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RESEARCH ARTICLE

The avifauna of the Zigoneni dam basin (Argeş county, Romania), observed in 2013

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Abstract

Some aspects regarding the breeding of the birds from Zigoneni Basin that belongs to the protected area ROSPA0062 the Dam Basins of the Argeş River are presented in this paper. 37 species were observed here, between May and July 2013, through the point counts method, within a radius of 100 m. On one side *Acrocephalus palustris*, *A. scirpaceus*, *A. arundinaceus*, *Alcedo atthis*, *Fulica atra*, *Oriolus oriolus* and *Parus major* were the most frequent species and on the other side *A. palustris* and *Fulica atra* were the most abundant. At the level of the habitat mosaic of the water shore, *A. palustris* (0.88 p./ha), *A. scirpaceus* and *F. atra* (each with 0.32 p./ha) and *A. schoenobaenus*, *A. arundinaceus*, *Phylloscopus collybita* and *Pica pica* (each with 0.24 p./ha) had the highest estimated densities. Additionally, 14 species dependent on wetlands were observed through the itinerary method. Other considerations about the ecological indices and the efficiency of the methods were also made.

Keywords

birds, dam reservoir, protected area, density, point counts, itinerary method.

Introduction

In Romania, the birds from the artificial wetlands have become the subject of a relatively recent research, dealing with the decline in number of some species, currently protected, and the adaptation of others to the anthropogenic conditions. Within this context, the dam basins are a special subject (Cărăuşu 1968, Munteanu and Mătieş 1983, Weber 1994, Munteanu 2000, Feneru 2002, Gache 2002, Mitruly 2002, Rang 2002, Mestecăneanu 2008), providing breeding places for many bird species, as well as food and shelter throughout the year or at least seasonally. The most valuable places from this point of view have been declared protected areas (Papp and Fântână 2008), but because they are not natural, the protection of birds and habitats developed here must be harmonized with their primary purposes of production of electricity, mitigation of floods, and water supplying of the neighbourhood economic and social objectives. The reservoirs from the Argeş River, between Zigoneni and Goleşti, are a such example (cf. http://www.baraje.ro), in this context the research of their ornithofauna starting immediately after their commissioning, especially on the dynamics and breeding of the species (Mătieş 1969, Gava 1997, Munteanu et al. 1989, Gava et al. 2007, Conete 2011, Conete et al. 2012, Mestecăneanu et al. 2010, Mestecăneanu and Gava 2016).

This study is the first paper dedicated to the avifauna of Zigoneni reservoir. It proposes a different approach of the fauna of the breeding birds from the protected area.

Material and method

The Zigoneni dam reservoir was built on the Argeş River in 1973, south of Curtea de Argeş, near the village of Zigoneni, hence the name. It is followed, downstream, by Vâlcele, Budeasa, Bascov, Piteşti and Goleşti dam basins. According to the Government Decision no. 1284/2007 (https://lege5.ro/Gratuit/geydknbwgi/), they form together the special protection area for avifauna, an integral part of the European ecological network Natura 2000, ROSPA0062 The Dam Basins of the Argeş River – in Romanian, „Lacurile de acumulare de pe Argeş" (Fig. 1).

Its functional features are: type – gravity dam/earth; kind of sealing – uphill embankment, concrete; height – 29 m; length – 2,850 m; volume – 13.3×10^6 m^3; area – 165 ha; length of the lake – 3 km; purpose – electricity, water supply; area of catchment – 625 km^2; discharge flow – 840 m^3/s; spill type – overflowing with the sluices (http://www.baraje.ro/rrmb/rrmb_idx.htm). It reaches 379 m a.s.l. (cf. Google Earth), 350–400 m lower than the peaks from vicinity of the Cotmeana Plateau, in the West, and of the Argeş Hills, in the East.

The hills that flank it are covered with beech (*Fagus sylvatica* L.), hornbeam (*Carpinus betulus* L.), oak (*Quercus robur* L.) and sessile oak forests (*Quercus petraea* (Mattuschka) Liebl., as well as fruit orchards and pastures. Particularly, corn and fodder plants grow in the nearby meadow. On the right bank, there are remnants of an old park, formed of alder (*Alnus* spp.), willow (*Salix* spp.) and poplar trees (*Populus* spp.), which, due to the silting process, increasingly began to claim territories to the lake end, on the alluvial beds, where the reed and bulrush were installed first. Also, a small pine (*Pinus* spp.) plantation lays at the tail of the basin. The palustral vegetation is poor, noticeable being the association *Potamo – Cerato-*

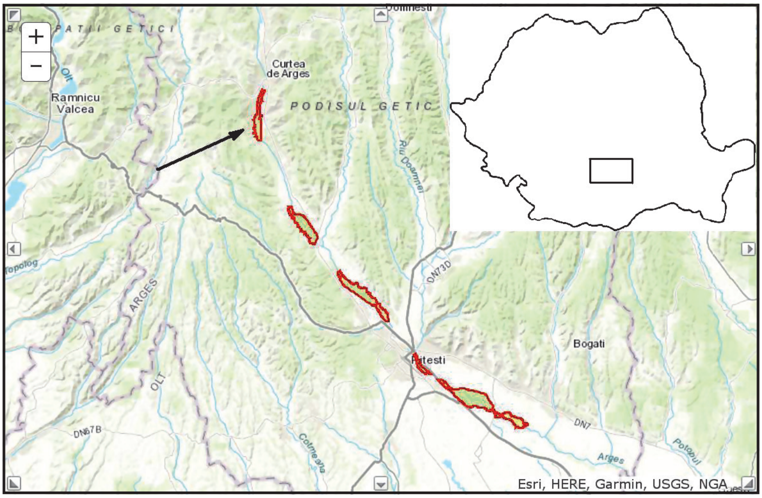

Figure 1. The map of the ROSPA0062, marked with red contour, and the position of the Zigoneni Reservoir, marked with black arrow (by http://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=ROSPA0062, modified).

phylletum submersi Pop 1962, found at depths of 60–120 cm, where *Ceratophyllum submersum* is the dominant and characteristic species (Stancu 2014).

