (Buresch & Zonkow, 1942; Schlüter, 2006b); **NG58**: "Arkutino Swamp" (Schlüter, 2006b; KLOOIPLEK, 2007); **NG59**: "Sozopol" (Batchvarov, 1963), "Alepou Swamp" (Stoyneva & Michev, 2007), "Chernomorets" (Dietrich, 1998); **NG65**: "Kosti Village" (Batchvarov, 1963); **NG67**: "Lozenets Village" (Schlüter, 2006b); **NG68**: "near Arkutino Beach" (KLOOIPLEK, 2007), "Primorsko" (Batchvarov, 1963; 1984; Speybroeck, 2005), "Stomoplou Swamp", "the mouth of Ropotamo River" (Stoyneva & Michev, 2007); **NG75**: "Brodilovo Village" (Batchvarov, 1963); **NG76**: "Tsarevo" (Buresch & Zonkow, 1942; Batchvarov, 1984; Balej, 2006; Schlüter, 2006b); **NG85**: "swamps near the mouth of Boutamyata (Botamyata) River, Sinemorets Village", "waterspill at the mouth of Veleka River", "the mouth of Silistar River" (Stoyneva & Michev, 2007), "Silistar" (Dufresnes et al., 2015).

Appendix 2. Published reptilian distributional records (1903-2022) in the Southern Black Sea Coast and Strandzha Nature Park, registered in the current study based on UTM grid (10x10 km).

Testudo graeca - **NH30**: "Burgas" (Kovatscheff, 1903; Schluter, 2005a), "Vaya Lake, Bourgas" (Stoyneva & Michev, 2007); **NG39**: "Kraymorie" (Nöllert, 1981; Schluter, 2005a); **NG44**: "Malko Tarnovo" (Buresch & Zonkow, 1933); **NG59**: "Sozopol" (Kovachev, 1912; Schluter, 2005a); **NG66**: "Izgrev Village" (Balej, 2006); **NG68**: "near the mouth of Ropotamo River" (Speybroeck, 2005; Mollov, 2016), "Kitka Peak, north of Primorsko" (Balej, 2006), "near Arkutino Beach" (Nöllert et al., 1986b; KLOOIPLEK, 2007), "near Primorsko" (Speybroeck, 2005); **NG76**: "Tsarevo" (Buresch & Zonkow, 1933; Schluter, 2005a), "Papia Peak, north of Brodilovo" (Drenski, 1955; Balej, 2006), "Ahtopol" (Gvoždík & Šnajdr, 2001); **NG85**: "Sinemorets Village" (Gvoždík & Šnajdr, 2001; Balej, 2006), "the mouth of Veleka River" (Jablonski, 2006); **NG84**: "Rezovo Village" (Gvoždík & Šnajdr, 2001).

Testudo hermanni - **NH30**: "Burgas" (Kovachev, 1912; Buresch & Zonkow, 1933; Schluter, 2005a), "Vaya Lake, Bourgas"

(Stoyneva & Michev, 2007); **NG39**: "Kraymorie" (Nöllert, 1981; Schluter, 2005a); **NG55**: "Gramatikovo Village" (Buresch & Zonkow, 1933); **NG58**: "near Arkutino Swamp" (Nöllert, 1981; Nöllert et al., 1986b; Speybroeck, 2005; Schluter, 2005a); **NG59**: "Sozopol" (Kovachev, 1912; Schluter, 2005a); **NG68**: "near the mouth of Ropotamo River" (Bartoshik et al., 1981; Speybroeck, 2005), "Kitka Peak, north of Primorsko" (Balej, 2006), "near Primorsko" (Speybroeck, 2005); **NG76**: "Tsarevo" (Buresch & Zonkow, 1933), "Ahtopol" (Gvoždík & Šnajdr, 2001); **NG84**: "Rezovo Village" (Buresch & Zonkow, 1933; Gvoždík & Šnajdr, 2001); **NG85**: "Sinemorets Village" (Gvoždík & Šnajdr, 2001; Balej, 2006).

Emys orbicularis - **NH30**: "Burgas" (Buresch & Zonkow, 1933), "Vaya Lake, Bourgas" (Stoyneva & Michev, 2007); **NG36**: "fish farm near Mladezhko Village" and "Mladezhka river" (Natchev et al., 2015); **NG39**: "Poda" (Stoyneva & Michev, 2007) "near the oil refinery in Burgas" (Tzankov & Stojanov, 2009); **NG44**: NW of Malko Tarnovo (Boev et al., 2008); **NG49**: the mouth of the river near Kraymorie (Nöllert et al., 1986b), Kraymorie (Schluter, 2005a); **NG55**: "Veleka River near Gramatikovo Village" (Buresch & Zonkow, 1933); **NG58**: "Arkutino Swamp" (Beshkov, 1955; Nöllert et al., 1986b; Thieme, 1986; Speybroeck, 2005; Schlüter, 2005; KLOOIPLEK, 2007); "Alepou Swamp" (Thieme, 1986, Schluter, 2005a, Stojanov et al., 2011), "Velyov Vir Reserve" (Tzankov & Stojanov, 2009); **NG59**: "Alepou Swamp", (Stoyneva & Michev, 2007), "Sozopol" (Buresch & Zonkow, 1933; Lenk et al., 1998; Ayaz et al., 2007); "Chernomorets" (Dietrich, 1998); **NG65**: "Veleka River near the villages of Kosti and Bulgari" (Buresch & Zonkow, 1933); **NG67**: "Karaagach Swamp"(Stoyneva & Michev, 2007); **NG68**: "Stomoplou Swamp", "the mouth of Ropotamo River", "wetlands at the mouth of Dyavolska River" (Stoyneva & Michev, 2007), "Primorsko" (Ayaz et al., 2007), "Ropotamo River" (Beshkov, 1955; Bartosik, 1981; Thieme, 1986; Ayaz et al., 2007); **NG75**: "near Brodilovo Village" (Jablonski, 2006; Mollov et al., 2021), "Veleka River - 1-4 km before the mouth" (Beškov, 1987; Popgeorgiev et al., 2017; Mollov et al., 2021), "Veleka River" (Schlüter 2005, Rudloff, 2007; Mollov et al., 2021); "waterspill at the mouth of Veleka River" (Mollov et al., 2021); **NG76**: "Tsarevo" (Buresch & Zonkow, 1933; Beshkov, 1955; Kirin, 2001; Balej, 2006), "Ahtopol" (Beškov, 1987; Thieme, 1986; Jablonski, 2006; Ayaz et al., 2007; Mollov et al., 2021), "the rivulet N of Ahtopol" (Beškov, 1987), "natural monument "Nakovo Kladenche"" (Mollov et al., 2021); **NG84**: "the lower reach of Rezovska River" (Buresch & Zonkow, 1933); **NG85**: "Silistar" (Mollov et al., 2021), "wetlands at the mouth of Boutamyata (Botamyata) River, Sinemorets Village", "waterspill at the mouth of Veleka River", "the mouth of Silistar River" (Gvoždík & Šnajdr, 2001; Stoyneva & Michev, 2007; Mollov et al., 2021); "the lower reaches of the Veleka River" (Tzankov et al., 2015; Mollov et al., 2021).

Kornilev et al. (2017, Appendix 3) provide previously unpublished distribution data for *Emys orbicularis,* based on the 1×1 km MGRS grid (Military Grid Reference System, UTM zone 35N, datum WGS 1984) with cell names and the X, Y coordinates of the centroids. We separated all localities from the Black Sea Coast and Strandzha NP and are given below.

