

Faunistic Study of the Tsibar Danube Island

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Abstract

Tsibar Island is situated on the Bulgarian part of the Danube River, at 680 m of the Bulgarian and about 100 of the Romanian coast from 716 to 719 km along the river, with an area of 1.3 km². The territory is covered mainly by riparian woodland. Because of its European importance to the protection of rare and threatened habitats, plants and animals, including birds, the island falls within the borders of proposed Natura 2000 sites under both the Birds and the Habitats Directives.

Part of the island is placed under strict protection as a managed reserve "Ibisha". In 1997 the territory was designated as an Important Bird Area by BirdLife International. In 2002 the reserve has been declared as a Ramsar site according to the international convention for the conservation of wetlands. Tsibar Island is of international importance defined by one of the largest mixed colony of herons and cormorants in Bulgaria. It is a site of global importance for the nesting Pygmy Cormorant (*Phalacrocorax pygmeus*) and White-tailed Eagle (*Haliaeetus albicilla*) and one of the most important sites in Bulgaria for the nesting of the Night Heron (*Nycticorax nycticorax*), Squacco Heron (*Ardeola ralloides*) and Spoonbill (*Platalea leucorodia*). There have been identified more than 100 animal species: 42 terrestrial and 16 aquatic invertebrates, 5 fish species, 1 amphibian and 1 reptile species, 30 birds (including 22 breeding), 16 mammalian species (including 8 species of bats). Ascertained are the Medicinal leech (*Hirudo verbana*), which is a rare species at the European level, endangered Thick-shelled river mussel (*Unio crassus*), protected fish Asp (*Leuciscus aspius*) and Great raft spider (*Dolomedes plantarius*), included in the Red Data Book of Bulgaria in the category "extinct". A management plan for Ibisha Menaged Reserve was developed in 2015.

Keywords: fauna, Ibisha reserve, Tsibar Island, Ibisha Ramsar Site

Rezumat.

Studiul faunistic al Insulei dunărene Tsibar

Insula Tsibar este situată în partea bulgărească a fluviului Dunărea, la 680 m de malul bulgăresc și aproximativ 100 m de malul românesc, între km fluviali 716 și 719, având o suprafață de 1,3 kmp. Teritoriul este acoperit în general de păduri ripariene. Datorită importanței sale europene pentru protecția unor habitate rare și amenințate, plante și animale, inclusiv păsări, insula se încadrează siturilor Natura 2000, atât în cadrul Directivei Păsări, cât și a Directivei Habitate.

Parte din suprafața insulei este sub protecție strictă, fiind inclusă rezervației *Ibisha*. În anul 1997, teritoriul a fost declarat ca Arie Avifaunistică Importantă de către organizația BirdLife International, iar în anul 2002 sit Ramsar, conform convenției internaționale pentru conservarea zonelor umede. Insula Tsibar prezintă importanță națională ca urmare a prezenței uneia dintre cele mai mari colonii mixte de stârci și cormorani din Bulgaria. Este un loc de importanță globală pentru cuibărirea cormoranului pitic (*Phalacrocorax pygmeus*) și a șoimului codalb (*Haliaeetus albicilla*), și unul din cele mai importante locuri din Bulgaria pentru cuibărirea mai multor specii stârc (*Nycticorax nycticorax*, *Ardeola ralloides* și lopătar (*Platalea leucorodia*). Au fost identificate peste 100 de specii de animale, din care 42 de nevertebrate terestre și 16 acvatice, 5 specii de pești, una de amfibieni și una de reptile, 30 de specii de păsări (din care 22 care cresc pui), 16 specii de mamifere (din care 8 de lilieci). A fost certificată prezența lipitorii medicinale (*Hirudo verbana*), o specie rar întâlnită în cadrul Europei, midia de râu cu cochilie groasă (*Unio crassus*), peștele viperă (*Leuciscus aspius*) și marele păianjen (*Dolomedes plantarius*), inclus pe Lista Roșie a Bulgariei, la categoria *extinct*. Un plan de management pentru rezervația Ibisha a fost elaborat în anul 2015.

