

THE RECENT STATUS OF BREEDING BIRD COMMUNITIES OF SREBARNA BIOSPHERE RESERVE (NE BULGARIA)

Aktualni status združb ptic gnezdilk v biosfernem rezervatu Srebarna (SV Bolgarija)

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The number, density and habitat distribution of breeding birds in the Srebarna Reserve, NE Bulgaria, were determined. The study, based on the method of transects, was carried out during the breeding seasons of 2001 – 2003. In six habitat types, 82 breeding bird species were recorded. The breeding populations in the reserve of Dalmatian Pelican *Pelecanus crispus* (max. 128 pairs) and Great Egret *Egretta alba* (max. 12 pairs) constitute the total Bulgarian population of these species. The Srebarna Reserve also contains the largest breeding population of Ferruginous Duck *Aythya nyroca* (max. 60 pairs) in Bulgaria. The Lesser Spotted Woodpecker *Dendrocopos minor* and Marsh Tit *Parus palustris* were recorded in the reserve for the first time. The largest number of breeding species (36) was observed in the bottom-growing reedbeds habitat (the dominant plant species was Common reed *Phragmites australis*) and the smallest number (1) in the White Water-lily habitat (the dominant plant species was White Water-lily *Nymphaea alba*). The diversity of species was greatest in the bottom-growing reedbeds habitat. The study reveals continual changes in the breeding bird communities in Srebarna Reserve, especially in the reedbeds habitat, and shows that short-term and long-term factors influence, not only the number of breeding pairs, but also the species composition and bird habitat distribution.

Key words: status of breeding birds, habitat, wetland, Srebarna Reserve, Bulgaria

Ključne besede: status gnezdilk, habitat, mokrišče, rezervat Srebarna, Bolgarija

1. Introduction

Wetlands are one of the habitat types that are affected considerably by human activity. In Bulgaria, this has been expressed mainly as the draining of agricultural lands at the end of the 1940's and the beginning of the 1950's. As a result, the total area of wetlands is now 20 times smaller than at the beginning of the 20th century (BONCHEV 1929, MICHEV 1993). Srebarna is one of the wetlands that have remained. It is a Ramsar site (since 1975), a UNESCO Biosphere Reserve (since 1977), a Monument of the World Cultural and Natural Heritage (since 1983) and an Important Bird Area (since 1990; HEATH & EVANS 2000), due to its very rich bird fauna and, in particular, the breeding of the globally threatened species: Dalmatian Pelican

Pelecanus crispus, Pygmy Cormorant *Phalacrocorax pygmeus* and Ferruginous Duck *Aythya nyroca*.

Since the 19th century, many European and Bulgarian ornithologists have visited and researched, not only the great bird diversity of Srebarna Lake, but mainly the permanent colony of the Dalmatian Pelican and the mixed heronry (HODEK 1882, LORENZ-LIBURNAU 1893, REISER 1894, PETROV 1947, PATEV 1950, PETROV & ZLATANOV 1955, MOUNTFORT & FERGUSON-LEES 1961, GEISSLER 1962). PASPALLEVA-ANTONOVA (1961A & B) and MICHEV (1963, 1966, 1968 & 1981) carried out comprehensive studies on the avifauna of Srebarna Lake.

The aim of this study was to assess the number and habitat distribution of the breeding avifauna in the Srebarna Reserve.

2. Study Area and Methods

The research was carried out in the Srebarna Managed Reserve (806 ha). The lake is near the Danube River, 18 km west of the town of Silistra, NE Bulgaria (44°07' N, 27°04' E; UTM NJ08; MGRS NJ 0560085000). Devnia Island, in the Danube, is situated in the northern part of the reserve (Figure 1).



Figure 1: Geographical position of Srebarna Reserve

Slika 1: Geografski položaj rezervata Srebarna

The water regime of the lake was not affected until the first half of the 20th century. In 1949 the lake was detached from the Danube and supplied with water only from underground sources and surface water flow. In 1978, the connection with the river was partially restored by removing part of the dike. However, the Danube waters did not enter every year, since this depended on the quantity of rainfall and the artificial control of the Danube water level. The absence of annual entering of Danube waters in the reserve and the prohibition of reed cutting (1975) led to the accumulation of organic sediments. Between 1992 and 1994, the ecological condition of the reserve worsened (STOYNEVA & MICHEV 1998). However, in 1994, the building of a new sluice considerably improved the condition of the reserve.

Six habitat types in the study area were identified according to the classification of Devilliers & Devilliers-Terschuren (1996; Figure 2):

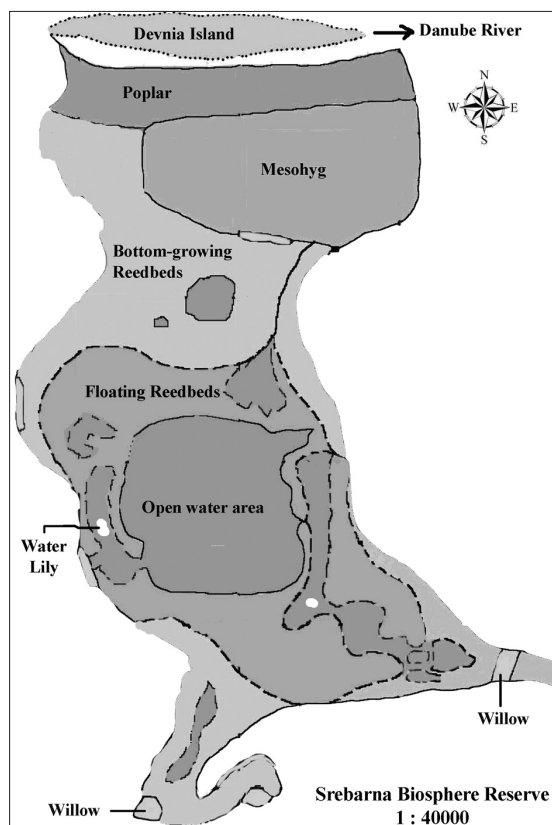


Figure 2: Habitats in Srebarna Reserve (Mesohyg – mesophylic and hygromesophylic grassland habitat; Willow – coastal forests of White Willow *Salix alba*; Poplar – Hybrid Poplar *Populus* \square *canadensis* plantation; Island – White Willow *Salix alba* and White Poplar *Populus alba* habitat on Devnia Island)

Slika 2: Habitati v rezervatu Srebarna (Reedbeds – trstičje; Mesohyg – mezofilni in higromezofilni travniki; Willowi (vrbovje) – obrežni gozdovi bele vrbe *Salix alba*; Poplar (topoli) – plantaža topolov *Populus* \square *canadensis*; Island (otok) – bela vrba *Salix alba* in beli topol *Populus alba* na otoku Devnia)

- (1) the “Reedbeds” occupy the largest part of the reserve area and can be divided into two microhabitat types:
 - the “Bottom-growing reedbeds” (285 ha) are present in all coastal parts around Srebarna Lake; there are open water areas of variable size within the vegetation; the dominant plant species is *Phragmites australis* and there are also other plant species (*Salix cinerea*, *Typha angustifolia*, *Typha latifolia*, *Schoenoplectus lacustris*, as well as *Nymphoides peltata* and *Potamogeton crispus*);
 - the “Floating reedbeds” (170 ha) are clumps of floating reedbeds which can be moved by strong winds; this microhabitat is located in the central part of the Srebarna Lake and the reedbeds are

- surrounded by a large expanse of open water (95.5 ha);
- (2) the White Water-lily *Nymphaea alba* community has an impermanent patchy distribution throughout the reserve (“*Water-lily*”);
 - (3) mesophytic and hygromesophytic grassland habitat (99.5 ha; “*Mesohyg*”) is a dry area where *Phragmites australis*, *Typha angustifolia*, *Typha latifolia*, *Carex pseudocyperus*, *Tanacetum vulgare* are the most common plant species;
 - (4) Hybrid Poplar *Populus* □ *canadensis* plantation (73.6 ha; “*Poplar*”); this habitat is located in the north part of the reserve along the banks of the Danube River; in addition to the dominant tree species there are also *Populus alba*, *Acer campestre* and *Alnus glutinosa*; the undergrowth of the plantation is comprised of *Amorpha fruticosa* (invasive species), *Paliurus spina-christi*, *Sambucus elbus* and 12 grass species;
 - (5) White Willow *Salix alba* and White Poplar *Populus alba* habitat on Devnia Island (18.6 ha; “*Island*”): this habitat is situated in the northernmost part of the reserve; besides the both dominant plant species, *Ulmus minor*, *Acer pseudoplatanus* and varied undergrowth consisting of shrub species (*Rubus caesius*, *Rubus idaeus*, *Cornus mas*) are also present in this habitat;
 - (6) coastal forests of White Willow (12.8 ha; “*Willow*”): this habitat type is comprised of small isolated patches in the shoreline of the reserve; these willow assemblages are free of undergrowth, but the herbaceous layer contains 49 species, such as *Ranunculus ficaria*, *Agrimonia eupatoria*, *Juncus articulatus* and *Trifolium campestre*.