The fish fauna gathers elements from the interference between *Thymallus thymallus* Linneus, 1758 and *Barbus meridionalis petenyi* Heckel, 1852 area and *Chondrostoma nasus* (Linneus, 1758) area, next to which *Phoxinus phoxinus* (Linneus 1758), *Noemacheilus barbatulus* (Linneus, 1758), *Cottus gobio* Linneus, 1758, *Leuciscus cephalus* (Linneus, 1758), *Barbus barbus* (Linneus, 1758) etc. live, too (Bănărescu 1964). Since 2011, *Cyprinus carpio* Linneus, 1758 and *Ctenopharyngodon idella* (Valenciennes, 1844), species introduced in the juvenile stage, added to them (http://apsvidraru.ro/populare.html).

The climate of the area is temperate continental with hilly influences. The average air temperature is 7°C (-2.5 °C in January and 19°C in July), 1–3°C lower than the average annual water temperature of Argeş River. The annual average of the precipitations reaches 750 mm/year (Barco and Nedelcu 1974).

The study was conducted through the project "Sistemul naţional de gestiune şi monitorizare a speciilor de păsări din România în baza articolului 12 din Directiva Păsări" [National system for the management and monitoring of bird species in Romania based on Article 12 of the Birds Directive] – *SMIS-CSNR 36586*, coordinated by the Ornithological Romanian Society and the Milvus Group for the Birds and Nature Protection and implemented in Romania by the National Center for Sustainable Development, Bucharest in partnership with the Ministry of Environment, Water and Forests (http://monitorizareapasarilor.cndd.ro) and it had as a purpose the assessment of the breeding of the aquatic and paludous species in the area.

According to the methodology (Fântână et al. 2014), in the WE86 square, of 2×2 km², from the end of the lake, four points of observation were established on the shore (Fig. 2). Here, the counting for: *Ixobrychus minutus*, *Botaurus stellaris*, *Rallus aquaticus*, *Porzana* spp., *Acrocephalus* spp., *Locustella* spp, *Emberiza schoeniclus, Remiz pendulinus, Panurus biarmicus, Luscinia svecica, Cettia cetti*, etc. was accomplished, while all the breeding pairs of grebes, herons, swans, shelducks, ducks, coots, moorhens and waders, all colonies of herons, waders, gulls, terns and marshterns, as well as all the existing breeding pairs of *Haliaeetus albicilla* and *Circus aeruginosus* were counted in the whole area. Additionally, except the methodology, the other observed species were recorded in order to obtain a big picture of the avifauna both in points and on the square route.

Four field researches were made within the following periods of time: April 20th – May 1st, Mai 15th – June 1st, June 10th – June 20th, July 10th – July 20th. The square was accessed before 5 a.m. in appropriate weather conditions (good visibility, low wind and no precipitation). The counting was made at the 4 preset points between 5:00 and 9:00, and subsequently, until 18 o'clock, all humid habitats were checked thoroughly. The observations were carried out on the lake, from the eastern bevel and western bank, watching the collecting channel as well, the adjacent brooks and the upstream river branches. Also, the dry surrounding habitats have been surveyed. At every point of observation, it was a period of 20 minutes of monitoring. In the field journal, in which the habitats were previously mapped, the number of observed (heard) individuals from each species was noted in the corresponding

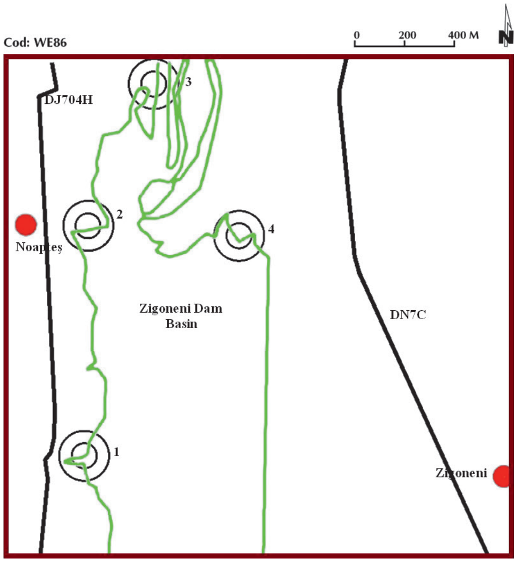

Figure 2. The position of the four points of observations on the map, inside the WE86 square (marked with brown line) from Zigoneni area (green line - the contour of the lake).

distance category (0–50 m, 50–100 m, over 100 m and in flight). For the species monitored by moving within the square, their position was marked on a map, the number of specimens, sex, breeding characterization, and some observations being registered in the associated form. The number of breeding pairs was evaluated through the standard method elaborated by Romanian Ornithological Society and "Milvus" Group (Fântână et al. 2014).

Results and discussions

1. Observations using the point counts.

For the analysis of the results in the points of observation, selected according to the working methodology at the interface between the aquatic and terrestrial environment, we considered only the habitats up to a distance of 100 m, where 37 breeding species were identified. They were represented by 141 males (or pairs), but it should be noted that they are not necessarily different, most of them being most likely observed on each field trip. The 25 species (67.56% of all) found in the 0–50 m range counted 59 males, while the 31 species (81.57% of all) from the 50–100 m range totalized 82 males (57.74% of all).