Cuvinte-cheie: faună, rezervația Ibisha, insula Tsibar, situl Ramsar Ibisha

Introduction

Tsibar (Ibisha) Island is situated on Bulgarian part of Danube River, at 680 m of the Bulgarian and about 100 m from the Romanian coast, from 716 to 719 km along the river. Its area covers 1.3 km², the average height is about 3.5 m above the water surface and its maximum width is 550 m. The territory is covered mainly by riparian woodland which originated naturally as a result of the influence of the river stream. Tsibar Island is identified as the twenty-third largest among the Bulgarian Danube Islands. On its territory since

1984, part of the island is placed under strict protection as a managed reserve "Ibisha" (34.6 ha) and a protected area "Tsibar Island" located in the municipality Valchedram.

The island Tsibar is located on about 600-700 m in a straight line (Romania is only about a hundred meters away). Since it is built mainly of silt, the coast of the island is covered with fine sand, only in some places mud. The climate is continental. The average annual rainfall is 571.8 mm with February minimum and May or June maximum. The average monthly maximum temperature (August) is 36.8°C and the minimum temperature (January) is 14.7°C below zero.

The island consists of river sediments. In the western part there is a large sand bank without vegetation. There are river shallows around the island. The water regime is entirely dependent on the regime of the Danube. At high levels on the Danube (especially in spring) the lower parts of the island are flooded by river water. The temporarily flooded areas are occupied by forest vegetation, changing their position in time and space. The territory contains a specific habitat type – flooded riverine forest, which is rare in Europe and thus contributes to the conservation of biological diversity in the biogeographic region. It is assessed with an average value of biodiversity relative to the rest of Bulgaria. The most valuable element of the island vegetation is the flooded forests /associations dominated by Black Alder (*Alnus glutinosa*), Crack Willow (*Salix fragilis*), White Poplar (*Populus alba*) and Black Poplar (*Populus nigra*). There are also hygrophyte grass communities. The forests have a dense and practically impenetrable layer of lianas and Blackberry (*Rubus sp.*).

Because of its European importance to the protection of rare and threatened habitats, plants and animals, including birds, the island falls within the borders of proposed Natura 2000 sites under both the Birds and the Habitats Directives.

The boundary of the Ramsar site Ibisha Island covers the boundaries of the Natura 2000 sites under the Birds Directive: BG0002007 "Ostrov Ibisha", BG0002008 "Ostrov do Gorni Tsibar", BG0002009 "Zlatiyata" and BG0002104 "Tsibarsko blato", and the territory of Natura 2000 site under Habitats Directive BG0000199 "Tsibar". Cross-border wetland "Island Ibisha - Bistrets" with Romania exists since 2013.

The area around Ibisha Island and the two smaller islands downstream used to be one of the key sites for commercial sturgeon fishery in the Danube River section between Bulgaria and Romania. Despite of the tendency for steady decline the sturgeon populations were intensively exploited until the year 2000. After that a dramatic decline in the populations was reported and fishing was limited due to the lack of fish resources.

The closeness of the Tsibar Island to the Romanian coast is a cause for settling on terrestrial mammal fauna which can easily pass, especially in summer low water. Record low water periods were noted in 1919 and 2004. Of importance is also the occasional freezing of the Danube River, the last major event having been registered in the winter of 1984 -1985.

The island is virtually uninhabited for most of the year, and human activity is very limited. There is seasonal work such as logging and hunting in the fall (October-December).

A characteristic feature of the Danube islands are their internal channels, called Zattons (Zattoni). In the spring fresh waters flood the islands and partially fill the channels. By the end of summer some of them dry, while others retain water until the next flooding. The existence of Zattons is a subject for specific biodiversity. Zattons are an important place for invertebrates, fish and amphibians, which serve as feeding base for birds and mammals.

Materials and methods

The field research in Ibisha reserve and the buffer zone were carried out in June - July 2014.

For identifying the species richness of **terrestrial invertebrates**, standard collecting methods and techniques were used: transect method with entomological sweep net, screening by using a Gilyarov's litter reducer (3/6 mm), pitfall trapping (13 traps (9/12 cm) with preservative formaldehyde- propylene glycol solution). The traps were situated in two groups - among scrub vegetation and near Zattons.