The habitat abbreviations are used throughout the text.

Observations were made during the breeding season (April–June) in 2001, 2002 and 2003. The open water areas were examined by boat. Observations were made between 8.00 and 12.00 h. The census of the species belonging to the family Podicipedidae and order Anseriformes, as well as Coot *Fulica atra* and Moorhen *Gallinula chloropus* was taken by counting the number of nests found and the number of individuals recorded at the beginning of the breeding season (April) in the open water areas. The censuses of the colonies of the breeding species belonging to the families Pelecanidae, Phalacrocoracidae, Ardeidae, Threskiornithidae and Sternidae were taken by counting the number of nests from places with the best viewpoint towards the colonies. In the case of Water Rail *Rallus aquaticus*, Spotted Crake *Porzana porzana*, Baillon’s Crake

Porzana pusilla and Corncrake *Crex crex* we counted the calls of males between 23.00 and 2.00 h from 25 May to 30 May. Tape recordings were used to provoke answers from males (DELOV 2002). The census of species belonging to order Falconiformes was done by counting breeding pairs.

The censuses of species belonging to the orders Passeriformes, Columbiformes, Coraciiformes, Piciformes and Galliformes were carried out using the transect method, and species were assessed by detecting the singing males. For species that do not defend their territory, each individual was considered as a member of a pair. The width of the transects was 50 m in wooded habitats and 100 m in shrubby-herbaceous habitats. Although JARVINEN *et al.* (1978) reported lower census efficiencies with the line transect method, this method should be generally capable of counting more species, because it encompasses all species (BIBBY *et al.* 1992). The transect method was chosen because it was more important to detect all bird species in order to make a comparison with Paspaleva-Antonova’s work (PASPALLEVA-ANTONOVA 1961A & B). We used 16 transects: 11 in *Reedbeds*, 2 in *Mesohyg*, 1 in *Poplar*, 1 in *Island* and 1 in *Willow* habitat. The length of the transects was between 870 and 2500 m in *Reedbeds*, between 1460 and 1600 m in *Mesohyg*, 1640 m in *Poplar*, and 1600 m in *Island*. In the censuses of Great Reed Warbler *Acrocephalus arundinaceus*, Reed Warbler *Acrocephalus scirpaceus* and Savi’s Warbler *Locustella luscinioides*, 11 one-side transects (50 m width) in the waterside of *Reedbeds* were used. In the area of these transects the numbers of breeding pairs of *Acrocephalus* and *Locustella* species were recorded, since they breed mostly near to the border (in the ecotone zone) of *Reedbeds* (MOSKAT *et al.* 1991, BÁLDI & KISBENEDEK 1999). The census was made between 15 May and 15 Jun, when the former species were characterized by their high acoustic activity and migration was finished. In *Poplar*, *Mesohyg* and *Island* habitats, the numbers of breeding pairs (B) were estimated according to the formula:

$$B = H \cdot b / T$$

where H is the area of habitat (ha), b the number of breeding pairs recorded in the transects, and T the area of the transect (ha). In *Willow* habitat, the area of habitat coincides with the area of the transect and the number of breeding pairs in the transect is equal to the number of breeding pairs in the habitat. The formula for the number of breeding pairs in *Reedbeds* habitat was not used because *Acrocephalus* and *Locustella* species breed mostly in the ecotone zone of *Reedbeds* –

using it would imply the assumption that these species are uniformly distributed in the habitat.

Brillouin's diversity index (HB), the Pielou evenness index (E), and the Berger-Parker index of domination (d) were used to compare bird diversity in different habitats over the three years studied. They were calculated as follows:

$$HB = \ln N! - \sum \ln n_i! / N$$

$$E = \sum (n_i / N)^2$$

$$d = N_{\max} / N$$

where N is the total number of individuals, n_i the number of individuals of the i-th species and N_{\max} is the number of individuals of the most abundant species. The program BIODIV was used to calculate these indices (BAEV & PENEV 1995).

The dominance of the species was calculated as follows:

$$d_{\%} = (n_i / N) \cdot 100$$

where n_i is the number of breeding pairs of a given species, and N the overall number of breeding pairs in a habitat. The scale of SIMEONOV & PETROV (1978) was used to estimate the dominant structure of bird communities in each habitat: the dominant species was defined as the one with more than 8% dominance (percent share); the subdominant species from 4 to 8% dominance, and differential species as those occurring in only one habitat type.

3. Results

A total of 82 breeding bird species were recorded in the six habitat types in Srebarna Reserve. The composition of bird species in the habitats for the years from 2001 to 2003 is shown in the Table 2. Whiskered Tern *Chlidonias hybridus* is missing in the Table 2, because this species breeds only in the *Water-lily* habitat and is at the same time the only species breeding there. The largest number of breeding species (51) was observed in the *Reedbeds* habitat and the smallest (1) in the *Water-lily* habitat. The number of breeding pairs was the greatest in the *Bottom-growing Reedbeds* and the smallest in the *Willow* habitat (Table 1). The diversity

Table 1: The average values of diversity parameters of the avifauna in the habitats of Srebarna Reserve for the period 2001 – 2003

Tabela 1: Povprečne vrednosti parametrov diverzitete avifavne v habitatih rezervata Srebarna v obdobju 2001 – 2003

| Parameters of the avifauna/ Parametri avifavne | Year / Leto | <i>Floating Reedbeds/ Plavajoče trstičje</i> | <i>Bottom-growing Reedbeds/ Z dna rastoče trstičje</i> | <i>Mesohyg</i> | <i>Poplar/ Topoli</i> | <i>Willow/ Vrbouje</i> | <i>Island/ Otok</i> |
|--|-------------|--|--|----------------|---------------------------|----------------------------|-------------------------|
| Number of breeding pairs/ Število gnezdečih parov | 2001 | 329 | 1670 | 211 | 229 | 100 | 479 |
| | 2002 | 287 | 715 | 239 | 272 | 110 | 421 |
| | 2003 | 254 | 590 | 179 | 346 | 95 | 433 |
| | average | 290 | 992 | 210 | 282 | 102 | 444 |
| Brillouin's diversity index (HB) / Brillounov indeks diverzitete (HB) | 2001 | 2.22 | 2.61 | 1.95 | 2.26 | 2.22 | 0.739 |
| | 2002 | 2.27 | 3.00 | 1.92 | 2.36 | 2.03 | 0.733 |
| | 2003 | 2.36 | 3.01 | 1.99 | 2.51 | 2.11 | 0.848 |
| | average | 2.03 | 2.87 | 1.95 | 2.38 | 2.12 | 0.773 |
| Pielou evenness index (E) / Pieloujev indeks enakosti (E) | 2001 | 0.767 | 0.741 | 0.853 | 0.878 | 0.831 | 0.324 |
| | 2002 | 0.770 | 0.845 | 0.808 | 0.876 | 0.758 | 0.322 |
| | 2003 | 0.820 | 0.829 | 0.878 | 0.888 | 0.795 | 0.360 |
| | average | 0.767 | 0.805 | 0.846 | 0.881 | 0.797 | 0.335 |
| Berger-Parker index for domination (d) / Berger-Parkerjev indeks dominance (d) | 2001 | 0.368 | 0.198 | 0.242 | 0.192 | 0.230 | 0.835 |
| | 2002 | 0.320 | 0.160 | 0.243 | 0.180 | 0.345 | 0.831 |
| | 2003 | 0.290 | 0.134 | 0.229 | 0.142 | 0.274 | 0.808 |
| | average | 0.352 | 0.164 | 0.238 | 0.171 | 0.274 | 0.825 |

of species is largest in the *Bottom-growing Reedbeds* habitat and smallest on Devnia Island. The largest number of breeding pairs in the reserve have Great Cormorant *Phalacrocorax carbo* and Coot.

3.1. Reedbeds habitats

3.1.1. Floating Reedbeds habitat

In this habitat, 15 bird species were observed (Table 4). The order Anseriformes contained the largest number of species (6). The largest number of breeding pairs of all species (329) was observed in 2001, when 50% of these breeding pairs were comprised of only two species (Dalmatian Pelican and Ferruginous Duck). The number of breeding pairs of Dalmatian Pelican over this period ranged from 80 to 128. Here a few species of dabbling ducks nested – Mallard *Anas platyrhynchos*, Gadwall *Anas strepera*, Garganey *Anas querquedula*, together with diving ducks – Ferruginous Duck and Pochard *Aythya ferina*. The dominant species were Dalmatian Pelican (34%), Moorhen (12%) and Ferruginous Duck (10%) (Table 4). The diversity (HB), evenness (E) and domination index (d) did not vary over the three years (Table 1).