The number of species in the 0–100 m range varied between 18 (on May 21) and 22 (on July 13), and the number of males (pairs) varied between 32 (on May 4 and June16) and 41 (on July 13), so the average daily number of species was 19.50, the average daily number of males was 35.25, and the number of males (pairs)/species was 1.81. Relative to the surface of 1 ha, the highest values of species and males were obtained for a distance of 0–50 m; in comparison, a loss of detection (difference between the estimated value and the measured value) of 57.60%, in terms of number of species, and of 53.69%, in terms of males, was established for the 50–100 m interval. For the 0–100 m range, the loss was 55.67% and 40.23%, respectively (Tab. 1), which demonstrates the overall expected decrease in efficiency of the point counting method with the increase of the monitoring range. In the 0–50 m range, the fewest species, represented by the lowest number of males, were recorded on May 21, while the largest number of species and most specimens were observed on July 13.

In total, 5 habitats were mapped (A – forest, 22.37% of all area, C – pasture, 6.55%, D – agricultural land, 7.43%, E – human habitat, 4.05%, and F – wetland, 59.58%) and 9 subtypes of habitats, but it should be noted that it is often difficult to differentiate them in the field, in reed-beds, for example, growing bushes or isolated trees, and the woods interfering with small reed-covered areas; there are also transit zones in some places. The only subtype of habitat found all points of observation was F5; A4 and F7 each appeared in three observation points, D2 and D5, in two observation points and the other subtypes of habitats in one point of observation. 7 subtypes (A2 – conifer forest, A4 – riparian forest, C1 – open pasture, D5 – orchard, E2 – rural habitat, F5 – water reservoir, F7 – reed-bed) were registered between 0

Table 1. The distribution of the number of species and males (pairs) recorded in every day of observation (by intervals of distance).

Date	0–50 m		50–100 m		0–100 m	
	No. species	No. males (pairs)	No. species	No. males (pairs)	No. species	No. males (pairs)
May 4	11	11	15	21	19	32
May 21	7	11	14	25	18	36
June 16	12	16	11	16	19	32
July 13	14	21	16	20	22	41
Mean (per day of observation)	11.00	14.75	14	20.5	19.50	35.25
Mean (per ha)	14.01	18.79	5.94	8.70	6.21	11.23
Loss of detection (%)	0	0	57.60	53.69	55.67	40.23

and 50 m and 9 (the above ones plus C4 – wet meadow and D2 – mosaic of annual crops, in small parcels, under 1 ha) between 50 and 100 m (Tab. 2).

It is known that the fragmentation of the natural habitats is one of the main causes of biodiversity loss (Ion et al. 2011), as our study confirmed. Thus, in the 0–100 m range, the point 3 (which holds most of the habitat subtypes – 7), counted, in total, the fewest species (15), while the point 2 (with 4 habitat subtypes), the most (19). About the males (pairs), the point 1 of observations was noted by the lowest total number (26), and the point 2 by the highest one (43). The ratio of total species/habitat subtype varied between 2.14 in point 3 and 5.00 in point 4, whereas the total number of male/subtype habitat ratio oscillated between 4.29 in point 3 and 14.00 in point 4. For each observation day, on average, the number of species/subtype of habitat was 2.16 and the number of males/subtype habitat, of 3.91. An almost similar situation occurred for interval 50–100 m, whereas for interval 0–50 m, the points of observation 2 and 4, where only two subtypes of habitat were mapped, hold the largest number of species and males, and the points 1 and 3, with the most subtypes of habitats, hold the minimum of species and males (Tab. 2).

Only two species (5.40% of all) were common to all points of observation in the range 0–100 m: *Fulica atra*, a typical species of wetland, and *Pica pica*, a species of land but with large ecological valences, while the rest of the species found no favourable breeding conditions than in some points of observations, claiming that the vast majority of birds need specialized habitats – old forests, intact thickets, healthy wetlands (Gill 2007). The similarity between avicenoses supports this idea, the highest values being recorded between points 2 and 3, both after Bray-Curtis (54.79%) and Jaccard (36.00%), and the smallest between points 1 and 4 (11.76% and 10.34%, respectively). Points 2 and 3 share the main habitats in the area (A4, F5 and F7), while points 1 and 4 share only the F7 habitat. The same two species, mentioned above, are common to the four observation points within 50–100 m range, too; there is no common species in the range 0–50 m.

The total number of species varied between 0, in the wet meadow (C4), and 21, in the riparian forest (A4), so that the total number of males (pairs) in a subtype of habitat was up to 54, in the riparian forest (A4). In terms of 1 ha, eliminating the wet meadow (C4), 0 species/ha, the smallest number of species was 0.31 in the water reservoir (F5) and the highest of 2.16 in the riparian forest (A4). For males, the lowest number was calculated in D5 – the orchard (0.47), and the biggest in A4 – the riparian forest (5.56). Also, the conifer forest (A2) and the reed-bed (F7) housed a significant number of (males) pairs/ha, so the number of males (pairs) identified per hectare at the level of the mosaic of habitats was 2.81. Within the range of 50 m, the species were found in three habitat subtypes (A4 – the riparian forest, F5 – the water reservoir and F7 – the reed-bed), with the highest densities in the riparian forest (3.26 species/ha and 6.08 p./ha, respectively). In the range of 50–100 m, the species were found in 8 habitat subtypes (A2 – the conifer forest, A4 – the riparian forest, C1 – the open pasture, D2 – the mosaic of annual crops, in small parcels, D5 – the orchard, E2 – the rural habitat, F5 – the water reservoir, F7 – the reed-bed), the highest densities being recorded in A4 – the riparian forest (3.33 species/

Table 2. The distribution on observation points of the total number of species and of the total number of observed males (pairs), by distance ranges (4 days of observations).