The identification of the taxa was according to field guides and relevant scientific papers. The collection of **aquatic invertebrates** was performed in high waters, where the depth of Zattons was about 1 m (21.06.2014) and after Zattons drying (12.07.2014). For the collection of the invertebrate animals a manual frame and a light triangular dragger (EN ISO 10870:2012), were used - about 300 linear m along the cost of Zattons and a narrow area along the Danube river cost.

The estimation of local species richness of the **vertebrate species** was investigated by registration based on the transect method and direct visual observations and reporting of the existence of a species at a trace (Oshmarin & Pikunov, 1990) and of vital activity (footprints, excrement and others).

The **ornithological** observations were accomplished using a transect method along the south edge of the mixed nesting colony of Great Cormorant. The count of Spoonbills and Egrets was taken, with birds flying in and out from the colony and their nests. The count of Cormorant nests was also registered -mainly on the hybrid Poplar, and Spoonbills and Egrets nests on Elms.

The numbers of songbirds nesting around have been identified mainly acoustically.

Bats were recorded 30 - 40 min after sunset by using a D240X bat detector (Pettersson Elektronik AB, Uppsala) with a sampling rate of 307 kHz and a frequency range from 10–120 kHz. The calls were recorded for 30 to 120 minutes in each habitat, then converted to the *.wav format and analyzed by the Bat Sound software. Ultrasound recordings were identified according to Russo & Jones (2002).

Results and discussions

On Tsibar Island there have been identified more than 100 animal species: 42 terrestrial and 11 aquatic invertebrates, 5 fish species, 1 amphibian and 1 reptile species, 30 birds (including 22 breeding), 16 mammalian species (including 8 species of bats).

Invertebrates

The terrestrial invertebrate fauna on Tsibar Island was not a subject to particular research so far. Todorov et al. (2016) are the only authors mentioning Medicinal leech (*Hirudo verbana*) location near the Reserve.

During the field studies representatives of 42 species distributed in 29 families of terrestrial invertebrates were identified. Most of the established terrestrial invertebrate species are relatively widespread in Bulgaria and in Europe, dominated mainly by hygrophiles and water-related species. Among the investigated species no relicts, Bulgarian and Balkan endemics were discovered. The only exception is the German Hairy Snail (*Pseudotrachia rubiginosa*) and may be referred to the European endemics. As alien species has been established Multicolored Asian lady beetle (*Harmonia axyridis*). Since 2008 this species is known in Bulgaria and already widespread (Tomov et al. 2009, 2010a, b, Nedved et al. 2010). Due to its predatory and competitive abilities the species may have strong negative effects on biodiversity (Tomov et al. 2010b, Nedved et al. 2010).

Another snail species, *Helix pomatia* is relatively widespread.

Among Araneae the Great raft spider (*Dolomedes plantarius*) (in the Pisauridae family) was established in the Reserve area. The finding is of great importance; moreover this species was considered as extinct (EX) so far (Golemanski et al., 2011, Deltsev, 2011 and Deltsev et al., 2005) due to the degradation and loss of habitat (Deltsev, 2011). The Ibisha Reserve is the third finding point of *Dolomedes plantarius*, so this species confirmed its presence in the Bulgarian fauna. In Romania the Great raft spider is also known from the Danube delta (Babina Island) (Weiss et al., 1998) and this is the reason that it is possible to discover its presence on other Bulgarian and Romanian Danube islands. This spider inhabits lowland fen and grazing marsh areas and is dependent on the presence of standing or slow moving neutral to alkaline water. Within these areas it can be found on the margins of pools or ditches. Emergent vegetation is highly important for use as perches for hunting and basking and to support nursery webs. Because of that the Zattons and their surroundings are of great importance for the Great raft spider for feeding and surviving. Great

raft spiders are predatory and hunt from perches at the water's edge. They primarily feed on aquatic invertebrates such as pond skaters, dragonfly larvae, small fish and smaller aquatic spiders. They will also feed on drowning terrestrial invertebrates and have been known to catch small vertebrates such as sticklebacks and tadpoles (Deltsev, 2011). Although the species is widely distributed in Europe, under-recording and confusion over identification make assessment of its status difficult. Populations are known to have declined substantially throughout its range particularly in the Western and Central areas but remaining populations are believed to be well established in Scandinavia and the Baltic States. These reductions in population are primarily due to the degradation and loss of habitat. The great raft spider is listed as a vulnerable species on the IUCN Red List (https://en.wikipedia.org/wiki/Great_raft_spider).