3.1.2. Bottom-growing Reedbeds habitat

During the period studied, 36 species belonging to the seven orders were recorded in this habitat – Podicipediformes, Pelecaniformes, Ciconiiformes, Anseriformes, Gruiformes, Charadriiformes and Passeriformes (Figure 3). The order Ciconiiformes contained the largest number of species (9). The largest number of all breeding pairs was recorded in 2001 and the lowest in 2003 (Table 1). This is confirmed by the fact that, in 2001, breeding pairs of the three species, Coot, Pygmy Cormorant and Squacco Heron *Ardeola ralloides*, comprised 50% of all breeding pairs in the habitat. In contrast, in 2002 and 2003 50% of breeding pairs were distributed among six species. The values of diversity (HB), evenness (E) and domination index (d) also did not differ very much over the three years (Table 1). The dominant species were Pygmy Cormorant, Squacco Heron, Little Egret *Egretta garzetta* and Coot. The number of breeding pairs of Coot was largest in this habitat in contrast with the *Floating Reedbeds* habitat. Some dabbling ducks also nested here – Mallard, Gadwall, Garganey – and diving ducks – Ferruginous Duck and Pochard. Of the four species of Podicipediformes, the Little Grebe *Tachybaptus ruficollis* provided the largest number of breeding pairs. Rare species in the habitat were Spotted

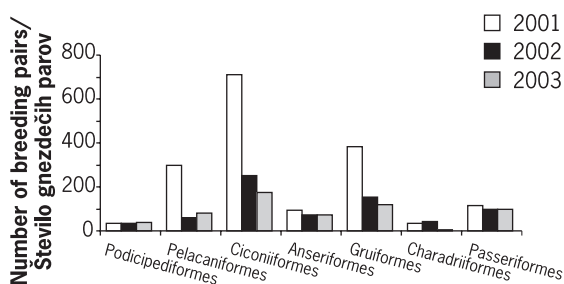


Figure 3: Number of breeding pairs in seven bird orders in *Bottom-growing Reedbeds* in Srebarna Reserve for the period 2001 – 2003

Slika 3: Število gnezdečih parov za sedem redov ptic v habitatu z dna rastočega trstičja v rezervatu Srebarna v obdobju 2001 – 2003

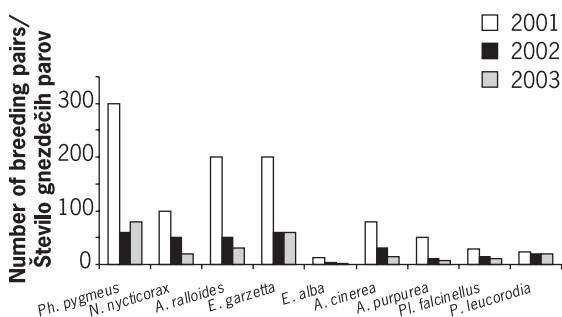


Figure 4: Number of breeding pairs in mixed heron colony in Srebarna Reserve for the period 2001 – 2003

Slika 4: Število gnezdečih parov v mešani koloniji čapelj v rezervatu Srebarna v obdobju 2001 – 2003

Crake, Baillon's Crake, Water Rail, Black-necked Grebe *Podiceps nigricollis*, and Greylag Goose *Anser anser*.

The mixed heron colony was located in this habitat (Figure 4) and was comprised of nine species. In 2001, the colony occupied an area of 35,000 m². About 90% of the nests were built on Grey Willows *Salix cinerea* and the remainder in the reeds. The nests of Spoonbill *Platalea leucorodia*, Great Egret *Egretta alba*, Grey Heron *Ardea cinerea* and Purple Heron *Ardea purpurea* were situated in the reeds and those of the other species on Grey Willow. In 2002 and 2003, the heronry was much more dispersed than in 2001. The most numerous species in the colony for the three years were Pygmy Cormorant, Little Egret and Squacco Heron. In 2001, the number of heron species comprised 59% of all species in the habitat, and, in 2002 and 2003, 41%. During this period we observed a decrease of breeding pairs in the heronry. The decrease of breeding pairs from 2001 to 2002 was the greatest for Pygmy Cormorant (80%), Purple Heron

(80%), Squacco Heron (75%), Little Egret (70%) and Grey Heron (62.5%). The declining water depth in 2002 caused the disappearance of the shallow shore part of the reserve (including the spring-flooded area in the north-eastern part), which is the major feeding site for the heron species.

3.2. Water-lily habitat

This habitat is a nesting place for only one breeding species, Whiskered Tern. For the period studied, their number varied from 25 to 40 breeding pairs. In 2001, the colony was located on the leaves of the White Water-lily in an area of approx. 40 m² in the western part of the reserve but, in 2002, in the south-eastern part in an area of approx. 25 m². In 2003 the breeding of this species in the reserve was interrupted because of unknown reasons.

3.3. Mesophylic and hygromesophylic grassland habitat (*Mesobyg*)

In this habitat, 15 bird species were recorded, from orders Charadriiformes (2 species), Galliformes (1), and Passeriformes (12; Table 5). The largest number of breeding pairs was recorded in 2002 and the lowest in 2003. In the three years of research about 50% of breeding pairs were concentrated in the two dominant species – Great Reed Warbler and Red-backed Shrike *Lanius collurio*. The avifauna of this habitat was characterized by reed nesting species (Marsh Warbler *Acrocephalus palustris*, Reed Warbler and Great Reed Warbler) as well as by species nesting in open lands and scattered trees and bushes, like Barred Warbler *Sylvia nisoria*, Lesser Whitethroat *Sylvia curruca*, Whitethroat *Sylvia communis*, Skylark *Alauda arvensis*, Yellow Wagtail *Motacilla flava* and Lapwing *Vanellus vanellus*. The presence of Little Ringed Plover *Charadrius dubius* is due to the small amount of open water with open sandy shores in the centre of the habitat. This little pond is also a feeding place for dabbling and diving ducks (Mallard, Gadwall, Garganey, and Ferruginous Duck), for Coot and for Moorhen. The values of diversity (HB), evenness (E) and domination index (d) show little variation over the three years (Table 1).

3.4. Hybrid Poplar plantation (*Poplar*)

In this habitat, 22 species from four orders were recorded – Columbiformes, Coraciiformes, Piciformes and Passeriformes (Table 6). The dominant species in the three years were Chaffinch *Fringilla coelebs*,

Blackbird *Turdus merula*, Blackcap *Sylvia atricapilla* and Great Tit *Parus major*. Rare species were Redstart *Phoenicurus phoenicurus*, Grey-headed Woodpecker *Picus canus*, Marsh Tit *Parus palustris* and Green Woodpecker *Picus viridis*. The largest number of breeding pairs was recorded in 2003. The values of diversity (HB), evenness (E) and domination index (d) show little change over the three years (Table 1).

3.5. White Willow and White Poplar habitat on Devnia Island (*Island*)

In this habitat, 13 bird species from orders Pelecaniformes, Columbiformes, Piciformes and Passeriformes were recorded (Table 7). The largest number of breeding pairs was recorded in the first year. A numerous colony of Great Cormorant nested on the Island, the number of breeding pairs varying between 350 and 400. This defines the different structure of the avian community in this habitat. The index for domination (d) is four times greater and diversity index (HB) smaller than the values for the other habitats (Table 1). Apart from Great Cormorant, the Chaffinch, Great Tit and Blackcap accounted for the largest number of breeding pairs for the three years.

3.6. Coastal forests of White Willow (*Willow*)

In this habitat, 23 species from four orders were recorded – Falconiformes, Coraciiformes, Piciformes and Passeriformes (Table 8). Five woodpecker species were recorded (Grey-headed Woodpecker, Green Woodpecker, Syrian Woodpecker *Dendrocopos syriacus*, Great Spotted Woodpecker *Dendrocopos major* and Lesser Spotted Woodpecker *Dendrocopos minor*). Seven bird species nested in this habitat only – Kestrel *Falco tinnunculus*, Lesser Spotted Woodpecker, Roller *Coracias garrulus*, Hoopoe *Upupa epops*, Penduline Tit *Remiz pendulinus*, Starling *Sturnus vulgaris* and Tree Sparrow *Passer montanus*. The largest number of breeding pairs was found in 2002. The most dominant species over the three years was Starling (29%). The other dominant species were Great Tit, Tree Sparrow and Penduline Tit.

4. Discussion

In Srebarna Reserve a significant number of bird species (82) breed on a relatively small area (806 ha). Under similar ecological conditions, Lake Prespa in Greece, with an area of 5000 ha, sustains 59 breeding species (BROUSSALIS 1975). Of the breeding species in Srebarna Reserve, 87% are protected by the Bulgarian

law for the protection of biodiversity, and 22% are included in the Bulgarian Red Data Book (1985). The breeding populations in the reserve of Dalmatian Pelican and Great Egret constitute the total Bulgarian population of these species. The Srebarna Reserve also contains the largest breeding population of Ferruginous Duck in Bulgaria.

The Lesser Spotted Woodpecker and Marsh Tit were reported for the first time in the reserve, and Chiffchaff *Phylloscopus collybita* and Robin *Erithacus rubecula* for the first time in the breeding period.