Distance range	Observation point	No. of habitat subtypes	No. of species	No. of species/ Habitat subtype	No. of males (pairs)	No. of males (pairs)/ Habitat subtype
0–50 m	1	4 (A4, D5, E2, F5)	8	2.00	9	2.25
	2	2 (A4, F7)	14	7.00	20	10.00
	3	4 (A2, A4, C1, F5)	9	2.25	11	2.75
	4	2 (F5, F7)	10	5.00	19	9.5
50–100 m	1	4 (A4, D5, E2, F5)	14	3.50	17	4.25
	2	4 (A4, D5, F5, F7)	14	3.50	23	5.75
	3	7 (A2, A4, C1, C4, D2, F5, F7)	10	1.43	19	2.71
	4	3 (D2, F5, F7)	12	4.00	23	7.66
0–100 m	1	4 (A4, D5, E2, F5)	17	4.25	26	6.50
	2	4 (A4, D5, F5, F7)	19	4.75	43	10.75
	3	7 (A2, A4, C1, C4, D2, F5, F7)	15	2.14	30	4.29
	4	3 (D2, F5, F7)	15	5.00	42	14.00

Legend: A2 – conifer forest, A4 – riparian forest, C1 – open pasture, C4 – wet meadow, D2 – mosaic of annual crops, in small parcels (<1ha), D5 – orchard, E2 – rural habitat, F5 – water reservoir, F7 – reed-bed.

ha, respectively 5.09 p./ha). At the level of the mosaic of habitats (M), the highest densities were recorded in the range of up to 50 m: 1.99 species/ha, respectively 4.70 p./ha (Tab. 3).

Regarding the constancy (Tab. 4, Fig. 3a), after the number of males (pairs) observed, the most species (between 40.54% and 58.06% of all), independent of the interval of distance considered, were the occasional ones. The euconstant species were the fewest, excepting 0–100 m interval, where the lowest represented were the constant ones. Only 2 species were euconstant in the range 50–100 m (*Acrocephalus palustris* and *A. scirpaceus*), 2 in the 50–100 m range (*A. palustris* and *Fulica atra*) and 7 in the interval 0–100 m (*A. palustris*, *A. scirpaceus*, *A. arundinaceus*, *Alcedo atthis*, *Fulica atra*, *Oriolus oriolus* and *Parus major*).

By dominancy (Tab. 4, Fig. 3b), the most species were the recedent ones, except for interval 0–100 m, where most of them were subdominant species. The lowest (0) were the subrecedent species for the 0–50 and 50–100 m intervals of distance and the eudominant species (5.41% of all) for the interval 0–100 m. In the interval 0–50 m, only one eudominant species (*Acrocephalus palustris*) was present, in the 50–100 m interval there were two (*Fulica atra* şi *Pica pica*), and in the interval 0–100 m, two (*A. palustris* and *Fulica atra*), too.

Regarding the Dzuba ecological significance index, regardless of the interval considered, there were no subrecedent species (Tab. 4, Fig. 3c). Excluding these, the least were the eudominant (between 3.23% and 5.41% of all) and the dominant ones, in the range 0–100 m. The most were the recedent species (between 52.00% and 58.06% of all). Reflecting not only their position in biocenosis but also the degree of detectability that differs with the distance from the observation point, *Acrocephalus palustris* was the eudominant species in the interval 0–50 m and *Fulica atra*, in the interval 50–100 m. Both species were eudominant in the interval 0–100 m.

In terms of diversity and evenness, the highest values for 0–100 m range of distance, both by Shannon-Wiener and Simpson indices, occurred in the points 1 and 2 of observations (where four habitats were mapped and that held the highest number species). By low values (and quite close to each other) the points 3 (where 7 habitats were mapped) and 4 (where 3 habitats were mapped) were remarked. Overall, although both indices of diversity had high values, the evenness was rather low, suggesting that there were relatively large discrepancies between the strengths of the species, which also emerged from the analysis of dominancy. A similar situation was also recorded in the other categories of distance (0–50 m and 50–100 m).

With regard to the density of each species, we presented the values calculated for each distance category (0–50 m, 50–100 m and 0–100 m) and, compared to the interval 0–50 m, a percentage estimate of the undetected males in the range 50–100 m. There were four cases: 1) 100% weight of undetected males, which means that all observed males have been recorded in the range 0–50 m; 2) non-determination (-), which means that all the observed specimens were seen in the interval 50–100 m; 3) a positive weight, of less than 100%, which means that the density recorded in the interval 0–50 m was greater than that recorded in the interval 50–100 m (a par-

Table 3. The overall distribution by habitats of the species number and of the number of observed males (pairs), by distance range.

Distance range	Habitat (Habitat subtype)	No. of species	No. of males (pairs)	No. of species/ha	No. of males (pairs)/ha
0–50 m	A2	0	0	0.00	0.00
	A4	15	28	3.26	6.08
	A	15	28	3.23	6.03
	C1	0	0	0.00	0.00
	C4	-	-	-	-
	C	0	0	0.00	0.00
	D2	-	-	-	-
	D5	0	0	0.00	0.00
	D	0	0	0.00	0.00
	E2	0	0	0.00	0.00
	E	0	0	0.00	0.00
	F5	4	8	0.94	1.88
	F7	9	23	2.85	7.27
	F	12	31	1.62	4.18
	M	25	59	1.99	4.70
50–100 m	A2	3	7	2.02	4.71
	A4	17	24	3.33	5.09
	A	17	33	2.58	5.01
	C1	2	2	0.87	0.87
	C4	0	0	0.00	0.00
	C	2	2	0.68	0.68
	D2	1	1	0.62	0.62
	D5	1	1	0.49	0.49
	D	2	2	0.55	0.55
	E2	2	2	1.03	1.03
	E	2	2	1.03	1.03
	F5	6	23	0.41	1.55
	F7	10	20	1.29	2.59
	F	14	43	0.62	1.91
	M	31	82	0.82	2.18
0–100 m	A2	3	7	1.96	4.58
	A4	21	54	2.16	5.56
	A	21	61	1.87	5.43
	C1	2	2	0.76	0.76
	C4	0	0	0.00	0.00
	C	2	2	0.61	0.61
	D2	1	1	0.62	0.62
	D5	1	1	0.47	0.47
	D	2	2	0.54	0.54
	E2	2	2	0.98	0.98
	E	2	2	0.98	0.98
	F5	6	31	0.31	1.63
	F7	13	43	1.19	3.95
	F	17	74	0.57	2.47
	M	37	141	0.74	2.81