The survival of the Great raft spider is unlikely without active conservation measures against the losses and degradation of its key habitats. Its populations are not numerous, and the species is sensitive to water pollution (Deltsev et al., 2005). This is the reason *Dolomedes plantarius* to be protected on regional level in the category "Critically Endangered".

The southern migrant hawkler (*Aeshna affinis*) is also very common. This species prefers standing water bodies that dry up over the summer that are often overgrown with low rushes, bulrushes or reeds.

Three species from order Lepidoptera were also found: - the Passenger (*Dysgonia algira*) - a species of moth of the family Noctuidae, the Holly Blue (*Celastrina argiolus*) a butterfly that belongs to the Lycaenids and *Pieris rapae*, also known as the Cabbagewhite or Brassica butterfly.

The **aquatic invertebrates** are presented with species that are typical of the Bulgarian Danube marshes. From Order Hirudinida was established the Mediterranean medical leech (*Hirudo verbana* Carena 1820), survivor in shallower layers of fine bottom substrate after drying of the Zattton. This globally threatened invertebrate was also mentioned for the Belene Islands complex (Solakov, 2010).

In Central and Eastern Europe this species until recently was wrongly synonymised with *H. medicinalis* L. 1758 (Todorov et al., 2016) and like this it exists in the cited documents. At present it is on the procedure of document rectification.

From the mussels was found the Thick-shelled river mussel (*Unio crassus* Philipson, 1788), determined only by empty valves. This species is included in the International Union for Conservation of Nature (IUCN) threatened species in category in danger "EN". This mussel nowadays is almost extinct

from the Danube (Evtimova et al. 2014; Graf et al., 2015).

From the aquatic gastropod mollusks were identified Planorbidae spp.; *Viviparus acerosus* (Bourguignat 1862), *Lymnaea stagnalis* (Linnaeus 1758) and *Stagnicola palustris* (O.F. Müller, 1774). From the freshwater crustaceans an Aquatic sowbug (*Asellus aquaticus* (Linnaeus 1758) was found. Among the water insect species on Tsibar island and the reserve were found the Dragonflies *Aeshna* sp., *Sympetrum* sp. (order Odonata); Water beetles (*Hydroporus marginatus* Duftschmid 1805 (Coleoptera); Water boatmen (*Corixidae* spp.), *Micronecta* sp., *Gerris* sp., *Plea minutissima* (Leach, 1817) (Hemiptera). From the Order Chaoborus (*Chaoborus*) *crystallinus* (De Geer 1776) and *Chironomus* sp. were established.

Fish

The river stream around the island is important for the protection of the Danube sturgeon species, whose stocks significantly decreased in recent decades (Vassilev & Pehlivanov, 2003). On the other hand, the Danube River is a corridor for nonindigenous (invasive) fish species such as: *Pseudorasbora parva*, *Neogobius* spp., *Gambusia holbrooki*, *Syngnathus abaster*, *Lepomis gibbosus*, *Percottus glenni* etc. (Jurajda et al. 2006; Polačik et al, 2008a; Polačik et al, 2008b; Trichkova et al, 2014; Pavlova et al, 2014). Various anthropogenic negative impacts such as pollution, fishing, hydropower, change and loss of habitats are the cause of changes in the ichthyofauna of the Danube during the last decades. The presence of wetlands - swamps and marshes - is important for the reproduction of some important local species such as Northern Pike (*Esox lucius*), Wild Common Carp (*Cyprinus carpio*), Tench (*Tinca tinca*), Common Rudd (*Scardinius erythrophthalmus*), Weatherfish (*Misgurnus fossilis*) etc. (Pehlivanov et al 2011). Our studies of the swamp on the island of Tsibar (June 2014) showed the presence of thousands of individuals of juvenile fishes (2-5 cm length). Solakov (2010) also mentioned that Belene Islands complex has a significant role as a nursery for about 20 fish species.