Square	X (centroid)	Y (centroid)
NG6699	27.841494	42.174556
NG7617	27.865462	42.156366
NG7635	27.889415	42.13817
NG7645	27.901515	42.138075
NG7643	27.901259	42.120065
NG7633	27.889163	42.120159
NG7661	27.925189	42.101861
NG7596	27.960787	42.056537
NG7576	27.936619	42.056737

NG8532	28.008551	42.020101
NG6680	27.828331	42.093595
NG4439	27.525219	41.996311
NG5790	27.720528	42.184386
NG7642	27.901132	42.111059
NG8448	28.020053	41.983973
NG5689	27.708319	42.175456
NG6685	27.828917	42.138623
NG6696	27.841136	42.14754
NG7519	27.864482	42.084322
NG8507	27.973008	42.06544
NG7566	27.924535	42.056835
NG8418	27.983843	41.984289
NG8419	27.983982	41.993295
NG8428	27.995913	41.984185
NG8515	27.984815	42.047327
NG3923	27.394868	42.393112
NG3932	27.406959	42.384064
NG5954	27.674394	42.400814
NG5944	27.662244	42.400885
NG5945	27.662339	42.409891
NG5897	27.722273	42.337481
NG6805	27.734202	42.319393
NG6744	27.781515	42.220012
NG6734	27.7694	42.220094
NG6811	27.745911	42.283293
NG3979	27.456006	42.446921
NG3953	27.431316	42.392981
NG4927	27.516657	42.428652
NG6803	27.733993	42.301382
NG6804	27.734097	42.310387
NG5883	27.70973	42.301534
NG5896	27.72217	42.328475
NG5970	27.698296	42.364647
NG4799	27.600205	42.266135
NG4789	27.588081	42.266198
NG6708	27.73347	42.256354
NG6718	27.745593	42.256276
NG5779	27.697202	42.265587
NG4897	27.60089	42.338181
NG4896	27.600804	42.329175
NG5805	27.612854	42.320105
NG5804	27.612766	42.3111
NG5814	27.6249	42.311034
NG5824	27.637033	42.310967
NG6835	27.770605	42.319154
NG6826	27.758579	42.3282
NG4861	27.563992	42.284332
NG5850	27.673049	42.274737
NG5841	27.661017	42.283813
NG5882	27.709629	42.292529
NG5873	27.697599	42.301609
NG5851	27.673144	42.283743
NG5861	27.685272	42.283671
NG5823	27.636942	42.301962
NG6815	27.746336	42.319314
NG5888	27.710237	42.346562
NG5980	27.710439	42.364573
NG7608	27.85348	42.165462

Mauremys rivulata - **NG68**: "The road near Arkutino Swamp" (Bartosik, 1981; Mollov, 2016). "the mouth of Ropotamo River" (Mollov, 2016); **NG75**: "Veleka river - 1-4 km before the mouth" (Beškov, 1987; Popgeorgiev et al., 2017; Mollov et al., 2021), "Veleka River (Schluter, 2005a; Rudloff, 2007); **NG76**: "Ahtopol" (Beshkov, 1985; Beškov, 1987; Thieme, 1986; Fritz & Wischuf, 1997; Beshkov & Nanev, 2002; Rudloff, 2007), "the rivulet N of Ahtopol, the mouth of a rivulet 4 km NW of Ahtopol" (Beškov, 1987), "natural monument "Nakovo Kladenche"" (Stoyneva & Michev, 2007; Kamburov, 2009; Mollov et al., 2021); **NG84**: "the lower reach of Rezovska River" (Buresch & Zonkow, 1933; Beshkov, 1955; 1985; Beškov, 1987; Schluter, 2005a), "near Rezovo Village" (Jablonski, 2006); **NG85**: "Silistar" (Mollov et al., 2021), "wetlands at the mouth of Boutamyata (Botamyata) River, Sinemorets Village", "the lower reach of Veleka River" (Beškov, 1987), "waterspill at the mouth of Veleka River", "the mouth of Silistar River" (Stoyneva & Michev, 2007), "the lower reaches of the Veleka River" (Tzankov et al., 2015).

Kornilev et al. (2017, Appendix 3) provide previously unpublished distribution data for Mauremys rivulata, based on the 1×1 km MGRS grid (Military Grid Reference System, UTM zone 35N, datum WGS 1984) with cell names and the X, Y coordinates of the centroids. We separated all localities from the Black Sea Coast and Strandzha NP and are given below.

Square	X (centroid)	Y (centroid)
NG7596	27.960787	42.056537
NG7597	27.960923	42.065542

NG7587	27.948837	42.065643
NG7577	27.936752	42.065742
NG7576	27.936619	42.056737
NG7661	27.925189	42.101861
NG7671	27.937282	42.101763
NG7556	27.912451	42.056931
NG7566	27.924535	42.056835
NG7519	27.864482	42.084322
NG8437	28.007841	41.975075
NG8419	27.983982	41.993295
NG8409	27.97191	41.993398
NG8418	27.983843	41.984289

Psedopus apodus - **NH30**: "Burgas" (Kovachev, 1905; 1912; Buresch & Zonkow, 1933, Buresh & Popov, 1963), "Vaya Lake, Bourgas" (Stoyneva & Michev, 2007); **NG39**: "Poda" (Kovachev, 1912; Buresch & Zonkow, 1933; Telenchev et al., 2015), "Izvorska Reka River (Telenchev et al., 2015); **NG49**: "Otmanli Park, near Atia Village" (Beshkov, 1973; Telenchev et al., 2015); "Kraymorie" (Schlüter, 2005b); **NG58**: "Arkutino Swamp" (Beshkov, 1973; Stoyneva & Michev, 2007); **NG59**: "Sozopol" (Kovatscheff, 1903; 1905; 1912; Buresch & Zonkow, 1933, Buresh & Popov, 1963; Beshkov, 1993; Schlüter, 2005b); **NG65**: "Kosti Village" (Drenski, 1955); **NG66**: "Izgrev Village" (Balej, 2006); **NG67**: "Kiten" (Bischoff, 1969; Obst, 1978), "near Lozenets Village" (Bartoshik et al., 1981; Belcheva et al., 1988); **NG68**: "near Arkutino" (Speybroeck, 2005; KLOOIPLEK, 2007), "near the mouth of Ropotamo River" (Beshkov, 1973; Bartosik, 1981; Bartoshik et al., 1981; Speybroeck, 2005), "Maslen Nos Cape" (Beshkov, 1973), "Primorsko" (Bischoff, 1969; Obst, 1978; Beshkov, 1985; Beshkov & Nanev, 2002; Schlüter, 2005b); **NG76**: "Tsarevo" (Cyren, 1941); "Ahtopol" (Schlüter, 2005b); **NG84**: "Rezovo" (Buresch & Zonkow, 1933; Gvoždík & Šnajdr, 2001; Telenchev et al., 2015); **NG85**: "waterspill at the mouth of Veleka River" (Stoyneva & Michev, 2007).

Anguis colchicus - **NH30**: "Burgas" (Schlüter, 2005b); "Vaya Lake, Bourgas" (Stoyneva & Michev, 2007); **NG36**: "Mladezhko Village" (Jablonski et al., 2016); **NG44**: "Malko Tarnovo" (Buresch & Zonkow, 1933); **NG45**: "area around Stoilovo Village" (Beschkov, 1966, p. 190, fig. 3); **NG46**: "area around Kalovo and Zebernovo Villages" (Beschkov, 1966, p. 190, fig. 3); **NG49**: "Rosenets Park" (Jablonski et al., 2016); **NG54**: "Slivarovo Village" (Jablonski et al., 2016); **NG55**: "area around Gramatikovo Village" (Buresch & Zonkow, 1933; Beschkov, 1966, p. 190, fig. 3; Mollov, 2010; Jablonski et al., 2016); **NG56**: "area around Kondolovo Village" (Buresch & Zonkow, 1933; Jablonski et al., 2016); **NG65**: "Kosti Village" (Speybroeck, 2005), "area around Kosti and Bulgari Villages" (Buresch & Zonkow, 1933; Beschkov, 1966, p. 190, fig. 3), "Silkosia Reserve" (Jablonski et al., 2016), "Marina Reka PA" (Mollov, 2016); **NG66**: "Izgrev Village" (Jablonski et al., 2016); **NG67**: "Kiten" (Bischoff, 1969); **NG68**: "area of the mouth of Ropotamo River" (Beschkov, 1966, p. 190, fig. 3; Bartosik, 1981; Jablonski et al., 2016), "Primorsko" (Bischoff, 1969); **NG75**: "Brodilovo Village" (Jablonski et al., 2016); **NG85**: "Sinemorets" (Jablonski et al., 2016).

Ablepharus kitaibelii - **NG44**: "Malko Tarnovo" (Buresch & Zonkow, 1933); **NG58**: "Arkutino" (Nöllert et al., 1986b; Moeller, 1990); **NG65**: "Bulgari Village" (Buresch & Zonkow, 1933); **NG66**: "Izgrev Village" (Balej, 2006); **NG58**: "Arkutino" (Schlüter, 2005b); **NG68**: "near the mouth of Ropotamo River" (Bartosik, 1981; Bartoshik et al., 1981), "Primorsko" (Bischoff, 1969); **NG75**: "between Ahtopol and Sinemorets Village" (Jablonski, 2006); **NG76**: "Brodilovo", "Ahtopol" (Vergilov & Natchev, 2018); **NG84**: "Rezovo Village" (Buresch & Zonkow, 1933); "Rezovska reka River" (Schlüter, 2005b).