Legend: A2 – conifer forest, A4 – riparian forest, A – forest, C1 – open pasture, C4 – wet meadow, C – pasture, D2 – mosaic of annual crops, in small parcels (<1ha), D5 – orchard, D – agricultural land, E2 – rural habitat, E – human habitat, F5 – water reservoir, F7 – reed-bed, F – wetland, M – mosaic of habitats, represented by all mapped habitats.

Table 4. The ecological indices (constancy, dominancy, Dzuba) of the breeding species, by the number of observed males (pairs); n = 4 days of observations (samples).

No.	Species	Const.			Domin.			Dzuba I.		
		0–50 m	50–100 m	0–100 m	0–50 m	50–100 m	0–100 m	0–50 m	50–100 m	0–100 m
1	*Acrocephalus palustris* Bechstein, 1798	C4	C4	C4	D5	D4	D5	W5	W4	W5
2	*Acrocephalus scirpaceus* Hermann, 1804	C4	C3	C4	D4	D3	D3	W4	W3	W3
3	*Acrocephalus schoenobaenus* (Linnaeus, 1758)	C3	C1	C3	D4	D2	D3	W3	W2	W3
4	*Acrocephalus arundinaceus* (Linnaeus, 1758)	C2	C3	C4	D4	D3	D3	W3	W3	W3
5	*Actitis hypoleucos* (Linnaeus, 1758)	-	C1	C1	-	D2	D1	-	W2	W2
6	*Alcedo atthis* (Linnaeus, 1758)	C3	C3	C4	D4	D3	D3	W3	W3	W3
7	*Anas platyrhynchos* Linnaeus, 1758	C1	C1	C1	D2	D3	D3	W2	W2	W2
8	*Aythya fuligula* (Linnaeus, 1758)	-	C1	C1	-	D3	D2	-	W2	W2
9	*Coccothraustes coccothraustes* (Linnaeus, 1758)	-	C1	C1	-	D2	D1	-	W2	W2
10	*Cuculus canorus* Linnaeus, 1758	C1	-	C1	D2	-	D1	W2	-	W2
11	*Dendrocopos major* (Linnaeus, 1758)	C2	-	C2	D3	-	D2	W3	-	W2
12	*Dendrocopos medius* (Linnaeus, 1758)	-	C1	C1	-	D2	D1	-	W2	W2
13	*Erithacus rubecula* (Linnaeus, 1758)	-	C2	C2	-	D3	D2	-	W3	W2
14	*Fulica atra* Linnaeus, 1758	C3	C4	C4	D4	D5	D5	W4	W5	W5
15	*Gallinula chloropus* (Linnaeus, 1758)	-	C3	C3	-	D3	D3	-	W3	W3
16	*Garrulus glandarius* (Linnaeus, 1758)	-	C3	C3	-	D3	D3	-	W3	W3
17	*Ixobrychus minutus* (Linnaeus, 1766)	C1	-	C1	D2	-	D1	W2	-	W2
18	*Lanius colurio* Linnaeus, 1758	C1	C2	C2	D2	D3	D3	W2	W3	W3
19	*Locustella luscinioides* Savi, 1824	-	C1	C1	-	D2	D1	-	W2	W2
20	*Motacilla alba* Linnaeus, 1758	-	C1	C1	-	D2	D1	-	W2	W2
21	*Nycticorax nycticorax* (Linnaeus, 1758)	C1	C1	C2	D2	D2	D2	W2	W2	W2
22	*Oriolus oriolus* (Linnaeus, 1758)	C1	C3	C4	D3	D3	D3	W2	W3	W3
23	*Otus scops* (Linnaeus, 1758)	-	C1	C1	-	D2	D1	-	W2	W2
24	*Parus caeruleus* Linnaeus, 1758	C1	C1	C2	D2	D2	D2	W2	W2	W2
25	*Parus major* Linnaeus, 1758	C3	C3	C4	D4	D3	D4	W4	W3	W4
26	*Passer domesticus* (Linnaeus, 1758)	-	C1	C1	-	D2	D1	-	W2	W2
27	*Passer montanus* (Linnaeus, 1758)	-	C1	C1	-	D2	D1	-	W2	W2
28	*Phylloscopus collybita* Vieillot, 1817	C1	C2	C2	D4	D3	D3	W3	W3	W3
29	*Pica pica* (Linnaeus, 1758)	C2	C3	C3	D3	D5	D4	W3	W4	W4
30	*Podiceps cristatus* (Linnaeus, 1758)	C1	C1	C2	D2	D3	D3	W2	W2	W3
31	*Sitta europaea* Linnaeus, 1758	C1	-	C1	D2	-	D1	W2	-	W2
32	*Sturnus vulgaris* Linnaeus, 1758	C1	C1	C2	D3	D2	D3	W2	W2	W3
33	*Sylvia atricapilla* (Linnaeus, 1758)	C2	C1	C3	D3	D2	D3	W3	W2	W3
34	*Sylvia borin* Boddaert, 1783	C1	C1	C1	D2	D2	D2	W2	W2	W2
35	*Sylvia curruca* (Linnaeus, 1758)	C1	C1	C2	D2	D2	D2	W2	W2	W2
36	*Turdus philomelos* Brehm C.L., 1831	C2	-	C2	D3	-	D2	W3	-	W2
37	*Turdus pilaris* Linnaeus, 1758	C1	-	C1	D2	-	D1	W2	-	W2

Legend: Const. – constancy, C1 – occasional species, C2 – accessory species, C3 – constant species, C4 – euconstant species; Domin. – dominancy, Dzuba I. – Dzuba Index of ecological significance, D1, W1 – subrecedent species, D2, W2 – recedent species, D3, W3 – subdominant species, D4, W4 – dominant species, D5, W5 – eudominant species.