The marsh is a favorable habitat for the growing the larvae of fish and is essential for maintaining biodiversity in the Danube River. On the other hand, larvae are good trophic resource for fish-eating birds from the colonies in the island. After our results, the most abundant were Carp and Topmouth gudgeon (*Pseudorasbora parva*, (*Temminck et Schlegel*, 1846)). Only single specimens were found from: Asp (*Leuciscus aspius* L., 1758); Bream (*Abramis brama* L., 1758) and Loach (*Cobitis* sp.). With conservation importance is only the Asp. (Golemanski, 2011).

Amphibians and Reptiles

The Bulgarian Danube islands are poorly explored in a herpetological respect. Data published for amphibians and reptiles originate from six scientific publications and refer for four islands. Described are seven species of amphibians (one species of the order Caudata and six species of the order Anura) and two species of reptiles (1 species of order Testudines and 1 species of the suborder Serpentes; both are closely related to the water). The species distribution of on different islands is as follows:

Belene Island (Persina) – Common Spadefoot Toad (*Pelobates fuscus* (Laurenti, 1768)), Eastern Spadefoot Toad (*Pelobates syriacus* Boettger, 1889), European Tree Frog (*Hyla arborea* (Linnaeus, 1758)), Marsh Frog (*Pelophylax ridibundus* Pallas, 1771), European Pond Turtle (*Emys orbicularis* Linnaeus, 1758) and Grass Snake (*Natrix natrix* Linnaeus, 1758) (see Stoyneva & Michev 2007a, Undjian 2000);

Oreh Island (Esperanto) – *Hyla arborea*, Edible Frog (*Pelophylax kl. esculentus* Linnaeus, 1758) and *Pelophylax ridibundus* (see Beškov 1972, Stoyneva & Michev 2007b);

Vardim Island (Beskut) – Danube Crested Newt (*Triturus dobrogicus* Kiritzescu, 1903) (see Buresch & Zonkow 1941);

Kosui Island – Common Toad (*Bufo bufo* Linnaeus, 1758) (see Buresch & Zonkow 1941).

For the other Bulgarian Islands (more than 40 in total) no literature data for amphibians and reptiles are available. During our studies on the Tsibar island were identified two species: Marsh Frog (*Pelophylax ridibundus*) - dozens of individuals and the Aesculapian snake (*Zamenis longissimus* (Laurenti, 1768)) - one individual. In Bulgaria *P. ridibundus* occurs ubiquitously (an exception being the high mountains), while *Z. longissimus* inhabits mainly mountainous and foothill areas but in the Danube valley it is spread sporadically (Stojanov et al. 2011). The first species is closely related to water and it has been reported on the other islands. The second type is entirely terrestrial and locating it on Tsibar island indicates that the Danube islands have the potential as a habitat for reptiles, which are not directly dependent on the water.

So far, it cannot be said to what extent the species richness of herpetofauna on the Danube islands depends on their size, their distance from the coast and the nature of their plant cover. It has to be mentioned that the biggest number of species (total 6) were found on Belene Island - the largest in area Bulgarian island (several times larger than others). As a result of our research into the herpetofauna species composition to the island has to be added the Aesculapian snake (*Zamenis*

longissimus). A final clarification of species diversity of amphibians and reptiles of the Bulgarian Danube islands, as well as the factors that define it is necessary to be provided in targeted and large-scale studies.

Birds

The ornithofauna of the Bulgarian Danube coast as part of the exclusive biodiversity of the Lower Danube has been of great interest for the researchers since the middle of 19th century (Lorenz-Liburnau, 1893; Reiser, 1894; Kalbermatten, 1891; Paspaleva-Antonova, 1961; Spitzenberger, 1966, Paspaleva & Mitshev, 1968, Iankov, 2007, Schurulinkov et al., 2008) and also of special interest to Boev, 1992, Antonov, 1995, 1997a, b; Shurulinkov et al., 2007. Data concerning the bird species on Tsibar island is possible to be found in SD forms of the Natura 2000 sites under the Birds Directive: BG0002007 "Ostrov Ibisha", BG0002008 "Ostrov do Gorni Tsibar", BG0002009 "Zlatiyata" and BG0002104 "Tsibarsko blato", and the Romanian "Bistret" ROSPA0010 and „Coridorul Jiului“ ROSCI0045.

As a result of the present research over 30 bird species were established. It is possible to accept that only at the reproductive period the ornithofauna in the Ibisha reserve is composed of 22 nesting species (field data and UTM square GP05). Another 106 species are passing, wintering and accidental (UTM data square GP05 and BGSPA0002007), altogether 128 bird species. Data concerning the structure and the conservation status of 22 breeding bird species are presented in Table 1.