Mediodactylus daniliewskii - **NH30**: "Burgas" (Kovachev, 1912; Buresch & Zonkow, 1933, Beutler, 1981; Schlüter, 2005b), "Vaya Lake, Bourgas" (Stoyneva &

Michev, 2007); **NG59**: "Chernomorets" (Schlüter, 2005b); "Sozopol" (Kovachev, 1912; Buresch & Zonkow, 1933, Müller, 1939; Beutler, 1981; Beshkov, 1993; Schlüter, 2005b), "Kavatsite-Djuni" (Schlüter, 2005b); "St. Ivan Island near Sozopol" (Buresch & Zonkow, 1933; Müller, 1939; Schlüter, 2005b); **NG68**: "near Arkutino Beach" (Bartosik, 1981; Nöllert et al., 1986b; KLOOIPLEK, 2007), "St. Thomas Island (Zmyiski ostrov)" (Müller, 1939; Kabisch, 1972; Schlüter, 2005b), "Cape Maslen Nos" (Papsdorf, 1971; Bischoff, 1969; Nöllert et al., 1986b; Schlüter, 2005b), "Primorsko" (Beutler, 1981; Beshkov, 1993; Speybroeck, 2005; Schlüter, 2005b); **NG76**: "Tsarevo" (Balej, 2006).

Darevskia praticola - **NG65**: "Kosti Village" (Speybroeck, 2005); **NG84**: "near Rezovo Village" (Buresch & Zonkow, 1933); "Rezovska reka River" (Schlüter, 2005b).

Lacerta agilis - **NG44**: "Malko Tarnovo" (Buresch & Zonkow, 1933).

Lacerta trilineata - **NH30**: "Burgas" (Buresch & Zonkow, 1933; Kradorf, 1986); **NG39**: "Kraymorie" (Nöllert et al., 1986b); **NG59**: "Sozopol" (Kovachev, 1912; Buresch & Zonkow, 1933; Bartosik, 1981; Schlüter, 2005b); **NG68**: "Arkutino Beach" (Nöllert et al., 1986b; Speybroeck, 2005), "near the mouth of Ropotamo River" (Speybroeck, 2005); **NG76**: "Tsarevo" (Cyren, 1941).

Lacerta viridis - **NH30**: "Burgas" (Kovachev, 1912; Donev et al., 2005; Nachev et al., 2016), "Vaya Lake, Bourgas" (Stoyneva & Michev, 2007); **NG36**: "fish farm near Mladezhko Village" (Natchev et al., 2015); **NG39**: "Poda" (Drenski, 1955; Speybroeck, 2005); NG49: "Chernomorets", "Kraymorie" (Schlüter, 2005b); **NG55**: "Gramatikovo Village" (Angelow et al., 1972); **NG58**: "near Arkutino Swamp" (Schlüter, 2005b; Speybroeck, 2005); **NG59**: "Kavatsite, Sozopol" (Schlüter, 2005b); **NG65**: "Kosti Village" (Speybroeck, 2005); **NG66**: "Izgrev Village" (Balej, 2006); **NG67**: "near Lozenets Village" (Bartoshik et al., 1981); **NG68**: "Arkutino Beach" (Schlüter, 2005b; Speybroeck, 2005; KLOOIPLEK, 2007), "near the mouth of Ropotamo River" (Bartoshik et al., 1981), "Cape Maslen Nos" (Bischoff, 1969), "Primorsko" (Cyren, 1941; Bischoff, 1969; Schlüter, 2005b; Speybroeck, 2005); **NG75**: "near Brodilovo Village" (Jablonski, 2006); **NG76**: "Tsarevo" (Buresch & Zonkow, 1933), "Papia Peak, north of Brodilovo" (Balej, 2006), "Ahtopol" (Gvoždík & Šnajdr, 2001; Schlüter, 2005b), **NG84**: "near Rezovo Village" (Buresch & Zonkow, 1933; Gvoždík & Šnajdr, 2001), **NG85**: "the mouth of Silistar River"(Stoyneva & Michev, 2007), "near Sinemorets Village" (Jablonski, 2006), "the mouth of Veleka River" (Jablonski, 2006).

Podarcis tauricus - **NG30**: "Burgas" (Kovachev, 1912); **NG39**: "Poda" (Buresch & Zonkow, 1933); **NG59**: "Sozopol" (Kovachev, 1912; Buresch & Zonkow, 1933; Schlüter, 2005b); **NG67**: "near Lozenets Village" (Bartoshik et al., 1981); **NG68**: "Arkutino area" (Buseke, 1982; Nöllert, 1983; Schlüter, 2005b), "near the mouth of Ropotamo River" (Bartoshik et al., 1981), "Cape Maslen Nos" (Bischoff, 1969), "Primorsko" (Cyren, 1941; Bischoff, 1969; Speybroeck, 2005); **NG76**: "Tsarevo" (Buresch & Zonkow, 1933, Balej, 2006), "Ahtopol" (Buresch & Zonkow, 1933; Gvoždík & Šnajdr, 2001; Schlüter, 2005b; Jablonski, 2006); **NG84**: "Rezovo Village" (Buresch & Zonkow, 1933; Gvoždík & Šnajdr, 2001; Jablonski, 2006).

Podarcis muralis - **NH30**: "Burgas" (Kovachev, 1905; Buresch & Zonkow, 1933; Schlüter, 2005b), "Vaya Lake, Bourgas" (Stoyneva & Michev, 2007); **NG44**: "Malko Tarnovo" (Buresch & Zonkow, 1933); **NG65**: "Kosti Village" (Speybroeck, 2005); **NG68**: "Arkutino area" (Buseke, 1982; Nöllert et al., 1986b; Schlüter, 2005b; KLOOIPLEK, 2007),

"near the mouth of Ropotamo River" (Bartoshik et al., 1981; Koynova et al., 2022), "Primorsko" (Cyren, 1941; Bischoff, 1969; Schlüter, 2005b; Speybroeck, 2005); **NG76**: "Tsarevo" (Buresch & Zonkow, 1933, Belcheva et al., 1989; Balej, 2006), "Ahtopol" (Buresch & Zonkow, 1933; Gvoždík & Šnajdr, 2001; Schlüter, 2005b), "Brodilovo Village" (Buresch & Zonkow, 1933); **NG84**: "near Rezvo Village" (Buresch & Zonkow, 1933; Gvoždík & Šnajdr, 2001; Jablonski, 2006).

Podarcis erhardii - **NG76**: "Varvara Village" (Koynova et al., 2022).

Xerotyphlops vermicularis - **NG58**: "Coast north of Arkutino and south of Shofyorski Beach" (Thieme, 1986); **NG59**: "St. Ivan Island, near Sozopol" (Buresch & Zonkow, 1933; Beshkov, 1956; 1961; 1985), "south of Sozopol" (Beshkov, 1985; Beshkov & Nanev, 2002); **NG67**: "Kiten Village" (Papsdorf, 1971); **NG68**: "Mainland seaside vis-à-vis St. Thomas Island (Zmiyski Ostrov)" (Beshkov, 1985; Jablonski et al., 2019b), "abandoned hotel complex "Zname na Mira"" (Jablonski et al., 2019b), "near Arkutino Beach" (Bartoshik, 1981; Kühnemann, 1981; Buseke, 1982), "near the mouth of Ropotamo River" (Beshkov, 1985), "Ropotamo River valley" (Čihař, 1989), "Maslen Nos Cape" (Beshkov, 1956; 1961), "Unfinished hotel complex "Perla 2" (1.5 km north of Primorsko)" (Jablonski et al., 2019b); **NG75**: "A brook valley between Ahtopol and Veleka River" (Čihař, 1989).

Coronella austriaca - **NG58**: "Yasna Poliana Village" (Kovachev, 1912; Buresch & Zonkow, 1934; Schlüter, 2006a); **NG59**: "Sozopol" (Kovachev, 1912; Buresch & Zonkow, 1934; Schlüter, 2006a).

Platyceps collaris - **NG37**: "near Indzhe Voyvoda Village, Strandzha Mts." (Milchev, 2021); **NG58**: "Arkutino Swamp" (Beshkov, 1985; 2015; Schlüter, 2006a); **NG59**: "Sozopol" (Beshkov, 2015); **NG67**: "near Lozenets Village" (Bartoshik et al., 1981; Rehak, 1985; Beshkov, 1985; 2015; Schlüter, 2006a), "near Primorsko" (Obst, 1981; Rehak, 1985; Speybroeck, 2005; Schlüter, 2006a); **NG68:** "near Arkutino Beach" (KLOOIPLEK, 2007), "near the mouth of Ropotamo River" (Bartoshik & Beshkov, 1979; Bartoshik et al., 1981; Rehak, 1985; Beshkov, 1985; 2015), "Primorsko" (Obst, 1981; Beshkov, 1985; 2015); **NG75**: "south of the town of Ahtopol" (Milchev, 2021); **NG76**: "Ahtopol" (Rehak, 1985; Schlüter, 2006a; Beshkov, 2015).