Using the data from REISER (1894), PATEV (1950), PETROV (1947) and PASPALLEVA-ANTONOVA (1961A & B), we compared the number and composition of breeding birds prior to and during the changes that have taken place in the Srebarna Reserve. Only PASPALLEVA-ANTONOVA (1961A & B) made a more detailed and long-term study of the reserve's avifauna. She defined three habitats: (1) lake with marsh plants; (2) woods; (3) agricultural area. She listed the proportions of different breeding species in the habitats, showing the largest bird diversity within the first habitat type and the lowest in agricultural areas. Between 1961 and 2001, the area between the dike (built in 1949) and the lake that was an agricultural area in Paspaleva-Antonova's survey is now covered with a mesophytic and hygromesophytic grassland. In our study, the coastal forests of White Willow and the Hybrid Poplar plantation are described as separate habitats. Despite the more common classification of habitats in Paspaleva-Antonova's survey, we can show some differences and similarities between the present study and the one conducted 42 years ago.

In the period 1959 – 1961, 33 bird species were recorded in *Reedbeds* (51 in the present study) of which 7 species no longer breed now on the territory of the reserve. These are Red-crested Pochard *Netta rufina*, Common Tern *Sterna hirundo*, Black Tern *Chlidonias niger*, White-winged Tern *Chlidonias leucoptera*, Redshank *Tringa totanus*, Black Kite *Milvus migrans*, Yellow-legged Gull *Larus cachinnans* and White Stork *Ciconia ciconia*. PASPALLEVA-ANTONOVA (1961) observed that White Stork nested on the sheaves of the old reed, but now only one pair breeds in the village of Srebarna. In the present study we recorded 14 breeding species, which were not found in Paspaleva-Antonova's survey – Black-necked Grebe, Red-necked Grebe *Podiceps grisegena*, Pygmy Cormorant, Great Cormorant, Great Egret, Glossy Ibis *Plegadis falcinellus*, Greylag Goose, Corncrake, Water Rail, Baillon's Crake, Black-headed Gull *Larus ridibundus* and Sedge Warbler *Acrocephalus schoenobaenus*. PASPALLEVA-ANTONOVA (1961B) determined the reduction of the number of all species

in the mixed colony compared with the observations of HODEK (1882) and REISER (1894). According to her, the reasons for this were:

- (1) the cutting down of coastal willow belt, which was the breeding site for Pygmy Cormorant and herons;
- (2) the lowering of water level in the lake by 1.5 m and the changes of fish fauna as a result of building the dike (BULGURKOV 1958, MICHEV 1963 & 1968);
- (3) large-scale reed masses were mowed, which deprived numerous bird species (pelicans, herons, ducks, warblers) of nest material and shelter;
- (4) the establishment of a stock-farm in the southern part of the reserve (PASPALLEVA-ANTONOVA 1961B);
- (5) many Muskrats *Ondatra zibetica*, which destroyed the nests and eggs of wetland birds.

These are some of the reasons accounting for the absence of some species from the reserve but it is difficult to determine an overall pattern because the reasons are complex. In order to reveal the exact reason, additional and more detailed research on particular factors and particular species are necessary. According to MARTIN (1981) the deficiency of a given species from its habitat may be due to the conditions in the habitat, but also to the competition with other closely related species, the abundance in the region or just chance. However, at the end of the 19th century and in the 1950s, the Pygmy Cormorant, Great Cormorant, Glossy Ibis and Great Egret bred in the reserve (REISER 1894, PETROV 1947, PATEV 1950).

In 1979, part of the dike (500 m) was destroyed and, for several years, the Danube waters entered the lake annually. The water area extended and the maximum water column increased to 3.5 m. (STOYNEVA & MICHEV 1994, MIKHOV 1994). Unfortunately, from 1988 to 1994, there was no penetration of large amounts of water. The water level lowered considerably and, in 1993, the water column was only 0.3 – 0.5 m, and at several sites only 0.15 m (MICHEV *et al.* 1993, STOYNEVA 1994). Many of the floating reed isles rooted and the nests of water birds became accessible to predators (Golden Jackals *Canis aureus*, Red Foxes *Vulpes vulpes*, Wild Boars *Sus scrofa*). The census of avifauna in this period showed a decrease of bird species and their abundances (MICHEV 2000). In 1990 – 1994, the species from the heronry bred on Devnia Island in the Danube River. Only Dalmatian Pelican and other species like Coot, Moorhen, Great Reed Warbler, Reed Warbler and Magpie *Pica pica* remained to breed (STOYNEVA & MICHEV 1994). The number of breeding pairs of Dalmatian Pelican increased after 1990, because a fence was built around the colony which protected the nests and chicks from terrestrial predators. In 1994, when a channel was

built to connect the reserve and the Danube River, the herons, Spoonbill and Glossy Ibis began to breed on the territory of the reserve again (MICHEV 2000).

There is a lot of information about the breeding of Dalmatian Pelican in the reserve. Even HODEK (1882) and REISER (1894) reported about the existence of the colony. According to PATEV (1950), in the 1940's and 1950's, 100 – 150 pairs bred in the lake. In the period 1956 – 1959 the number of breeding pairs varied from 30 to 85, while in 1959 it decreased and there were two small colonies (PASPALLEVA-ANTONOVA 1961A). GEISLER (1962) estimated that the biggest part of the colony consisted of 91 nests and the smallest 36 nests. In the period 1954 – 1980, an average of 67 pairs bred in the reserve, with a large variation in numbers from 29 to 127 (MICHEV 1981). All these data show that Srebarna Reserve is a traditional breeding site for the Dalmatian Pelican and that its population fluctuates. There have also been some spatial changes of the colony. In the past (even before 1882), the nests were situated in the far northern part of the lake. In the 1940's, the colony was dispersed and separate breeding pairs bred on floated islets (PETROV 1947). Nowadays, the colony of the species is situated in the southern part of the northern *Reedbeds*, near the central open water. According to CRIVELLI *et al.* (1998) the water level and destruction of the islets were the most important factors which influenced the spatial distribution of the breeding units of Dalmatian Pelican. In spite of the 0.75 m decrease of the water column in 2002, this made no impact on the number of pelicans. But according to BALIAN *et al.* (2002) larger fluctuations in water level (up to 19.5 m) could lead to extinction of the species from the current wetland. We also observed a reduction in the breeding pairs of Coot, Ferruginous Duck, Pochard and Mallard from 2001 to 2002. The change was associated with the facts that: (1) in 2002 the area of water bodies, which was abundant with food and nesting resources, decreased; (2) because these species were numerous in 2001, making the decline in 2002 substantial. REITAN and SANDVIK (1992) in NORWAY and KOSINSKI (1999) in Poland also confirmed that water depth is a key factor for the number of pairs of *Anas* and *Aythya* species.

A decrease was observed in the mixed heron colony. PASPALEVA-ANTONOVA (1961B) also reported a reduction of the number of all species in the mixed colony as compared with the observations of HODEK (1882) and REISER (1894). According to the author, this was a result of building a dike (in 1949) between the lake and the Danube River, which interrupted the entry of Danube water into the reserve.

A big decrease was observed in the breeding numbers of Black-headed Gull – approximately 8 times less than in the 1980's.

For the period under study, *Water-lily* habitat was a breeding place of Whiskered Tern only. The species composition and the number of breeding pairs of terns decreased due to reduced area of the *Water-lily* communities in Srebarna Lake. According to REISER (1894) the Common Tern and Whiskered Tern bred in large numbers in the reserve. In the second half of the 20th century, four tern species bred in the reserve (Common Tern, Whiskered Tern, Black Tern and White-winged Tern). In the 1970's and 1980's, its colonies were situated in the eastern and northern part of the lake. According to PASPALEVA-ANTONOVA (1961A & B) the Black Tern was “markedly numerous” in the reserve, but its population began to decrease in the beginning of the 1970's, when only 1 to 3 pairs bred (IVANOV 1985).

The agricultural area from Paspaleva-Antonova's survey provided breeding places for nine bird species compared with the mesophytic and hygromesophytic vegetation in *Mesohyg* habitat (15 species). In our study, Savi's Warbler, Reed Warbler, Great Reed Warbler, Whitethroat, Lesser Whitethroat, Red-backed Shrike, Lesser Grey Shrike *Lanius minor* bred here, but Crested Lark *Galerida cristata*, Grey Partridge *Perdix perdix*, Quail *Coturnix coturnix* did not.

The special features of *Poplar* habitat, that determine the breeding avifauna, are the height of the trees (18 – 20 m) and the thin canopy. The middle tree layer was occupied by Chaffinch and Golden Oriole *Oriolus oriolus*. Nightingale *Luscinia megarhynchos*, Blackbird, Song Thrush *Turdus philomelos* and Blackcap bred in the shrubby layer. Since the poplar trees are 10 to 40 years old, there are cavities for the breeding of different species of woodpeckers, tits and Spotted Flycatcher *Muscicapa striata*. Some of the species (Grey-headed Woodpecker, Green Woodpecker, Wood Pigeon *Columba palumbus*, Redstart, and Marsh Tit) were observed only in one of the three years, which probably means that the abundance of these species in the region as a whole was low.