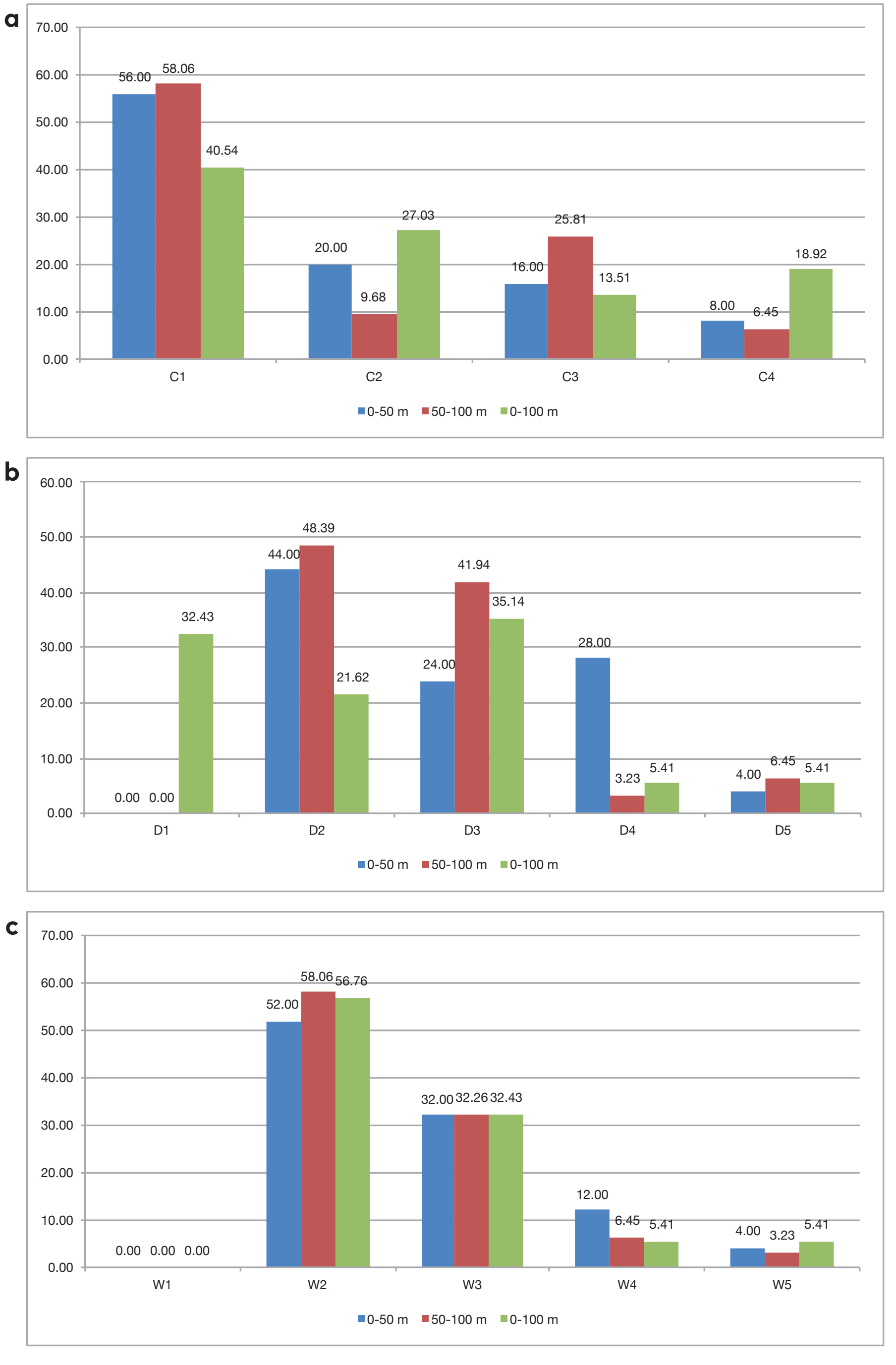

Figure 3. The grouping of the breeding species, by the distance intervals, in %: a – by the constancy, b – by the dominancy, c – by the Dzuba ecological index (C1 – occasional species, C2 – accessory species, C3 – constant species, C4 – euconstant species, D1, W1 – subrecedent species, D2, W2 – recedent species, D3, W3 – subdominant species, D4, W4 – dominant species, D5, W5 – eudominant species).

Table 5. The diversity and evenness of the breeding birds' species, by the number of males (pairs) identified in the four days of monitoring.