Platyceps najadum - **NG59:** "Sozopol" (Kovatscheff, 1903; Kovachev, 1905; 1912 Buresch & Zonkow, 1934; Schlüter, 2006a, p. 64, Fig. 10). This locality is unconfirmed according to Naumov et al. (2007).

Dolichophis caspius - **NH30**: "Burgas" (Buresch & Zonkow, 1934; Nachev et al., 2016), "Vaya Lake, Bourgas" (Stoyneva & Michev, 2007); **NG58**: "Yasna Poliana Village" (Kovachev, 1912); **NG59**: "Sozopol" (Müller, 1939; Schlüter, 2006a); **NG66**: "Izgrev Village" (Balej, 2006); **NG67**: "near Lozenets Village" (Bartoshik et al., 1981); **NG68**: "near Arkutino" (Speybroeck, 2005; KLOOIPLEK, 2007), "near the mouth of Ropotamo River" (Beshkov, 1964; Bartoshik et al., 1981; Speybroeck, 2005), "Kitka Peak, north of Primorsko" (Balej, 2006), "near Primorsko" (Speybroeck, 2005); **NG75**: "between Ahtopol and Sinemorets Village" (Jablonski, 2006); **NG76**: "Tsarevo" (Buresch & Zonkow, 1934; Kirin, 1994b; Balej, 2006), "Ahtopol" (Buresch & Zonkow, 1934; Schlüter, 2006a); **NG85**: "waterspill at the mouth of Veleka River" (Stoyneva & Michev, 2007), "near Sinemorets Village" (Jablonski, 2006).

Elaphe sauromates - **NH30**: "Burgas" (Kovachev, 1912; Buresch & Zonkow, 1934; Schlüter, 2006a), "Vaya Lake, Bourgas" (Stoyneva & Michev, 2007); **NG39**: "Poda"

(Stoyneva & Michev, 2007; Nachev et al., 2016; Jablonski et al., 2019a); **NG58**: "near Arkutino Swamp" (Speybroeck, 2005; Schlüter, 2006a); **NG59**: "Sozopol" (Müller, 1939; Schlüter, 2006a), "Alepou Swamp", (Buseke, 1982; Stoyneva & Michev, 2007), "Dyuni" (Jablonski et al., 2019a); **NG65**: "Kosti Village" (Schlüter, 2006a); **NG67**: "Kiten" (Beshkov, 2015); **NG68**: "Ropotamo" (Bartosik, 1981); NG76: "Ahtopol" (Schlüter, 2006a).

Natrix natrix - **NH30**: "Burgas" (Kovachev, 1912; Cyren, 1941; Buresch & Zonkow, 1934), "Vaya Lake, Bourgas" (Stoyneva & Michev, 2007); **NG36**: "fish farm near Mladezhko Village" and "Mladezhka river" (Natchev et al., 2015); **NG39**: "Poda" (Stoyneva & Michev, 2007; Nachev et al., 2016); "Mandra Lake" (Schlüter, 2006a); **NG44**: "Malko Tarnovo" (Guicking et al., 2006); **NG58**: "Arkutino Swamp" (Nöllert et al., 1986a; 1986b; Speybroeck, 2005; Schlüter, 2006a; Stoyneva & Michev, 2007); **NG59**: "Sozopol" (Buresch & Zonkow, 1934), "Alepou Swamp" (Stoyneva & Michev, 2007); "Chernomorets" (Dietrich, 1998); **NG66**: "Izgrev Village" (Balej, 2006); **NG67**: "Karaagach River" (Michev, 1958), "Karaagach Swamp" (Stoyneva & Michev, 2007), "Lozenets" (Schlüter, 2006a); **NG68**: "Arkutino area" (Buseke, 1982; Schlüter, 2006a; KLOOIPLEK, 2007), "St. Thomas Island (Zmiyski ostrov)" (Müller, 1939), "Primorsko" (Buresch & Zonkow, 1934; Speybroeck, 2005), "near the mouth of Ropotamo River" (Bartoshik et al., 1981; Speybroeck, 2005; Schlüter, 2006a), "Stomoplou Swamp", "the mouth of Ropotamo River", "wetlands at the mouth of Dyavolska River" (Stoyneva & Michev, 2007), "Ropotamo" (Bartosik, 1981); **NG75**: "between Ahtopol and Sinemorets Village" and "near Brodilovo Village" (Jablonski, 2006); **NG76**: "Tsarevo" (Buresch & Zonkow, 1934; Batchvarov & Kirin, 1994; Balej, 2006; Schlüter, 2006a), "Ahtopol" (Gvoždík & Šnajdr, 2001); **NG84**: "Rezovo Village" (Buresch & Zonkow, 1934; Gvoždík & Šnajdr, 2001; Jablonski, 2006); **NG85**: "Sinemorets" (Buresch & Zonkow, 1934), "wetlands at the mouth of Boutamyata (Botamyata) River, Sinemorets Village", "waterspill at the mouth of Veleka River" (Balej, 2006; Jablonski, 2006; Schlüter, 2006a), "the mouth of Silistar River" (Stoyneva & Michev, 2007).

Natrix tessellata - **NH30**: "Burgas" (Kovachev, 1912; Buresch & Zonkow, 1934; Schlüter, 2006a), "Vaya Lake, Bourgas" (Stoyneva & Michev, 2007); **NH31**: "Atanasovsko Ezero Reserve" (Michev, 2003); **NG36**: "Mladezhko Village" (Naumov et al., 2011); **NG39**: "Mandra Lake" (Buresch & Zonkow, 1934; Stoyneva & Michev, 2007), "Poda" (Speybroeck, 2005; Stoyneva & Michev, 2007; Brischoux & Kornilev, 2014; Nachev et al., 2016), "Tvarditsa Village" (Naumov et al., 2011); **NG46**: "Kalovo Village" (Naumov et al., 2011); **NG47**: "Yasna Poliana reservoir" (Naumov et al., 2011); **NG48**: "Novo Panicharevo Reservoir" (Naumov et al., 2011); **NG49**: "Kraymorie" (Nöllert et al., 1986b; Schlüter, 2006a), "Rosen Village" (Schlüter, 2006a), "Tsiganski Zaliv Cove" (Naumov et al., 2011); **NG55**: "Gramatikovo Village" (Buresch & Zonkow, 1934); **NG57**: "Fazanovo Village" (Naumov et al., 2011); **NG58**: "the left bank of Ropotamo River near to the mouth (Bartosik et al. 1981), "Arkutino Swamp" (Nöllert et al., 1986b; Schlüter, 2006a; Stoyneva & Michev, 2007), "Yasna Poliana Village" (Kovachev, 1912; Buresch & Zonkow, 1934), "Alepu Swamp" (Naumov et al., 2011); **NG59**: "Sozopol" (Kovachev, 1912; Buresch & Zonkow, 1934; Balej, 2006; Guicking et al., 2006; Jablonski, 2006; Schlüter, 2006a), "Kavatsite" (Kabisch, 1966), "St. Ivan Island, near Sozopol" (Müller, 1939), "Chernomorets" (Dietrich, 1998), "Alepou Swamp" (Stoyneva & Michev, 2007); **NG65**: "Kosti Village" (Balej, 2006; Jablonski, 2006); **NG67**: "Wetlands Karaagach" (Stoyneva & Michev, 2007);

"near Lozenets Village" (Bartoshik et al., 1981), "between Fazanovo and Velika Villages" and "Arapya Cove" (Naumov et al., 2011); **NG68**: "Arkutino area" (Buseke, 1982; Speybroeck, 2005), "St. Thomas Island (Zmiyski ostrov)" (Hecht, 1930; Müller, 1939; Kabisch, 1972; Brecko et al., 2011), "near the mouth of Ropotamo River" (Bartoshik et al., 1981; Speybroeck, 2005; Brecko et al., 2011), "Stomoplou Swamp", "the mouth of Ropotamo River" (Beshkov & Nanev, 2002; Balej, 2006; Jablonski, 2006; Schlüter, 2006a; Stoyneva & Michev, 2007), "wetlands at the mouth of Dyavolska River" (Stoyneva & Michev, 2007), "Kitka Peak, north of Primorsko" (Balej, 2006), "Primorsko" (Balej, 2006; Jablonski, 2006; Brecko et al., 2011); **NG75**: "Brodilovo Village" (Balej, 2006; Jablonski, 2006); **NG76**: "Tsarevo" (Kirin, 1994a; Balej, 2006; Jablonski, 2006), "Ahtopol" (Buresh & Zonkow, 1934; Gvoždík & Šnajdr, 2001; Balej, 2006; Jablonski, 2006; Schlüter, 2006a); **NG84**: "the lower reach of Rezovska River" (Buresch & Zonkow, 1934; Gvoždík & Šnajdr, 2001; Schlüter, 2006a); **NG85**: "Sinemorets" (Buresch & Zonkow, 1934; Schlüter, 2006a), "wetlands at the mouth of Boutamyata (Botamyata) River, Sinemorets Village", "waterspill at the mouth of Veleka River", "the mouth of Silistar River" (Stoyneva & Michev, 2007), "the mouth of Veleka River" (Speybroeck, 2005).