Although the vegetation community in *Island* habitat is characterized by large structural diversity, only 14 species of birds were recorded here, probably due to the small area of the *Island*. The large number of breeding pairs in this habitat is due to the large colony of Great Cormorant. This defines the lowest value of diversity index (HB) and the largest value of the dominance index (d). These results confirm the assertion of JAMES & RATHBUN (1981) that the

species rich ornithocoenoses have models with lower dominants than those that have a small number of bird species.

The *Willow* habitat has a patchy character, as the separate willow groves are situated along the coastal part of the reserve and, despite its small area, more bird species were observed here than in the previously mentioned two habitats. Although the vegetation community is characterized by low structural diversity, the willow trees are old and branchy and provide breeding sites for many bird species that nest in holes (the largest number of all the habitats) and in the tree canopy.

This study reveals that the changes in bird communities in Srebarna Reserve have been considerable and frequent (especially in *Reedbeds* habitat) and that different factors, both short-term and long-term, have influenced, not only the number of breeding pairs, but also the species composition and bird habitat distribution. Additional studies are needed to understand the particular factors (transparency, the abundance of phytoplankton and zooplankton, the amount of macrophytes, the amount of total dissolved nitrogen and phosphorous) that influence a particular species or group of species (the species belonging to the families Anatidae, Ardeidae, Threskornithidae and Phalacrocoracidae).

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5. Povzetek

Avtorica podaja število, gostoto in razporeditev habitatov gnezdečih ptic v rezervatu Srebarna v SV Bolgariji. Raziskave, temelječe na metodi transektov, je opravljala v gnezdilnem obdobju med letoma 2001 in 2003. Zabeleženih je bilo 83 gnezdil v šestih habitatnih tipih. Populacija čopastega pelikana *Pelecanus crispus* in velike bele čaplje *Egretta alba* predstavlja celotno populacijo teh dveh vrst v Bolgariji. V rezervatu Srebarna je tudi največja gnezdeča bolgarska populacija kostanjevke *Aythya nyroca*. Prvič sta bila v rezervatu ugotovljena mali detel *Dendrocopos minor* in močvirska sinica *Parus palustris*. Največ vrst (36) je gnezdil v habitatu z dna rastočega trstičja (dominantna vrsta rastlin je bil navadni trst *Phragmites australis*), najmanj (1) pa v habitatu belega lokvanja *Nymphaea alba*. Največja pestrost vrst je bila zabeležena v habitatu z dna rastočega trstičja. Raziskave kažejo na nenehne spremembe v združbah gnezdečih ptic v rezervatu Srebarna, še posebej v habitatu z dna

rastočega trstičja, ter kako kratkoročni in dolgoročni dejavniki vplivajo ne le na število gnezdil, marveč tudi na sestavo vrst in razporeditev pričjih habitatov.

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PRILOGA / APPENDIX

Table 2: Species composition, maximum breeding number (br. p.) and dominance (%) for the period 2001 – 2003 in the habitats of Srebarna Reserve; *Mesohyg* - mesophytic and hygromesophytic grassland habitat; *Willow* – Costal forests of White Willow *Salix alba*; *Poplar* – Hybrid Poplar *Populus nigra* x *Populus canadensis* plantation; *Island* - White Willow *Salix alba* and White Poplar *Populus alba* habitat on Devnia Island

Tabela 2: Sestava vrst, maksimalno število gnezdečih parov (br. p.) in dominanca (%) za obdobje 2001 – 2003 v habitatih rezervata Srebarna; *Mesohyg* – mezofilni in higromezofilni travniki; *vrbovje* – obrežni gozdovi bele vrbe *Salix alba*; *topoli* – plantaža topolov *Populus nigra* x *Populus canadensis*; *otok* – bela vrba *Salix alba* in beli topol *Populus alba* na otoku Devnia

| Species / Vrsta | <i>Floating Reedbeds/ Plavajoče trstičje</i> | | <i>Bottom- growing Reedbeds/ Z dna rastoče trstičje</i> | | <i>Mesohyg</i> | | <i>Willow/ Vrbovje</i> | | <i>Poplar/ Topol</i> | | <i>Island/ Otok</i> | | Total br. p./ Skupno |
|-------------------------------|--|------|---|------|----------------|-----|----------------------------|-----|--------------------------|---|-------------------------|------|----------------------------|
| | br. p. | % | br. p. | % | br. p. | % | br. p. | % | br. p. | % | br. p. | % | |
| <i>Tachybaptus ruficollis</i> | - | - | 22 | 1.0 | - | - | - | - | - | - | - | - | 22 |
| <i>Podiceps cristatus</i> | - | - | 14 | 1.0 | - | - | - | - | - | - | - | - | 14 |
| <i>Podiceps grisegena</i> | - | - | 2 | 0.1 | - | - | - | - | - | - | - | - | 2 |
| <i>Podiceps nigricollis</i> | - | - | 2 | 0.1 | - | - | - | - | - | - | - | - | 2 |
| <i>Phalacrocorax carbo</i> | - | - | - | - | - | - | - | - | - | - | 400 | 80.0 | 400 |
| <i>Phalacrocorax pygmeus</i> | - | - | 300 | 17.0 | - | - | - | - | - | - | - | - | 300 |
| <i>Pelecanus crispus</i> | 128 | 34.0 | - | - | - | - | - | - | - | - | - | - | 128 |
| <i>Ixobrychus minutus</i> | 11 | 3.0 | 17 | 1.0 | - | - | - | - | - | - | - | - | 28 |
| <i>Nycticorax nycticorax</i> | - | - | 100 | 6.0 | - | - | - | - | - | - | - | - | 100 |
| <i>Ardeola ralloides</i> | - | - | 200 | 12.0 | - | - | - | - | - | - | - | - | 200 |
| <i>Egretta garzetta</i> | - | - | 200 | 12.0 | - | - | - | - | - | - | - | - | 200 |
| <i>Egretta alba</i> | - | - | 12 | 1.0 | - | - | - | - | - | - | - | - | 12 |
| <i>Ardea cinerea</i> | - | - | 80 | 5.0 | - | - | - | - | - | - | - | - | 80 |
| <i>Ardea purpurea</i> | - | - | 50 | 3.0 | - | - | - | - | - | - | - | - | 50 |
| <i>Plegadis falcinellus</i> | - | - | 28 | 1.6 | - | - | - | - | - | - | - | - | 28 |
| <i>Platalea leucorodia</i> | - | - | 24 | 1.4 | - | - | - | - | - | - | - | - | 24 |
| <i>Cygnus olor</i> | 3 | 1.0 | 3 | 0.2 | - | - | - | - | - | - | - | - | 6 |
| <i>Anser anser</i> | - | - | 2 | 0.1 | - | - | - | - | - | - | - | - | 2 |
| <i>Anas strepera</i> | 5 | 1.0 | 15 | 1.0 | - | - | - | - | - | - | - | - | 20 |
| <i>Anas platyrhynchos</i> | 11 | 3.0 | 19 | 1.0 | - | - | - | - | - | - | - | - | 30 |
| <i>Anas querquedula</i> | 4 | 1.0 | 18 | 1.0 | - | - | - | - | - | - | - | - | 22 |
| <i>Anas clypeata</i> | - | - | 10 | 0.6 | - | - | - | - | - | - | - | - | 10 |
| <i>Aythya ferina</i> | 20 | 5.0 | 10 | 0.6 | - | - | - | - | - | - | - | - | 30 |
| <i>Aythya nyroca</i> | 38 | 10.0 | 22 | 1.3 | - | - | - | - | - | - | - | - | 60 |
| <i>Circus aeruginosus</i> | 2 | 0.5 | - | - | - | - | - | - | - | - | - | - | 2 |
| <i>Falco tinnunculus</i> | - | - | - | - | - | - | 1 | 0.7 | - | - | - | - | 1 |
| <i>Phasianus colchicus</i> | - | - | - | - | 10 | 4.0 | - | - | - | - | - | - | 10 |
| <i>Rallus aquaticus</i> | - | - | 2 | 0.1 | - | - | - | - | - | - | - | - | 2 |
| <i>Porzana porzana</i> | - | - | 1 | 0.1 | - | - | - | - | - | - | - | - | 1 |
| <i>Porzana pusilla</i> | - | - | 3 | 0.2 | - | - | - | - | - | - | - | - | 3 |
| <i>Crex crex</i> | - | - | 1 | 0.1 | - | - | - | - | - | - | - | - | 1 |