Interval of distance	Point of observations	Shannon-Wiener Index	Hsmax	Evenness	Simpson Index	1/λmax	Evenness
	1	2.04	2.08	0.98	36.00	64.00	0.56
	2	2.43	2.64	0.92	14.62	44.33	0.33
0–50 m	**3**	2.10	2.20	0.95	18.33	45.00	0.41
	4	2.16	2.30	0.94	12.21	20.00	0.61
	Overall	2.94	3.22	0.91	18.01	42.64	0.42
	1	2.59	2.64	0.98	45.33	74.66	0.61
	2	2.52	2.64	0.96	21.08	34.22	0.62
50–100 m	**3**	2.19	2.30	0.95	13.15	20.00	0.66
	4	2.26	2.48	0.91	11.00	24.00	0.46
	Overall	3.07	3.43	0.89	18.66	49.23	0.38
	1	2.72	2.83	0.96	27.08	47.22	0.57
	2	2.72	2.94	0.92	17.37	33.25	0.52
0–100 m	**3**	2.46	2.71	0.91	13.18	29	0.45
	4	2.41	2.71	0.89	11.18	22.77	0.49
	Overall	3.19	3.61	0.88	19.24	49.80	0.39
Overall (100 ha)		3.05	3.61	0.84	14.47	40.07	0.36

ticular case is the weight 0, when all males supposed to be present in the 50–100 m range were detected); 4) negative weight, which means that the density recorded in the interval 50–100 m was higher than that in interval 0–50 m. We thought that for positive values (cases 1 and 3), the higher the weight of the undetectable males, the more difficult the species is detectable in the respective habitat (habitat subtype), increasing the observation range from 0–50 m to 50–100 m, but the 100% or very close values to it, may also indicate an insufficient number of observation points for the species in the habitat (habitat subtype) taken into account. For negative values (case 4), the lower this percentage, the more favourable becomes the habitat (habitat subtype) to the species in question, increasing the range of observation from 0–50 to 50–100 m, but it may also be a sign of the disturbance caused by observer on nearby specimens (when it tends to 0 or we are in a situation of unidentification – case 2). Taking these into account, we considered as right the densities corresponding to the interval 0–50 m, in the case 3, and those from the interval 0–100 m, in the other cases (marked with grey colour, Tab. 6).

In the case 1, there were 8 species: 5 of forests (*Dendrocopos major*, *Sitta europaea*, *Phylloscopus collybita, Turdus philomelos*, *T. pilaris*), 1 of wetlands (*Ixobrychus minutus*) and 1 ubiquist (*Cuculus canorus*). In the case 2, there were 16 species: 7 of forests (*Coccothraustes coccothraustes*, *Dendrocopos medius*, *Erithacus rubecula*, *Garrulus glandarius*, *Otus scops*, *Parus major*, *Pica pica*), 5 characteristic of wetlands (*Acrocephalus palustris*, *Actitis hypoleucos*, *Aythya fuligula*, *Gallinula chloropus*, *Locustella luscinioides*), 3 preferring anthropogenic environment (*Motacilla alba*, *Passer domesticus*, *P. montanus*) and 1 living in open places with scrubs and thornbushes (*Lanius colurio*). In the case 3, there were 18 species: 9 characteristic of wetlands (*Acrocephalus palustris*, *A. scirpaceus*, *A. schoenobaenus*, *A. arundinaceus*, *Alcedo atthis*, *Anas platyrhynchos*, *Fulica atra*, *Nycticorax nycticorax*, *Podiceps cristatus*), 8 of forests (*Oriolus oriolus*, *Parus caeruleus*, *P. major*, *Phylloscopus collybita, Sturnus vulgaris*, *Sylvia atricapilla*, *S. borin*, *S. curruca*) and 1 common in bushes (*Lanius colurio*). In the case 4, there were 2 species, both of the forest (*Oriolus oriolus* and *Pica pica*). Altogether, although the observations were made on the edge of a dam lake, 18 species (48.64% of all) were of forest, 14 species (37.83%) were dependent on wetlands, 3 (8.10%) were typical of the anthropogenic environment, 1 (2.70%) was ubiquist and 1 (2.70%) preferred the open areas, with scrubs and thornbushes.

Covering, predominantly, the wetlands, the points of observations do not allow a satisfactory estimation of the density of all breeding pairs in the dry habitats. These have low strengths (of 1, 2 males or pairs, seen inside the 100 m radius) and belong to subrecedent or recedent species. The highest estimated densities have been achieved by *Acrocephalus palustris* (2.53 p./ha) in F7, *Pica pica* (1.96 p./ha) in A2, *Garrulus glandarius* and *Parus major* (each 1.31 p./ha) in A2, *Acrocephalus scirpaceus* (1.26 p./ha) in F7 (Tab. 6), etc., but, the strongly fragmented habitats and the border effect from the points of observations certainly influenced the results. Because many individuals of some species (*Anas platyrhynchos*, *Aythya fuligula*, *Fulica atra*, *Gallinula chloropus*, *Podiceps cristatus*) were seen on the water reservoir (F5) where they fed, their densities in the breeding subtypes of habitats cannot be exactly established. Taking in account the previously exposed, summing up the estimated densities achieved by each species in each of the habitats (subtypes of habitats) in which they were present, the best represented subtype of habitat was the reed-bed (F7, 7.19 p./ha). It was followed by the riparian forest (A4, 6.47 p./ha), the conifer forest (A2, 4.58 p./ha), the water reservoir (F5, 2.16 p./ha), the rural habitat (E2, 0.98 p./ha), the open pasture (C1, 0.76 p./ha), the mosaic of annual crops, in small parcels (D2, 0.62 p./ha), the orchard (D5, 0.47 p./ha) and the wet meadow (C4, 0 p./ha). By types of habitats, the order is: the forest (A, 6.58 p./ha), the wetland (F, 4.23 p./ha), the human habitat (E, 0.98 p./ha), the pasture (C, 0.6 p./ha), the agricultural land (D, 0.54 p./ha), so the mosaic of habitats from the area had 4.70 p./ha. It is noted the high density registered in the conifer forest (the pine plantation), which in other similar places, in relation to the different local environmental conditions,

Table 6. The density of the males (pairs) of each breeding species in the habitats (subtypes of habitats) mapped at the waterfront observation points by distance categories and their dominancy by density.