Malpolon insignitus - **NG45**: "15 km north-east from Malko Tarnovo on the road towards "Kachul" locality" (Beškov et al., 1967); **NG58**: "near Arkutino" (Beshkov & Dushkov, 1981; Bartosik, 1981; Buseke, 1982; Nöllert et al., 1986b; Schlüter, 2006a); **NG59**: "Sozopol" (Buresch & Zonkow, 1934; Schlüter, 2006a); **NG67**: "Lozenets Village" (Schlüter, 2006a); **NG68**: "Maslen Nos Cape" (Buresch & Zonkow, 1934), "near Ropotamo" (Beshkov, 1964), "near Primorsko" (Speybroeck, 2005; Schlüter, 2006a); **NG75**: "near Brodilovo Village" (Jablonski, 2006); **NG76**: "Tsarevo" (Kirin, 1994b); **NG74-NG84**: "Rezovska River" (Beshkov & Nanev, 2002); **NG84**: "Rezovo" (Buresch & Zonkow, 1934; Schlüter, 2006a).

Zamenis longissimus - **NH30**: "Vaya Lake, Bourgas" (Stoyneva & Michev, 2007); **NG39**: "Mandra wetlands" (Stoyneva & Michev, 2007); **NG44**: "near Malko Tarnovo" (Buresch & Zonkow, 1934); **NG58**: "Arkutino Swamp" (Stoyneva & Michev, 2007); **NG65**: "Kosti Village" (Speybroeck, 2005); **NG68**: "near the mouth of Ropotamo River" (Müller, 1939; Bartoshik et al., 1981, Beshkov & Dushkov, 1981), "near Arkutino Beach" (KLOOIPLEK, 2007), "Maslen Nos cape" (Buresch & Zonkow, 1934), "near Primorsko" (Speybroeck, 2005); **NG76**: "Tsarevo" (Balej, 2006), "Ahtopol" (Gvoždík & Šnajdr, 2001); **NG74**: "Rezovo Village" (Gvoždík & Šnajdr, 2001); **NG85**: "near Sinemorets Village" (Jablonski, 2006), "wetlands at the mouth of Boutamyata (Botamyata) River, Sinemorets Village", "waterspill at the mouth of Veleka River", "the mouth of Silistar River" (Stoyneva & Michev, 2007).

Zamenis situla - **NG58**: "Arkutino" (Bartosik, 1981); **NG59**: "Sozopol" (Kovachev, 1905; 1912; Buresch & Zonkow, 1934; Beshkov, 1961; 1985; 2015; Thieme, 1986; Moravec & Böhme, 2003; Schlüter, 2006a), "a cemetary park near Kavatsite Camping" (Buseke, 1982; Schlüter, 2006a); **NG68**: "near Primorsko" (Obst, 1981).

Vipera ammodytes - **NH30**: "Burgas" (Kovachev, 1905; 1912; Buresch & Zonkow, 1932), "Vaya Lake, Bourgas" (Stoyneva & Michev, 2007), **NG49**: "Rosen Village" (Christov & Beshkov, 1999), **NG55**: "Gramatikovo Village" (Buresch & Zonkow, 1934; Schlüter, 2006a), **NG59**: "Sozopol" (Kovachev, 1912; Buresch & Zonkow, 1932), **NG66**: "Izgrev Village" (Balej, 2006), **NG67**: "Kiten" (Biella & Blättler, 1992; Schlüter, 2006a) "near Lozenets Village" (Bartoshik et al., 1981; Christov & Beshkov, 1999), **NG68**:

"near Arkutino Beach" (Schlüter, 2006a; KLOOIPLEK, 2007), "near the mouth of Ropotamo River" (Bartoshik et al., 1981), "Primorsko" (Biella, 1983; Biella & Blättler, 1992; Speybroeck, 2005; Schlüter, 2006a), **NG76**: "Tsarevo" (Christov & Beshkov, 1999), "Ahtopol" (Buresch & Zonkow, 1932), **NG84**: "Rezovo Village" (Buresch & Zonkow, 1932; Gvoždík & Šnajdr, 2001), **NG85**: "Simorets Village" (Gvoždík & Šnajdr, 2001, Jablonski, 2006).

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Short note

On the Distribution of the Otter (Lutra lutra L.) in Nature Park "Strandzha" (Bulgaria)

*Dilian G. Georgiev**

University of Plovdiv "Paisii Hilendarski", Faculty of Biology, Department of Ecology and Environmental Conservation, 24 Tzar Assen Str., BG-4000 Plovdiv, BULGARIA
*Corresponding author: diliangeorgiev@gmail.com

Abstract. A total of 18 transects near rivers and streams of different sizes in the area of "Strandzha" Nature Park were studied. The otter was found out in 92% of the studied transects of optimal habitats. It can be assumed that the total number of otters in "Strandzha" Nature Park is 60-70 individuals.

Key words: Otter, Balkans, distribution.

The mountain regions of Bulgaria are not so favorable areas for the European Otter (*Lutra lutra* L.) providing mainly temporary usable habitats to the species, and probably low food resources (Georgiev, 2005; 2006). However the region of Strandzha Mts. situated at SE Bulgaria is consisted of low elevated hilly areas close to the Black Sea Coast, and has very suitable river habitats usable for the otters throughout the year (Georgiev, 2005).

Two previous studies considering the otter distribution in the nature park were carried out: the first by Spassov (2007), and the second by Natchev et al. (2015). However first study was never published and the second was aimed mainly on the otter diet and did not use the "standard" monitoring method of Mason & Macdonald (1986).

This short note is aimed on providing current distributional data for this species in the protected area of the Nature Park "Strandzha" in Bulgaria as a base for future monitoring proposing particular transect localities.

The study was carried out during early June of 2021 at the largest rivers in the area, providing permanently inhabitable habitats for the species. The "standard" otter monitoring method of Mason & Macdonald (1986) accepted and for Bulgaria was used. This method for otter population monitoring was developed for rivers where 600 m lengths (transects) of river bank are selected at intervals of 5-8 km and searched for evidence of otter presence. If otter presence is detected the transect walk is stopped. If there are no any signs of otter presence in the whole 600 m bank length, the sample is considered "negative". Otter signs (spraints, footprints, food remains) were localized using GPS receiver.

A total of 18 transects near rivers of different sizes in the area of "Strandzha" Nature Park were studied. Photos and GPS files for all studied areas, as well as an Excel

file with a description of the points were created as database and given to the nature park authorities.

The otter was found out in 12 of a total of 18 studied transects (Fig. 1) of running waters. These were 66% positive sites. However, some of these studied habitats in which the species has not been registered were secondary, temporarily inhabitable ones. These were: a small river in Ahtopol Town, a karst stream in the Kovach Area, a small stream near the village of Evrenozovo and a small river near the chapel of St. Panteleimon near the village of Brashlyan. If they are excluded, the otter was found out in 12 of the 13 studied transects of optimal habitats - 92% positive sites.

Registrations of the species in the respective transects with their GPS coordinates:

8.6.2021, Silistar River, spraints, N42 01 20.8 E27 59 57.0; 9.6.2021, Veleka River, west of the bridge at Sinemorets, spraints, N42 03 36.7 E27 57 59.3; 10.6.2021, estuary between Ahtopol and Varvara, spraints, N42 06 38.8 E27 54 44.4; 10.6.2021, estuary north of Varvara, spraints, N42 08 04.6 E27 53 49.0; 10.6.2021, a small river near the village of Brodilovo, spraints, N42 05 15.6 E27 51 08.3; 10.6.2021, Veleka River near the village of Brodilovo, foot prints on sand and mud, N42 04 53.8 E27 51 36.9; 10.6.2021, a small river in the village of Kosti, spraints, N42 03 29.7 E27 46 52.0; 10.6.2021, Veleka River near the bridge east of Malko Tarnovo, spraints, N42 01 40.7 E27 37 18.3; 10.6.2021, small river south of the village of Stoilovo, spraints and food remains (crabs), N42 01 00.1 E27 30 16.1; 11.6.2021, Mladezhka River, at a road bridge, spraints, N42 08 15.4 E27 26 28.4; 11.6.2021, Mladezhka River, near the village of Mladezhko, spraints, N42 09 10.6 E27 22 21.9; 11.6.2021, Mladezhka River, near the Izvora Cave, spraints, N42 09 04.1 E27 21 31.7.