(continuation of Table 2 / nadaljevanje tabele 2)

| Species / Vrsta | Floating Reedbeds/ Plavajoče trstičje | | Bottom- growing Reedbeds/ Na dnu rastoče trstičje | | Mesohyg | | Willow/ Vrbovje | | Poplar/ Topol | | Island/ Otok | | Total br. p./ Skupno |
|-----------------------------------|--|------|---|------|---------|------|--------------------|-----|------------------|------|-----------------|-----|----------------------------|
| | br. p. | % | br. p. | % | br. p. | % | br. p. | % | br. p. | % | br. p. | % | |
| <i>Gallinula chloropus</i> | 45 | 12.0 | 45 | 3.0 | - | - | - | - | - | - | - | - | 90 |
| <i>Fulica atra</i> | 21 | 5.0 | 335 | 20.0 | - | - | - | - | - | - | - | - | 356 |
| <i>Charadrius dubius</i> | - | - | - | - | 1 | 0.4 | - | - | - | - | - | - | 1 |
| <i>Vanellus vanellus</i> | - | - | 2 | 0.1 | 1 | 0.4 | - | - | - | - | - | - | 3 |
| <i>Larus ridibundus</i> | - | - | 40 | 2.0 | - | - | - | - | - | - | - | - | 40 |
| <i>Columba palumbus</i> | - | - | - | - | - | - | 2 | 1.5 | 4 | 1.2 | - | - | 6 |
| <i>Streptopelia turtur</i> | - | - | - | - | - | - | - | - | 11 | 3.0 | 2 | 0.4 | 13 |
| <i>Alcedo atthis</i> | - | - | - | - | - | - | - | - | 8 | 2.0 | - | - | 8 |
| <i>Coracias garrulus</i> | - | - | - | - | - | - | 3 | 2.0 | - | - | - | - | 3 |
| <i>Upupa epops</i> | - | - | - | - | - | - | 1 | 0.7 | - | - | - | - | 1 |
| <i>Picus canus</i> | - | - | - | - | - | - | 1 | 0.7 | 4 | 1.2 | - | - | 5 |
| <i>Picus viridis</i> | - | - | - | - | - | - | 1 | 0.7 | 4 | 1.2 | - | - | 5 |
| <i>Dendrocopos major</i> | - | - | - | - | - | - | 2 | 1.5 | 8 | 2.0 | 2 | 0.4 | 12 |
| <i>Dendrocopos syriacus</i> | - | - | - | - | - | - | 2 | 1.5 | 13 | 4.0 | 3 | 0.6 | 18 |
| <i>Dendrocopos minor</i> | - | - | - | - | - | - | 2 | 1.5 | - | - | - | - | 2 |
| <i>Alauda arvensis</i> | - | - | - | - | 10 | 4.0 | - | - | - | - | - | - | 10 |
| <i>Motacilla flava</i> | - | - | - | - | 3 | 1.0 | - | - | - | - | - | - | 3 |
| <i>Erithacus rubecula</i> | - | - | - | - | - | - | - | - | 4 | 1.2 | - | - | 4 |
| <i>Luscinia megarhynchos</i> | - | - | - | - | - | - | - | - | 17 | 5.0 | - | - | 17 |
| <i>Phoenicurus phoenicurus</i> | - | - | - | - | - | - | - | - | 4 | 1.2 | - | - | 4 |
| <i>Turdus merula</i> | - | - | - | - | - | - | 2 | 1.5 | 44 | 13.0 | 11 | 2.0 | 57 |
| <i>Turdus philomelos</i> | - | - | - | - | - | - | - | - | 22 | 7.0 | 7 | 1.4 | 29 |
| <i>Locustella fluviatilis</i> | - | - | 1 | 0.4 | - | - | - | - | - | - | - | - | 1 |
| <i>Locustella luscinioides</i> | 28 | 7.0 | 31 | 2.0 | 10 | 4.0 | - | - | - | - | - | - | 69 |
| <i>Acrocephalus schoenobaenus</i> | - | - | 1 | 0.1 | - | - | - | - | - | - | - | - | 1 |
| <i>Acrocephalus palustris</i> | - | - | - | - | 29 | 10.0 | - | - | - | - | - | - | 29 |
| <i>Acrocephalus scirpaceus</i> | 19 | 5.0 | 21 | 1.2 | 36 | 13.0 | - | - | - | - | - | - | 76 |
| <i>Acrocephalus arundinaceus</i> | 32 | 8.0 | 57 | 3.0 | 58 | 21.0 | - | - | - | - | - | - | 147 |
| <i>Hippolais icterina</i> | - | - | - | - | - | - | - | - | 8 | 2.0 | - | - | 8 |
| <i>Sylvia nisoria</i> | - | - | - | - | 6 | 2.0 | - | - | - | - | - | - | 6 |
| <i>Sylvia curruca</i> | - | - | - | - | 6 | 2.0 | - | - | - | - | - | - | 6 |
| <i>Sylvia communis</i> | - | - | - | - | 22 | 8.0 | - | - | - | - | - | - | 22 |
| <i>Sylvia atricapilla</i> | - | - | - | - | - | - | 5 | 4.0 | 30 | 9.0 | 13 | 3.0 | 48 |
| <i>Phylloscopus collybita</i> | - | - | - | - | - | - | - | - | 8 | 2.0 | 2 | 0.4 | 10 |
| <i>Carduelis carduelis</i> | - | - | - | - | - | - | 2 | 1.5 | - | - | - | - | 2 |
| <i>Carduelis chloris</i> | - | - | - | - | - | - | 2 | 1.5 | - | - | 2 | 0.4 | 4 |

(continuation of Table 2 / nadaljevanje tabele 2)

| Species / Vrsta | Floating Reedbeds/ Plavajoče trstičje | | Bottom- growing Reedbeds/ Na dnu rastoče trstičje | | Mesohyg | | Willow/ Vrbovje | | Poplar/ Topol | | Island/ Otok | | Total br. p./ Skupno |
|----------------------------|--|-----|---|-----|---------|------|--------------------|------|------------------|------|-----------------|-----|----------------------------|
| | br. p. | % | br. p. | % | br. p. | % | br. p. | % | br. p. | % | br. p. | % | |
| <i>Muscicapa striata</i> | - | - | - | - | - | - | 2 | 1.5 | 4 | 1.2 | - | - | 6 |
| <i>Parus palustris</i> | - | - | - | - | - | - | - | - | 4 | 1.2 | - | - | 4 |
| <i>Parus caeruleus</i> | - | - | - | - | - | - | 5 | 4.0 | 17 | 5.0 | 10 | 2.0 | 32 |
| <i>Parus major</i> | - | - | - | - | - | - | 17 | 13.0 | 39 | 12.0 | 16 | 3.0 | 72 |
| <i>Remiz pendulinus</i> | - | - | - | - | - | - | 14 | 10.0 | - | - | - | - | 14 |
| <i>Lanius collurio</i> | - | - | - | - | 54 | 20.0 | - | - | - | - | - | - | 54 |
| <i>Lanius minor</i> | - | - | - | - | 3 | 1.0 | - | - | - | - | - | - | 3 |
| <i>Oriolus oriolus</i> | - | - | - | - | - | - | 7 | 5.0 | 21 | 6.0 | 2 | 0.4 | 30 |
| <i>Garrulus glandarius</i> | - | - | - | - | - | - | 1 | 0.7 | 4 | 1.2 | - | - | 5 |
| <i>Pica pica</i> | 4 | 1.0 | 5 | 0.3 | - | - | 3 | 2.0 | - | - | - | - | 12 |
| <i>Sturnus vulgaris</i> | - | - | - | - | - | - | 38 | 29.0 | - | - | - | - | 38 |
| <i>Passer montanus</i> | - | - | - | - | - | - | 15 | 11.0 | - | - | - | - | 15 |
| <i>Fringilla coelebs</i> | - | - | - | - | - | - | 4 | 3.0 | 49 | 15.0 | 26 | 5.0 | 79 |
| <i>Miliaria calandra</i> | - | - | - | - | 25 | 9.0 | - | - | - | - | - | - | 25 |
| Sum / Vsota | 371 | | 1695 | | 274 | | 132 | | 327 | | 496 | | |