Table 1: Structure and conservation status of the ornithofauna in Ibisha reserve (only breeding species are included)

Category	Number of species
Residents	8
Breeding summer visitors	14
Bird Directive, Annex I	7
Red Data Book of IUCN, category NT	1
Red Data Book of Bulgaria, category CR	2
Red Data Book of Bulgaria, category EN	0
Biodiversity Law, Annex III	18

By the zoogeographical analysis of breeding bird species (Voous, 1960) in the reserve Ibisha it was established that they belong to 7 zoogeographical regions. The most numerous are the species with palearctic zoogeographical origin, following by species with European origin (species of the Old world) - 4, and Europe-Turkestan an Turkestan-Mediterranean origin - 2 and 1 species with Ethiopian origin.

A special interest from the conservation point of view represents the long-term species observation and the quantitative composition of the nesting colony of the great cormorants', egrets and herons in the reserve. The colony is recognizable from 1972 (Michev & Petrov, 1984) and in the last years a lot of changes have occurred in a number of species and their quantitative composition (Table 2).

Table 2: Long-term survey of species and quantitative (in breeding pairs) composition of cormorant and heron breeding colony in the managed reserve "Ibisha"

Species	Boev (1992)	Antonov (1997a,b)	Shurulinkov et al. (2007)	June2014	Breeds since:
Great Cormorant (<i>Phalacrocorax carbo</i>)	100	180-200	450-500	150-200	1985
Pygmy Cormorant (<i>Phalacrocorax pygmeus</i>)	20-40	12	55-60	non breeding	1988
Black-crowned Night Heron (<i>Nycticorax nycticorax</i>)	80-100	250	120-140	100-125	<1984
Squacco Heron (<i>Ardeola ralloides</i>)	10	50	3	10-15	1986
Great Egret (<i>Egretta alba</i>)				3-5	2014 г.
Little Egret (<i>Egretta garzetta</i>)	60-80	300	110-130	85-90	<1984
Grey Heron (<i>Ardea cinerea</i>)	20-25		60 -70	50-80	1972
Purple Heron (<i>Ardea purpurea</i>)		2-3		non breeding	
Spoonbill (<i>Platalea leucorodia</i>)	Tens	10	6	20-25	1990?

For first time the Reserve's territory was established as a nesting site of the Great Egret (*Ardea alba*). Breeding pairs of Pygmy Cormorant (*Phalacrocorax pygmeus*) and Purple Heron (*Ardea purpurea*) were not registered.

There were also increases in the number of the gray heron, but a decrease of the *Spoonbill* (*Platalea leucorodia*). For the other species stable breeding populations were established.

The northern part of the island was used for the cultivation of hybrid Poplar and forestry. This activity combined with human presence causes a disturbance of cormorants' and egrets' nesting colonies, especially in the breeding season. Instances of illegal logging have also been established (Antonov, 1997) combined with a direct nests' destruction of egrets and cormorants of the colony (Boev, 1992).

According to the local fishermen, north of the nesting colony a White-tailed Eagle (*Haliaeetus albicilla*) nest was located. In the Tsibar Island region and fishponds in Bistret in 2010 adult Sea Eagles have been observed twice (on the nameless island near village Gorni Tsibar and of the northern shore of the lake Bistret in Romania). During research of the feeding areas of breeding water birds a Eurasian Stone-curlew (*Burhinus oediacnemus*) with strongly pronounced nesting behavior was observed.

The obtained results in the present study confirmed once again the scheme of the spatial distribution of the water birds nesting colonies in the Lower Danube. The islands are used for nesting and the wetlands along the left bank of the river - for a basic feeding base. They confirmed also the great importance of the island as a Ramsar site, EU Natura 2000 site and Menaged reserve.

Mammals

The mammalian fauna on the Bulgarian Danube islands is not well studied. More information is possible to be found for the Romanian islands - Cama-Dinu (km 511 – 505), Mocanului and Albina islands (km 412 – 401), Slobozia islets (km 498 – 495) (Murario, 2005), and for the Danube Delta where 5 orders: Insectivora (7 species), Lagomorpha (1 species), Rodentia (21 species), Carnivora (15 species) and Artiodactyla (2 species) were described (Murario, 1996).