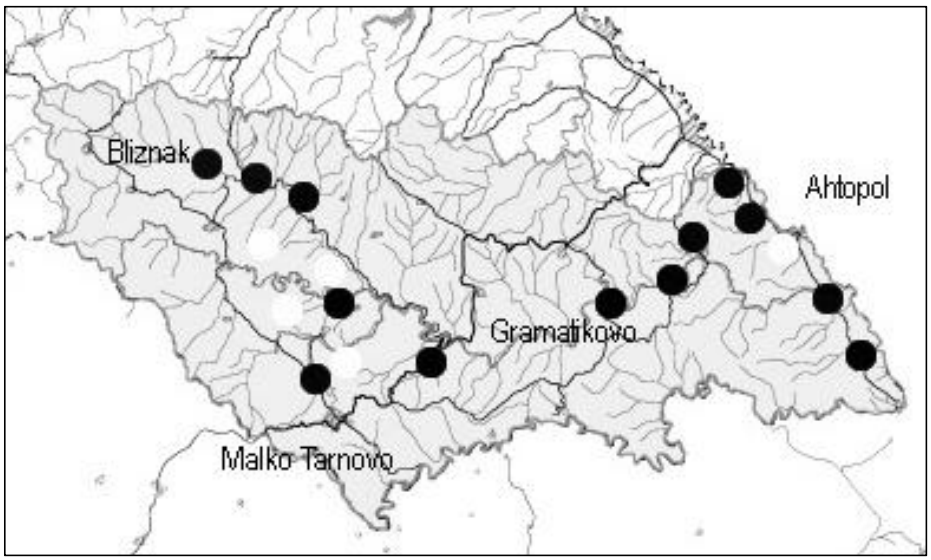

Fig. 1. Approximate transect position in "Strandzha" Nature Park during present study: black circles – positive transects, white circles – negative transects.

Species was not found at the Aidere River south of the village of Stoilovo. The possible reason could be the registered poaching: night fishing with nets and light. A report for these illegal activities was submitted immediately to the "Strandzha" Nature Park authorities by the author.

According to the accepted methodology for monitoring of the species, its population in Strandzha Nature Park can

be considered as such in a very good condition, and extrapolate the maximum density of 0.3 individuals per kilometer of river section using the criteria of Georgiev (2008). On this base, the following number of specimens along the two large rivers in the park was calculated: Veleka River - 40-50 resident individuals and Mladezhka River - 10-15 resident individuals. If we add and the shorter river sections and small tributaries in the park, providing capacity for a permanent residence of otters, it can be assumed that the total number of otters in "Strandzha" Nature Park is 60-70 individuals.

Acknowledgements

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Short note

On the Freshwater Snails of Strandzha Mountains and its Adjacent Coastal Area

Dilian Georgiev[*1], *Teodora Trichkova*[2], *Milcho Todorov*[2], *Ivaylo Dedov*[3]

[1]University of Plovdiv, Faculty of Biology, Department of Ecology and Environmental Conservation, 24 Tzar Assen Str., BG-4000 Plovdiv, BULGARIA
[2]Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, 1 Tsar Osvoboditel Blvd., 1000 Sofia, BULGARIA
[3]Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, 2 Gagarin Street, 1113 Sofia, BULGARIA
[*]Corresponding author: diliangeorgiev@gmail.com

Abstract. Six species of freshwater snails were newly recorded to the area of Strandzha Mts (Bulgaria): *Acroloxus lacustris*, *Anisus spirorbis*, *Aplexa hypnorum*, *Planorbarius corneus*, *Gyraulus albus*, and *G. laevis*. An updated check list was provided for this area containing a total of 27 species. The sum of the Palearctic and Holarctic species is highest in number (34%) but the percentage of local endemics is high too (27%). These endemics inhabit a few very restricted spring sites in the karstic regions of the mountains and belong to the genera *Bythinella*, *Radomaniola* and *Strandzhia*.

Key words: freshwater, snails, Balkan Peninsula, Strandzha Mountains, diversity, distribution, zoogeography.

Introduction

The freshwater snails of Strandzha Mts. are not studied in detail. A review of all published literature was done (Valkanov, 1957; Lyutskanov, 1990; Angelov, 2000; Damyanov & Liharev, 1975; Georgiev & Glöer, 2013; Georgiev & Hubenov, 2013; Georgiev, 2014). Till now a total of 21 species of freshwater snails (Mollusca, Gastropoda) have been known from Strandzha Mts. and its adjacent coastal area.

Material and Methods

Data were collected from published sources and field surveys. A portion of the materials were collected in the course of the project "Joint Monitoring for Environmental Protection in BSB countries" in various habitats in Strandzha Mts. New collections in the area were carried out by the authors mainly during various projects between 2009 and 2021. One single record from 1993 was also added. The snails were hand-collected as well as by a standard hydrobiological net.

The zoogeographical groups are considered according to Georgiev (2014). The following abbreviations are used: LE – local endemic, EuA – European-Anatolian, P – Palearctic, H – Holarctic, MSEu – middle-south European, EuS – European-Siberian, EM – East Mediterranean, Eu – European, A – alien to Bulgaria and Europe.

Results and Discussion

Six species of freshwater snails were newly recorded to the area of Strandzha Mts:

Acroloxus lacustris (Linnaeus, 1758): 06.08.2011, Fakyiska River near Varovnik Village, N42 13 22.7 E27 11 33.5, T. Trichkova, M. Todorov leg., det.

Anisus spirorbis (Linnaeus, 1758): 29.09.2011, Arkutino Lake, N42 19 55.2 E27 43 34.1, T. Trichkova, M. Todorov leg., det.

Aplexa hypnorum (Linnaeus, 1758): 23-29.05.1993, Veleka River (?), near Sinemorets Village, coordinates not known, P. Mitov leg., I. Dedov det.;

Planorbarius corneus (Linnaeus, 1758): 06.08.2011, Fakyiska River near Varovnik Village, N42 13 22.7 E27 11 33.5, T. Trichkova, M. Todorov leg., det.

Gyraulus albus (O. F. Müller 1774): 08.06.2009, a small river at Popski Beach near Tsarevo Town, N42 10 12.4 E27 49 25.9, D. Georgiev leg., det.

Gyraulus laevis (Alder, 1838): 03.10.2012, Ropotamo River, "Velyov Vir" reservation, N42 17 59.1 E27 42 37.3, T. Trichkova, M. Todorov leg., det.

One new locality of the invasive *Potamopyrgus antipodarum* (J. E. Gray, 1843) was recorded during present study: a small river near the village of Brodilovo, 10.6.2021, N42 05 15.6 E27 51 08.3, D. Georgiev leg., det.

After our study a total of 27 species of freshwater snails were known from Strandzha Mts.