Table 3: Bird species composition, the number of breeding pairs (br. p.) and dominance (%) in *Bottom-growing Reedbeds* habitat in Srebarina Reserve for the period 2001 – 2003**Tabela 3:** Sestava vrst, število gnezdečih parov (br. p.) in dominanca (%) za obdobje 2001 – 2003 v habitatu "z dna rastoče trstičje"

| Species / Vrsta | 2001 | | 2002 | | 2003 | |
|-------------------------------|--------|------|--------|-----|--------|------|
| | br. p. | % | br. p. | % | br. p. | % |
| <i>Tachybaptus ruficollis</i> | 17 | 1.0 | 18 | 2.4 | 22 | 4.0 |
| <i>Podiceps cristatus</i> | 12 | 1.0 | 13 | 2.0 | 14 | 2.0 |
| <i>Podiceps grisegena</i> | 1 | 0.0 | 2 | 0.3 | 1 | 0.2 |
| <i>Podiceps nigricollis</i> | 2 | 0.1 | 1 | 0.1 | 1 | 0.2 |
| <i>Phalacrocorax pygmeus</i> | 300 | 18.0 | 60 | 8.0 | 80 | 13.4 |
| <i>Ixobrychus minutus</i> | 17 | 1.0 | 14 | 2.0 | 11 | 2.0 |
| <i>Nycticorax nycticorax</i> | 100 | 6.0 | 50 | 7.0 | 20 | 3.0 |
| <i>Ardeola ralloides</i> | 200 | 12.0 | 50 | 7.0 | 30 | 5.0 |
| <i>Egretta garzetta</i> | 200 | 12.0 | 60 | 8.0 | 60 | 10.0 |
| <i>Egretta alba</i> | 12 | 1.0 | 3 | 0.4 | 2 | 0.3 |
| <i>Ardea cinerea</i> | 80 | 5.0 | 30 | 4.0 | 15 | 2.5 |
| <i>Ardea purpurea</i> | 50 | 3.0 | 10 | 1.3 | 8 | 1.0 |
| <i>Plegadis falcinellus</i> | 28 | 1.6 | 15 | 2.0 | 10 | 2.0 |
| <i>Platalea leucorodia</i> | 24 | 1.4 | 20 | 3.0 | 20 | 3.3 |
| <i>Cygnus olor</i> | 3 | 0.2 | 2 | 0.3 | 3 | 0.5 |

(continuation of Table 3 / nadaljevanje tabele 3)

| Species / Vrsta | 2001 | | 2002 | | 2003 | |
|-----------------------------------|--------|------|--------|------|--------|------|
| | br. p. | % | br. p. | % | br. p. | % |
| <i>Anser anser</i> | 2 | 0.1 | 1 | 0.1 | 2 | 0.3 |
| <i>Anas platyrhynchos</i> | 19 | 1.1 | 17 | 2.3 | 19 | 3.0 |
| <i>Anas strepera</i> | 15 | 1.0 | 12 | 1.6 | 13 | 2.0 |
| <i>Anas clypeata</i> | 5 | 0.3 | 10 | 1.3 | 3 | 0.5 |
| <i>Anas querquedula</i> | 18 | 1.0 | 8 | 1.0 | 11 | 2.0 |
| <i>Aythya ferina</i> | 10 | 0.6 | 10 | 1.3 | 7 | 1.0 |
| <i>Aythya nyroca</i> | 22 | 1.3 | 13 | 2.0 | 15 | 2.5 |
| <i>Rallus aquaticus</i> | 1 | 0.0 | 2 | 0.3 | 2 | 0.3 |
| <i>Porzana porzana</i> | 1 | 0.0 | 1 | 0.1 | 1 | 0.2 |
| <i>Porzana pusilla</i> | 1 | 0.0 | 1 | 0.1 | 3 | 0.5 |
| <i>Crex crex</i> | 1 | 0.0 | 0 | 0.0 | 1 | 0.2 |
| <i>Gallinula chloropus</i> | 45 | 2.6 | 29 | 4.0 | 37 | 6.0 |
| <i>Fulica atra</i> | 335 | 20.0 | 120 | 16.0 | 75 | 12.0 |
| <i>Vanellus vanellus</i> | 0 | 0.0 | 2 | 0.3 | 1 | 0.2 |
| <i>Larus ridibundus</i> | 35 | 2.0 | 40 | 5.0 | 5 | 0.8 |
| <i>Locustella fluviatilis</i> | 0 | 0.0 | 0 | 0.0 | 1 | 0.2 |
| <i>Locustella luscinioides</i> | 31 | 1.8 | 31 | 4.0 | 28 | 5.0 |
| <i>Acrocephalus schoenobaenus</i> | 0 | 0.0 | 1 | 0.1 | 1 | 0.2 |
| <i>Acrocephalus scirpaceus</i> | 21 | 1.2 | 21 | 3.0 | 21 | 3.5 |
| <i>Acrocephalus arundinaceus</i> | 57 | 3.4 | 44 | 6.0 | 41 | 7.0 |
| <i>Pica pica</i> | 5 | 0.3 | 4 | 0.5 | 5 | 0.8 |
| Sum / Vsota | 1670 | | 715 | | 590 | |

Table 4: Bird species composition, the number of breeding pairs (br. p.) and dominance (%) in Floating Reedbeds habitat in Srebarna Reserve for the period 2001 – 2003

Tabela 4: Sestava vrst, število gnezdečih parov (br. p.) in dominanca (%) za obdobje 2001 – 2003 v habitatu "plavajoče trstičje"

| Species / Vrsta | 2001 | | 2002 | | 2003 | |
|----------------------------|--------|------|--------|------|--------|------|
| | br. p. | % | br. p. | % | br. p. | % |
| <i>Pelecanus crispus</i> | 128 | 39.0 | 102 | 31.0 | 80 | 31.4 |
| <i>Ixobrychus minutus</i> | 7 | 2.0 | 11 | 4.0 | 9 | 3.5 |
| <i>Circus aeruginosus</i> | 2 | 0.6 | 1 | 0.3 | 2 | 1.0 |
| <i>Cygnus olor</i> | 2 | 0.6 | 3 | 1.0 | 1 | 0.4 |
| <i>Anas platyrhynchos</i> | 6 | 2.0 | 3 | 1.0 | 11 | 4.3 |
| <i>Anas strepera</i> | 5 | 1.5 | 3 | 1.0 | 2 | 1.0 |
| <i>Anas querquedula</i> | 2 | 0.6 | 2 | 1.0 | 4 | 1.6 |
| <i>Aythya ferina</i> | 20 | 6.0 | 4 | 1.4 | 5 | 2.0 |
| <i>Aythya nyroca</i> | 38 | 11.5 | 22 | 7.6 | 25 | 10.0 |
| <i>Gallinula chloropus</i> | 25 | 7.5 | 45 | 15.5 | 13 | 5.0 |
| <i>Fulica atra</i> | 20 | 6.0 | 20 | 7.0 | 21 | 8.2 |

(continuation of Table 4 / nadaljevanje tabele 4)

| Species / Vrsta | 2001 | | 2002 | | 2003 | |
|----------------------------------|--------|-----|--------|------|--------|------|
| | br. p. | % | br. p. | % | br. p. | % |
| <i>Locustella luscinioides</i> | 28 | 8.5 | 26 | 9.0 | 27 | 10.5 |
| <i>Acrocephalus scirpaceus</i> | 19 | 5.7 | 14 | 5.0 | 18 | 7.0 |
| <i>Acrocephalus arundinaceus</i> | 24 | 7.3 | 29 | 10.0 | 32 | 12.5 |
| <i>Pica pica</i> | 3 | 1.0 | 2 | 0.7 | 4 | 1.6 |
| Sum / Vsota | 329 | | 287 | | 254 | |

Table 5: Bird species composition, the number of breeding pairs (br. p.) and dominance (%) in *Mesohyg* habitat in Srebarna Reserve for the period 2001 – 2003**Tabela 5:** Sestava vrst, število gnezdečih parov (br. p.) in dominanca (%) za obdobje 2001 – 2003 v habitatu "Mesohyg"

| Species / Vrsta | 2001 | | 2002 | | 2003 | |
|----------------------------------|--------|------|--------|------|--------|------|
| | br. p. | % | br. p. | % | br. p. | % |
| <i>Phasianus colchicus</i> | 6 | 3.0 | 6 | 2.0 | 10 | 6.0 |
| <i>Vanellus vanellus</i> | 0 | 0.0 | 1 | 1.0 | 0 | 0.0 |
| <i>Charadrius dubius</i> | 0 | 0.0 | 1 | 1.0 | 0 | 0.0 |
| <i>Alauda arvensis</i> | 10 | 5.0 | 10 | 4.0 | 0 | 0.0 |
| <i>Motacilla flava</i> | 3 | 1.0 | 3 | 1.0 | 3 | 2.0 |
| <i>Locustella luscinioides</i> | 10 | 5.0 | 0 | 0.0 | 0 | 0.0 |
| <i>Acrocephalus palustris</i> | 25 | 12.0 | 29 | 12.0 | 20 | 11.0 |
| <i>Acrocephalus scirpaceus</i> | 32 | 15.0 | 36 | 15.0 | 16 | 9.0 |
| <i>Acrocephalus arundinaceus</i> | 51 | 24.0 | 58 | 24.0 | 39 | 22.0 |
| <i>Sylvia nisoria</i> | 0 | 0.0 | 6 | 2.0 | 6 | 3.0 |
| <i>Sylvia curruca</i> | 0 | 0.0 | 0 | 0.0 | 6 | 3.0 |
| <i>Sylvia communis</i> | 13 | 6.0 | 10 | 4.0 | 22 | 12.0 |
| <i>Lanius colurio</i> | 48 | 23.0 | 54 | 22.0 | 41 | 23.0 |
| <i>Lanius minor</i> | 3 | 1.0 | 0 | 0.0 | 3 | 2.0 |
| <i>Miliaria calandra</i> | 10 | 5.0 | 25 | 10.0 | 13 | 7.0 |
| Sum / Vsota | 211 | | 239 | | 179 | |