According to present concepts of the area and habitat preferences of mammals (Peshev et al. 2004; Popov & Sedevchev 2003; Popov et al. 2007) it can be assumed that on the island territory is found about 16 mammalian species (including 8 species of bats).

Because of the low ability of mammals to overcome barriers to their resettlement, the mammal fauna on the island is represented fairly

poorly and in low numbers. The entire site is inhabited by small rodents of the *Microtus* and *Apodemus* genera, with relatively low numbers;

The Yellow-necked field mouse (*Apodemus flavicollis*) is a common species on Tsibar Island. Murariu (2005) established an important population of this species and of *Apodemus uralensis* on Albina Island. The most prolific Microtidae species - the Common vole (*Microtus arvalis*), is surprisingly present in the forest skirts of the studied island.

Regarding the bat fauna, it is one of the least studied areas in Bulgaria. Until 2003, reports of bats in this area accounted for only 1.9% of all reports for the presence of bats in Bulgaria (Benda et al. 2003). Only eight species of bats, known from the territory of Tsibar Island were recorded (24.2% of total 33 species, inhabiting Bulgaria, belonging to the Family Vespertilionidae) despite that the Island offers good feeding conditions for all bat species.

Bats from the gender *Myotis* are present in high numbers, but due to the proximity of the shape and parameters of their echolocation sounds, the species determination is difficult. From the undefined *Myotis* species it is unlikely that the Greater Mouse-eared Bat (*Myotis myotis/blythii*), but it was recorded on the Island with the explanation that *M. myotis* can migrate up to 200 km away from its winter roosts.

The Serotine Bat (*Eptesicus serotinus*) is typical mainly for rocky terrains, but often is common in other habitats and is regarded as ubiquitous.

The Common Noctule (*Nyctalus noctula*) is one of the most frequent bats (Decu et al. 2003) and, along with the Lesser Noctule (*Nyctalus leisleri*) is a forest species, preferring deciduous forests and often settled in tree hollows.

The most widespread bats on the island are these of the genus *Pipistrellus*, which are mainly synantropic and/or dendrophilic, inhabiting deciduous forests.

One species - the Schreiber's Bent-winged Bat (*Miniopterus schreibersii*) is a typical cave species, but it was not reported from the banks of the Danube. The identification of the species using the bat detector (with frequencies of 53 – 55 kHz), can be accidental on Tsibar Island (maybe for feeding). It comes there from the Bulgarian bank of the Danube where karst formations are presented. It was also registered by (Murario, 2005) from the Cama-Dinu Island. This species probably overflows to the area due to the extremely favorable food and habitat.

When studying the bat fauna of the islands Batin and Vardim in June 2012, Serotine Bat (*Eptesicus serotinus*), Common Noctule (*Nyctalus noctula* /*N. leisleri*), *Myotis* Bats (*Myotis* sp.), Common Pipistrelle (*Pipistrellus pipistrellus*), *Nathusius'* Pipistrelle (*P. natusii*) were established. The high similarity in the

bat fauna of the three Danube islands (Tsibar, Batin and Vardim) is due both to the similar vegetation and closeness to populated areas. This is the reason for the establishment of synanthropic species of the genus *Pipistrellus*. The absence of *M. schreibersii* on Vardim and Batin Islands is due to the lack of shelters there.

Of particular importance as a migration corridor is the valley of the Danube River, where the adjacent humid vegetation and riparian forests provide not only multiple daily shelters for migratory populations, but also create conditions necessary to feed them. In fact, dominant species composition is not differentiated from that found over open arable lands, but the continuous presence and activity of bats is considerably higher.

Individual representatives of the European Roe Deer (*Capreolus capreolus*) visit Tsibar Island mainly from the left (Romanian) bank of the Danube (Murariu, 2005).

Numerous is the population of the Wild Boar (*Sus scrofa*). It is frequently occurring in most of the Danube islands (Murariu, 2005).

The Golden Jackal (*Canis aureus*) has also been noted - those occurrences were possible especially during the heavy winters, when it could cross the frozen Danube, mainly from Bulgaria to Romania.