Updated check list of the freshwater snails of Strandzha Mountains

(The newly recorded species are marked with an asterisk and are in bold)

Neritidae
Theodoxus fluviatilis (Linnaeus, 1758) - EuA

Bythinellidae
Bythinella dedovi Glöer & Georgiev, 2011 - LE
Bythinella elenae Glöer & Georgiev, 2011 - LE
Bythinella izvorica Glöer & Georgiev, 2011 - LE
Bythinella margritae Glöer & Georgiev, 2011 - LE
Bythinella temelkovi Georgiev & Glöer, 2014 - LE

Hydrobiidae
Radomaniola strandzhica Georgiev & Glöer, 2013 - LE
Strandzhia bythinellopenia Georgiev & Glöer, 2013 - LE

Tateidae
Potamopyrgus antipodarum (J. E. Gray, 1843) - A

Lymnaeidae
Galba truncatula (O. F. Müller, 1774) - P
Radix auricularia (Linnaeus, 1758) - P
Radix balthica (Linnaeus, 1758) - P
Radix labiata (Rossmässler, 1835) - MSEu

Acroloxidae
***Acroloxus lacustris* (Linnaeus, 1758)** - EuS

Physidae
***Aplexa hypnorum* (Linnaeus, 1758)** - H
Physella acuta (Draparnaud, 1805) - A

Planorbidae
Ancylus fluviatilis (O.F. Müller, 1774) - Eu
***Anisus spirorbis* (Linnaeus, 1758)** - P
Anisus vorticulus (Troschel, 1834) - EuS
Ferrissia fragilis (Tryon, 1863) - A
***Gyraulus albus* (O. F. Müller 1774)** - H
***Gyraulus laevis* (Alder, 1838)** - H
Gyraulus piscinarum (Bourguignat, 1852) - EM
Hippeutis complanatus (Linnaeus, 1758) - P
***Planorbarius corneus* (Linnaeus, 1758)** - EuS
Planorbis planorbis (Linnaeus, 1758) - H
Segmentina nitida (O. F. Müller, 1774) - P

With its unique geographical location and geology, Strandzha Mountains have a specific complex of freshwater snail species, taking into account their distribution (Fig. 1). The percentage of Palearctic and Holarctic species is typically the highest (34%), followed by local endemics which percentage is also high (27%). The endemics inhabit a few very small spring sites in the karstic regions of the mountains. These are mainly representatives of the genus *Bythinella* (5 recently described species), one species of *Radomaniola*, and one of *Strandzhia* (the only known species from this genus). The other

zoogeographical categories are represented with a low percentage and are relatively evenly distributed. However some parts of the mountains still remain unexplored, especially its underground waters where some more local endemics of Rissooidea could be found.

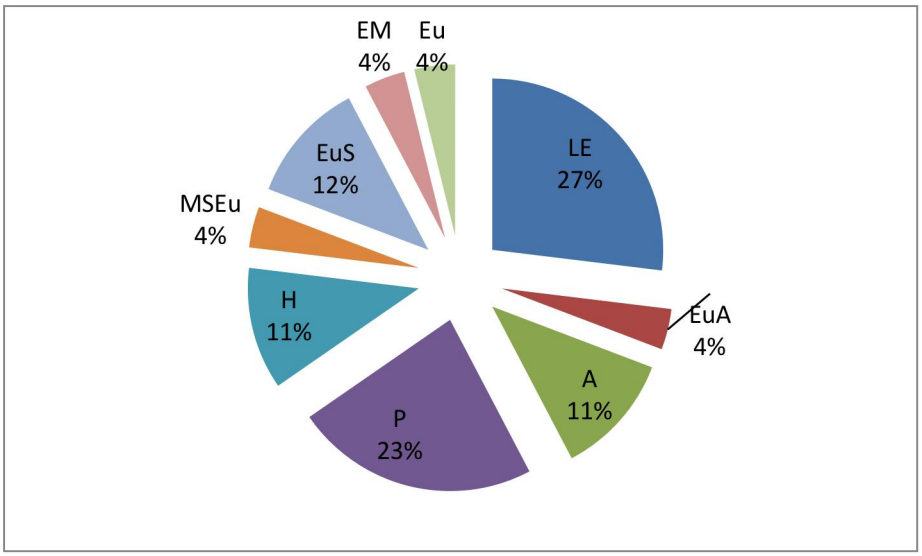

Fig. 1. Zoogeographical structure of the freshwater snail complex known from Strandzha Mountains and its adjacent coastal area.

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Short note

A Case of Deformed Carapaces of the European Pond Turtle (Emys orbicularis) from Veleka River (SE Bulgaria)

Ivelin A. Mollov[1], Tsvetelina D. Petrova[2]*

[1]University of Plovdiv "Paisii Hilendarski", Faculty of Biology, Department of Ecology and Environmental Conservation, 24 Tzar Assen Str., BG-4000 Plovdiv, BULGARIA
[2]Regional Natural History Museum – Plovdiv, 34 Hristo G. Danov Str., BG-4000 Plovdiv, BULGARIA
*Corresponding author: mollov_i@uni-plovdiv.bg

Abstract. Herein we report a peculiar case of deformed carapaces of 4 individuals of the European Pond Turtle (*Emys orbicularis*) from Veleka RIver in "Strandzha" Nature Park. A discussion of their potential causes and comparison with similar cases are also given.

Key words: carapaces deformities, *Emys orbicularis*, Veleka River, Strandzha, Bulgaria.

During a monitoring study on the populations of the European Pond Turtle *Emys orbicularis* (Linnaeus, 1758) and the Balkan Pond Turtle *Mauremys rivulata* (Valenciennes, 1833) in "Strandzha" Nature Park (Mollov et al., 2021) we managed to capture 4 adult individuals with strangely deformed carapaces (Fig. 1). All turtles were captured on land by hand in a spillway at the mouth of Veleka River (42°03'55.7"N, 27°58'24.2"E) and on the right riverbank, close to the mouth (42°03'53.1"N, 27°58'12.5"E). The carapaces and plastrons of the captured individuals looked very deformed from their normal shape and color (Fig. 1). Some authors describe the same phenomenon for *E. orbicularis* from other locations in Bulgaria and Europe. Unjiyan (2000) published a photo of an adult female (p. 74, fig. 31) from 23.05.1967, from the Srebarna Reserve (NE Bulgaria), with similar deformations on the carapace, which we also observed at the mouth of the Veleka River, but the author does not give any explanations for this condition. Similar deformations of the carapace were also observed by Dr. O. Todorov (2022, pers. comm.) from the Srebarna Reserve.

Fig. 1. The study site (a temporary spillway near the mouth of Veleka River ("Strandzha" NP).

A possible explanation for the observed deformities is provided by Cyren (1941), who described an adult *E. orbicularis* of Euboea, Greece with a carapace that also had deformities (very similar to those observed by us). The stated cause is a significant overgrowth of algae on the shell. According to the author, this did not interfere in any way with the turtle he describes.

A - An adult female *E. orbicularis* (see No 1 in Table 1).

B - An adult male *E. orbicularis* (see No 2 in Table 1).

C - An adult male *E. orbicularis* (see No 3 in Table 1).

D - An adult female *E. orbicularis* (see No 4 in Table 1).

Fig. 2. The captured individuals of *E. orbicularis* from the mouth of Veleka River. Photos: I. Mollov. All captured individuals have severe deformities on the carapace and plastron, where the black smooth other shell with the normal coloration for this species is completely destroyed and lower layers significantly deformed.

Table 1. Morphometric characteristics of the captured *Emys orbicularis* individuals with deformed carapaces from Veleka River (see Mollov et al. (2021) for methodology and abbreviation).

No	Sex	Weight (W), g	SCL, mm	MPL, mm	H, mm	MCW, mm	Date (hour)
1.	Female	475	131.5	125.0	56.0	96.0	01.06.2021 / 17:09
2.	Male	485	140.0	134.0	59.0	108.6	01.06.2021 / 17:29
3.	Male	660	153.0	147.0	66.0	112.4	01.06.2021 / 17:29
4.	Female	515	133.5	130.0	55.0	120.0	2.7.2021 / 14:35

We think that this explanation fits, since the same deformities are presented in Akgul et al. (2014, p. 27, fig. 4) from *E. orbicularis* individuals from Turkey, and the extend of the deformities, depends on the the extent of the algal plaques. If the reason for these deformities was something in the water (like pH, salinity, etc.), then all turtles would have been affected. We found these deformities on only these four individuals.

In our opinion much more individuals are affected by the algae, but we managed to capture only four. All captured individuals seemed otherwise healthy and undisturbed by these deformities. Also we did not observe this phenomenon on *Mauremys rivulata* (occurring simpatrically with *E. orbicularis* at the study site). Again based on the results presented by Akgul et al. (2014) *E. orbicularis* is much more affected (especially adult turtles), than *M. rivulata*.

Soylu et al. (2006) reported fifty-three species of epizoic algae growing on *Emys orbicularis* from several locations in the Central Anatolia region, Turkey, with significant variation in algal communities from different sites. Akgul et al. (2014) studied in more detail the algae developing on the surface of the carapace of individuals of *M. rivulata* and *E. orbicularis* from Kayak River Delta (Saros Gulf, Canakkale Province, Turkish Thrace). The study describes fourteen taxa of epizoic algae, the most common being species from the genera *Chamaesiphon, Phormidium* and *Oscillatoria*. Greater algal growth was found on *E. orbicularis* than in *M. rivulata*. A similar study was also done by Fayolle et al. (2016), who studied epizoic algae on the carapaces of a total of 60 ind. of *Emys orbicularis* in three shallow Mediterranean wetlands located in the Camargue, France. The carapace and plastron of the individuals were sampled, and seventy-seven epizoic algal species were identified, grouped into 51 Bacillariophyta, 11 Chlorophyta, 7 Cyanophyta, 6 Euglenophyta, 1 Dinophyta and 1 Xanthophyta taxa. These findings show a clear distribution of epizoic algae according to taxonomic group density, with the taxa Chlorophyta and Cyanophyta dominating the carapace and representatives from the taxon Xanthophyta (genus *Vaucheria*) dominating the plastron. Algal assemblages did not vary significantly among the wetlands studied.