Table 6: Bird species composition, the number of breeding pairs (br. p.) and dominance (%) in *Poplar* habitat in Srebarna Reserve for the period 2001 – 2003**Tabela 6:** Sestava vrst, število gnezdečih parov (br. p.) in dominanca (%) za obdobje 2001 – 2003 v habitatu "topoli"

| Species / Vrsta | 2001 | | 2002 | | 2003 | |
|----------------------------|--------|-----|--------|-----|--------|-----|
| | br. p. | % | br. p. | % | br. p. | % |
| <i>Columba palumbus</i> | 0 | 0.0 | 0 | 0.0 | 4 | 1.0 |
| <i>Streptopelia turtur</i> | 8 | 3.0 | 13 | 5.0 | 17 | 5.0 |
| <i>Alcedo atthis</i> | 13 | 6.0 | 8 | 3.0 | 8 | 2.0 |
| <i>Picus canus</i> | 0 | 0.0 | 0 | 0.0 | 4 | 1.0 |
| <i>Picus viridis</i> | 0 | 0.0 | 4 | 1.0 | 0 | 0.0 |

(continuation of Table 6 / nadaljevanje tabele 6)

| Species / Vrsta | 2001 | | 2002 | | 2003 | |
|--------------------------------|--------|------|--------|------|--------|------|
| | br. p. | % | br. p. | % | br. p. | % |
| <i>Dendrocopos major</i> | 4 | 2.0 | 4 | 1.0 | 8 | 2.0 |
| <i>Dendrocopos syriacus</i> | 0 | 0.0 | 0 | 0.0 | 13 | 4.0 |
| <i>Erithacus rubecula</i> | 4 | 2.0 | 4 | 1.0 | 0 | 0.0 |
| <i>Luscinia megarhynchos</i> | 4 | 2.0 | 8 | 3.0 | 17 | 5.0 |
| <i>Phoenicurus phoenicurus</i> | 0 | 0.0 | 0 | 0.0 | 4 | 1.0 |
| <i>Turdus merula</i> | 36 | 16.0 | 40 | 15.0 | 44 | 13.0 |
| <i>Turdus philomelos</i> | 17 | 7.0 | 17 | 6.0 | 22 | 6.0 |
| <i>Hippolais icterina</i> | 4 | 2.0 | 8 | 3.0 | 8 | 2.0 |
| <i>Sylvia atricapilla</i> | 31 | 14.0 | 31 | 11.0 | 40 | 12.0 |
| <i>Phylloscopus collybita</i> | 4 | 2.0 | 8 | 3.0 | 8 | 2.0 |
| <i>Muscicapa striata</i> | 4 | 2.0 | 4 | 1.0 | 4 | 1.0 |
| <i>Parus palustris</i> | 0 | 0.0 | 0 | 0.0 | 4 | 1.0 |
| <i>Parus caeruleus</i> | 13 | 6.0 | 13 | 5.0 | 17 | 5.0 |
| <i>Parus major</i> | 26 | 11.0 | 40 | 15.0 | 44 | 13.0 |
| <i>Oriolus oriolus</i> | 17 | 7.0 | 17 | 6.0 | 31 | 9.0 |
| <i>Garrulus glandarius</i> | 0 | 0.0 | 4 | 1.0 | 0 | 0.0 |
| <i>Fringilla coelebs</i> | 44 | 19.0 | 49 | 18.0 | 49 | 14.0 |
| Sum / Vsota | 229 | | 272 | | 346 | |

Table 7: Bird species composition, the number of breeding pairs (br. p.) and dominance (%) in *Island* habitat in Srebarna Reserve for the period 2001 – 2003**Tabela 7:** Sestava vrst, število gnezdečih parov (br. p.) in dominanca (%) za obdobje 2001 – 2003 v habitatu "otok"

| Species / Vrsta | 2001 | | 2002 | | 2003 | |
|-------------------------------|--------|------|--------|------|--------|------|
| | br. p. | % | br. p. | % | br. p. | % |
| <i>Phalacrocorax carbo</i> | 400 | 83.0 | 350 | 83.0 | 350 | 81.0 |
| <i>Streptopelia turtur</i> | 2 | 0.4 | 2 | 0.5 | 2 | 0.5 |
| <i>Dendrocopos major</i> | 2 | 0.4 | 2 | 0.5 | 0 | 0.0 |
| <i>Dendrocopos syriacus</i> | 0 | 0.0 | 0 | 0.0 | 3 | 0.7 |
| <i>Turdus merula</i> | 7 | 1.0 | 5 | 1.0 | 11 | 3.0 |
| <i>Turdus philomelos</i> | 5 | 1.0 | 3 | 0.7 | 7 | 2.0 |
| <i>Sylvia atricapilla</i> | 13 | 3.0 | 8 | 2.0 | 11 | 3.0 |
| <i>Phylloscopus collybita</i> | 0 | 0.0 | 0 | 0.0 | 2 | 0.5 |
| <i>Carduelis chloris</i> | 2 | 0.4 | 2 | 0.5 | 0 | 0.0 |
| <i>Parus major</i> | 16 | 3.0 | 13 | 3.0 | 13 | 3.0 |
| <i>Parus caeruleus</i> | 10 | 2.0 | 8 | 2.0 | 10 | 2.0 |
| <i>Oriolus oriolus</i> | 0 | 0.0 | 0 | 0.0 | 2 | 0.5 |
| <i>Fringilla coelebs</i> | 20 | 4.0 | 26 | 6.0 | 20 | 5.0 |
| Sum / Vsota | 479 | | 421 | | 433 | |

Table 8: Bird species composition, the number of breeding pairs (br. p.) and dominance (%) in *Willow* habitat in Srebarna Reserve for the period 2001 – 2003**Tabela 8:** Sestava vrst, število gnezdečih parov (br. p.) in dominanca (%) za obdobje 2001 – 2003 v habitatu "vrbovje"

| Species / Vrsta | 2001 | | 2002 | | 2003 | |
|-----------------------------|--------|------|--------|------|--------|------|
| | br. p. | % | br. p. | % | br. p. | % |
| <i>Falco tinnunculus</i> | 0 | 0.0 | 0 | 0.0 | 1 | 1.0 |
| <i>Columba palumbus</i> | 2 | 2.0 | 1 | 1.0 | 0 | 0.0 |
| <i>Coracias garrulus</i> | 1 | 1.0 | 3 | 3.0 | 3 | 3.0 |
| <i>Upupa epops</i> | 1 | 1.0 | 1 | 1.0 | 0 | 0.0 |
| <i>Picus canus</i> | 1 | 1.0 | 1 | 1.0 | 0 | 0.0 |
| <i>Picus viridis</i> | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 |
| <i>Dendrocopos syriacus</i> | 2 | 2.0 | 2 | 2.0 | 2 | 2.0 |
| <i>Dendrocopos major</i> | 2 | 2.0 | 1 | 1.0 | 1 | 1.0 |
| <i>Dendrocopos minor</i> | 0 | 0.0 | 0 | 0.0 | 2 | 2.0 |
| <i>Turdus merula</i> | 2 | 2.0 | 2 | 2.0 | 1 | 1.0 |
| <i>Sylvia atricapilla</i> | 4 | 4.0 | 5 | 4.0 | 2 | 2.0 |
| <i>Carduelis carduelis</i> | 2 | 2.0 | 1 | 1.0 | 1 | 1.0 |
| <i>Carduelis chloris</i> | 0 | 0.0 | 0 | 0.0 | 2 | 2.0 |
| <i>Muscicapa striata</i> | 2 | 2.0 | 2 | 2.0 | 0 | 0.0 |
| <i>Parus caeruleus</i> | 5 | 5.0 | 3 | 3.0 | 4 | 4.0 |
| <i>Parus major</i> | 15 | 15.0 | 17 | 15.0 | 9 | 9.0 |
| <i>Remiz pendulinus</i> | 14 | 14.0 | 11 | 10.0 | 12 | 13.0 |
| <i>Oriolus oriolus</i> | 5 | 5.0 | 5 | 4.0 | 7 | 7.0 |
| <i>Garrulus glandarius</i> | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 |
| <i>Pica pica</i> | 3 | 3.0 | 2 | 2.0 | 3 | 3.0 |
| <i>Sturnus vulgaris</i> | 23 | 23.0 | 38 | 34.0 | 26 | 26.0 |
| <i>Passer montanus</i> | 10 | 10.0 | 10 | 9.0 | 15 | 16.0 |
| <i>Fringilla coelebs</i> | 4 | 4.0 | 3 | 3.0 | 1 | 1.0 |
| Sum / Vsota | 100 | | 110 | | 95 | |