Tsibar Island offers enough good conditions for the Red Fox (*Vulpes vulpes*), the European Badger (*Meles meles*) and at least for the rather large population of the Least Weasel (*Mustela nivalis*).

The European Otter (*Lutra lutra*) was established in all sections of the Danube River with preserved natural and dense vegetation (even forests on the Danubian Islands which offer the optimum conditions this species needs) including the swamps, fish breeding-ponds and lakes near the Danube River, but currently sufficient data is not available (Georgiev & Koshev, 2006). Murariu (2005) observed otter tracks on the shores of the Cama, Slobozia islets and Albina Island.

One of the factors affecting adversely the ecological character of the island is the entry of different invasive species causing changes of the native fauna communities.

Invasive species have many ecological effects and may threaten biological diversity (Hulme, 2007; Vilà et al., 2010). Alien species may alter the habitat, and predate on, or compete with native fauna or be important vectors of diseases and parasites. The Raccoon Dog (*Nyctereutes procyonoides*) is one of the most successful alien carnivores in Europe. It has spread rapidly into many European countries after being introduced by Russians during the first half of the 20th century. The Raccoon Dog has been suspected of causing damage to native fauna through predation, but firm

evidence of this is scarce (Lavrov, 1971; Nasimovič & Isakov, 1985; Kauhala, 2004). Raccoon Dogs may also compete with native medium-sized carnivores, such as the Eurasian Badger (*Meles meles*) and the Red Fox (*Vulpes vulpes*) (Jędrzejewska & Jędrzejewski, 1998; Kowalczyk et al., 2008). The preferred habitats of Raccoon Dogs are wet open habitats: damp meadows and forests with sparse canopy but abundant undergrowth, marshlands, river valleys and gardens.

The successful expansion of Raccoon Dogs in Europe was also possible due to their tendency to wander, the secretiveness of the species and low persecution at the beginning of invasion. Raccoon dogs are nocturnal animals, utilizing mainly wet habitats covered with dense vegetation and showing inactivity in winter.

In north-eastern Poland, the diet of Raccoon Dogs overlaps 41% with Red Foxes and 35% with Badgers in spring and summer. In winter, the diet overlap between Raccoon Dogs and Red Foxes increases to 62%, when both species utilize more carrion. Other species that Raccoon Dogs may compete with are semi-aquatic species like the Otter (*Lutra lutra*)–33%; Jędrzejewska & Jędrzejewski, 1998).

Amphibians (e.g., *Rana* spp., *Bufo* spp., *Bombina* spp. and *Triturus cristatus*) commonly occur in the diet of Raccoon Dogs in the spring and summer (Ivanova, 1962; Lavrov, 1971; Jędrzejewska & Jędrzejewski, 1998; Sutor et al., 2010). Both adult frogs and tadpoles are easy prey for Raccoon Dogs and this may cause a decline in frog populations, especially on islands and in other fragmented or isolated areas (Sutor et al., 2010).

Management plan

In 2014 a Management Plan of the managed reserve "Ibisha" was established based on its relevance to the ecology and conservation of the typical Danube island communities - riparian woodland, forests and marshes, as well as refuges for rare and endangered plant and animal species. The plan aims to increase public awareness about the opportunities, the importance and the value of the reserve. For the complete faunistic, botanical and ecological studies different scientific projects will be developed. For an effective management, a database is also foreseen to be created. It is necessary to improve the control of the entry into the reserve, but also to enhance the knowledge concerning the nature of Ibisha Island.

Conclusion

The riparian woodland, forests, swamps and Zattons on Tsibar Island are an integral part of the Danube migration corridor, which is of prime

importance for the distribution of many invertebrates, fish and fish-eating birds during their nesting and migration.

At present the distribution, abundance and species composition of the most of animal's groups including the bats is unclear. This requires specialized studies. Little is still known on the impact of raccoon dogs on the native fauna.

As a whole the fauna of Tsibar Island is characterized by high vulnerability. Most of the species associated with the Danube wetlands are easily vulnerable, with insufficient numbers and with strong dependence on the water level of the Danube, especially at the low levels when many of the species do not reproduce at all.

The preservation of the natural diversity in one of the largest and most remarkable riparian woodland areas like Tsibar Island is of great conservation importance.

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