Studies on the epizoic algal assemblages on the freshwater turtles in Bulgaria has not been conducted so far, so in our opinion this finding is important and could serve as basis on future research on this interesting symbiotic relationship. The relationship between turtle and algae is considered commensal, since algae take advantage of the movement of their host for access to resources and dispersion, while algae generally have little effect on the health of their host (Wahl, 2008; Roubeix et al., 2021).

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Short note

Body Condition of the European Pond Turtle (Emys orbicularis) and the Balkan Pond Turtle (Mauremys rivulata) from Silistar River (SE Bulgaria)

*Ivelin A. Mollov**

University of Plovdiv "Paisii Hilendarski", Faculty of Biology, Department of Ecology and Environmental Conservation, 24 Tzar Assen Str., BG-4000 Plovdiv, BULGARIA
*Corresponding author: mollov_i@uni-plovdiv.bg

Abstract. Fulton's condition factor and the scaled mass index of the European Pond Turtle (*Emys orbicularis*) and the Balkan Pond Turtle (*Mauremys rivulata*) populations from Silistar RIver in "Strandzha" Nature Park were calculated and compared. *E. orbicularis* shows greater values of both indices, than *M. rivulata*.

Key words: *Emys orbicularis*, *Mauremys rivulata*, body condition.

Introduction

Body condition is a major concept in ecology considered in many studies, and a variety of non-destructive methods are often used to estimate the condition of individuals based on the relationship between the mass and the length of the body. There is currently no consensus among ecologists about the most appropriate body condition index (BCI) method, and most authors usually tend to apply a method used previously by their peers (Peig & Green, 2010).

Condition indices are used to quantify individual health and they are often used in addition to ecological studies (Stevenson & Woods Jr., 2006). In a previous study on the populations of the European Pond Turtle - *Emys orbicularis* (Linnaeus, 1758) and the Balkan Pond Turtle - *Mauremys rivulata* (Valenciennes, 1833) in "Strandzha" Nature Park (Mollov et al., 2021) we presented new data on the ecological properties of the above-mentioned species of aquatic turtles. In our stidy we used a BCI defined in the sense of Willemsen & Hailey (2002), where the $\log_{10}$ actual weight of the individual is devided the expected weight of the individual as a function of size. The expected weight of the individuals was obtained according to the modified ellipsoid volume formula (after Loehr et al., 2004).

In the current short note a different aproach for calculating the BCI is applied, based on weight and length of the body.

Material and Methods

For the estimating the body condition of the two species of aquaic turtles we used two separate approaches, based on weight and length of the body.

Fulton's condition factor (CF)

Originally developed for fish this is probably the most frequently used metric, for calculating individual fitness (Fulton 1904; Stevenson & Woods Jr., 2006). *CF* is computed as body mass divided by the

cube of body length. In the current study we used a multiplier of 10^4. The calculation of CF assumes isometric growth (isometry in which shape and body composition does not change with size) because length is raised to the 3rd power. This is a fair approximation for many species, including Emys orbicularis (Zuffi et al., 2017).

Scaled mass index (SMI)

The scaled mass index was calculated as an index of body condition following Peig & Green (2009; 2010) and is calculated with the following formula:

$$SMI_i = M_i * \left(\frac{L_0}{L_i}\right)^{b_{SMA}},$$

where: SMI - scaled mass index (the predicted body mass for individual i when the linear body measure is standardized to L_0); M_i - the mass (body weight) of the individual i, measured in grams (g); L_i - straight carapace length, measured with a caliper (with an accuracy of 0.1 mm), L_0 - the arithmetic mean value for L for the study population; b_{SMA} - the scaling exponent, that is, the slope of a standardised major axis (SMA) regression (also know as RMA or reduced major axis regression) of the length relationship. The scaling exponent b_{SMA} was calculated using ln-transformed data by dividing the slope from the RMA regression by the Pearson's correlation coefficient r, using the "RMA" v.1.21 software (Bohonak & van der Linde 2004).

The data were analyzed by descriptive statistics. Comparison of CF and SMI between the two aquatic turtle species was done using the Mann-Whitney U-test, where differences with $p<0.05$ [α=5%] were considered statistically significant. All statistical analises (except for the RMA regression) were performed using the PAST v.4.0 software (Hammer et al., 2001).

Results and Discussion

Details of the morphometric variables measured in both studied species species of aquatic turtles from Silistar River are presented in Table 1.

Table 1. Straight carapace length (L, mm), body weight (M, g), Fulton's condition factor (CF), scaled mass index (SMI) and standard deviations (SD), and details of the scaling exponents used to calculate the SMI in the two studied species of freshwater turtles. The regression coefficients for standardised major axis regressions of M on L (b_{SMA}) and the 95% confidence intervals are also shown. Mean length shown was used as L_0, when calculating the SMI.

Species	n	L ± SD	M ± SD	CF ± SD	SMI ± SD	b_{SMA}	b_{SMA} (CI 95%)
Emys orbicularis	14	120.60 ± 20.87	303.0 ± 134.37	1.62 ± 0.16	284.01 ± 26.12	2.871	2.50 - 3.08
Mauremys rivulata	16	129.23 ± 32.05	318.12 ± 226.05	1.26 ± 0.20	222.89 ± 37.21	3.235	2.71 - 3.47

As mentioned before the Fulton's condition factor assumption is growth to be isometric, since the length is raised to the 3rd power. This seems to be true for *Mauremys rivulata*, since the b_{SMA} value is 3.235, and somewhat true for *Emys orbicularis* as the b_{SMA} value is very close to 3, namely 2.871 and all confidence intervals for b_{SMA} were below around 3 as well (Table 1).

E. orbicularis shows a statistically significant higher values of the *CF* (U=17.0, z=3.93, p=0.0001) and *SMI* index (U=18.00, z=3.98, p=0.00002) than *M. rivulata* in Silistar River.

These results could be used in future studies on the body condition of the native aquatic turtles in Bulgaria.

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Example: Management plan for the protected area for birds BG 0002086, "Rice Fields Tsalapitsa". (2013). Retrieved from https://plovdiv.riosv.com (In Bulgarian)

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Author, A., Author, B. & Author, C. (Year of Publication). Title of work. In A. Author, B. Author, & C. Author (Eds.). *Title of the book or proceedings.* (Edition, pp. XX-XX). Publisher City, Country: Publisher.

Software:

Author, A. (Year of Publication). *Name of software*. Vers. XX. Retrieved from http://xxxx

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StatSoft Inc. (2004). *STATISTICA (Data analysis software system)*, Vers. 7. Retrieved from http://www.statsoft.com

Website:

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European Directive:

Official European directives, issued from the European parliament and of the Council (EC) should be cited as follows (example):

EC. (2010). Directive 2010/63/EU of the European Parliament and of the Council on the protection of animals used for scientific purposes. *Official Journal of the European Union, L276,* 33-79. Retrieved from https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:276:0033:0079:en:PDF

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Biological Diversity Act. (2002). *State Gazzette, 77*, 09.08.2002. (In Bulgarian).
Medicinal Plants Act. (2000). *State Gazette, 29,* 07.04.2000. (In Bulgarian).
Protected Areas Act. (1998). *State Gazette, 133,* 11.11.1998 (In Bulgarian).

In case of papers written in other than Latin letters, if there is an English (or German, or French) title in the summary, it is recommended to be used. If there is not such a summary, the author's names must be transcribed and the title of the paper must be translated into English. If the name of the journal is also not in Latin letters it also should be transcribed (not translated). This should be noted in round brackets at the end of the paragraph, for instance: (In Bulgarian, English summary).

Examples:

Angelov, P. (1960). Communications entomologiques. I. Recherches sur la nourriture de certaines espèces de grenouilles. *Godishnik na muzeite v grad Plovdiv, 3,* 333-337. (In Bulgarian, Russian and French summary).
Korovin, V. (2004). Golden Eagle (*Aquila heliaca*). Birds in agricultural landscapes of the Ural. Ekaterinburg, Russia: Published by Ural University. (In Russian).

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E-mail: ecologia_balkanica@abv.bg

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