Species	Habitat	Density, 0–50 m (p./ha)	Density, 50–100 m (p./ha)	Density, 0–100 m (p./ha)	Undetected males (pairs), 50–100 m (%)	Remarks	Dominancy
*Acrocephalus palustris**	A4	0.65	0.20	0.41	69.96	C1 - area with isolated bushes. In Romania, in a rape crop, it had 5 male/ha (Munteanu 2012). In other parts of Europe, it reaches 8–13 p./ha in optimal habitat, but generally 0.1–0.2 p./ha (Hagemeijer and Blair 1997).	D5
	A	0.65	0.15	0.36	76.50		D4
	C1	0.00	0.43	0.38	-		D5
	C	0.00	0.34	0.30	-		D5
	F7	2.53	0.78	1.29	69.30		D5
	F	1.08	0.27	0.47	75.30		D5
	M	0.88	0.21	0.38	75.75		D5
*Acrocephalus scirpaceus**	F7	1.26	0.39	0.64	69.30	In Romania, the Histria area, over 5–8 p./ha (Weber 2000), and in Moldavia, up to 1 p./ha (Ion 2007). In Europe, in semi-colonial groups - over 40 p./ha (Hagemeijer and Blair 1997); generally, much lower, up to 1 p./ha (Snow and Perrins 1998).	D5
	F	0.54	0.13	0.23	75.30		D5
	M	0.32	0.08	0.14	75.00		D4
*Acrocephalus schoenobaenus**	F7	0.95	0.13	0.37	86.35	Typically, density in Europe is of 0.1–0.2 p./ha, rarely up to 8–9 p./ha (Snow and Perrins 1998). In Moldavia (Romania), up to 0.5 p./ha (Ion 2007).	D5
	F	0.40	0.04	0.13	89.02		D4
	M	0.24	0.03	0.08	88.88		D4
*Acrocephalus arundinaceus**	F7	0.95	0.39	0.55	59.07	In the Danube Delta, up to 2–3 p./ha (Ciochia 1992); in Moldavia (Romania), up to 1.9 p./ha (Ion 2007); in Europe, 1.2–11 p./ha, in suitable habitat (Hagemeijer and Blair 1997).	D5
	F	0.40	0.13	0.20	67.07		D4
	M	0.24	0.08	0.12	66.66		D4
*Actitis hypoleucos**	C1	0.00	0.43	0.38	-	C1 - area with rare herbs. Equivalent density: 1.5 p./km of adequate shore. Other values: 0.36 p./km, Mureş River, in Romania (Ciochia 1992), 1 p./km, the mean (Hagemeijer and Blair 1997) or up to 6.2 p./km (Snow and Perrins 1998), in Europe.	D5
	C	0.00	0.34	0.30	-		D5
	M	0.00	0.03	0.02	-		D1
*Alcedo atthis**	F5	0.71	0.27	0.37	61.67	F5 - area with clay banks and emergent roots and branches of trees. Equivalent density: 3.5 p./km of natural shore. The upper limit of the recordings from Romania – 3 p./km (Munteanu 2012). In Europe, up to 4 p. on 650 m long islet (Hagemeijer and Blair 1997).	D5
	F	0.40	0.18	0.23	56.10		D4
	M	0.24	0.11	0.14	55.55		D4
*Anas platyrhynchos**	F5	0.24	0.14	0.16	42.51	F5 – area of feeding. The mallard is a species that breeds in vegetation alone or semi-colonial, with nests 5–10 m apart on islands well protected against terrestrial predators (Hagemeijer and Blair 1997).	D5
	F	0.13	0.09	0.10	34.15		D3
	M	0.08	0.05	0.06	33.33		D2

Legend: * – species depending on wetlands. Habitat: A2 – conifer forest, A4 – riparian forest, A – forest, C1 – open pasture, C – pasture, D2 – mosaic of annual crops, in small parcels (<1ha), D5 – orchard, D – agricultural land, E2 – rural habitat, E – human habitat, F5 – water reservoir, F7 – reed-bed, F – wetland, M – mosaic of habitats. Grey cells – values of reference. Dominancy: D1 – subrecedent species, D2 – recedent species, D3 – subdominant species, D4 – dominant species, D5 – eudominant species.

Table 6. (continued)

Species	Habitat	Density, 0–50 m (p./ha)	Density, 50–100 m (p./ha)	Density, 0–100 m (p./ha)	Undetected males (pairs), 50–100 m (%)	Remarks	Dominancy
*Aythya fuligula**	F5	0.00	0.14	0.10	-	F5 – area of feeding. The tufted duck is a single or semi-colonial breeder in vegetation. Over large wetlands, in some places from the North of Europe, their densities reached 1 p./ha and frequently not more than 0.02–0.05 p./ha (Hagemeijer and Blair 1997).	D3
	F	0.00	0.09	0.07	-		D2
	M	0.00	0.05	0.04	-		D1
Coccothraustes coccothraustes	A4	0.00	0.20	0.10	-	The hawfinch prefers *Quercus-Carpinus betulus* forests from the temperate regions (Hagemeijer and Blair 1997), where attains a density of over 1 p./ha (Snow and Perrins 1998, Munteanu 2012).	D2
	A	0.00	0.15	0.09	-		D2
	M	0.00	0.03	0.02	-		D1
Cuculus canorus	F7	0.32	0.00	0.09	100	1 male/10 ha populated with *Acrocephalus palustris* (Snow and Perrins 1998) or up to 0.9 p./ha, into an old forest of oak from low altitude (Munteanu 2012).	D2
	F	0.13	0.00	0.03	100		D1
	M	0.08	0.00	0.02	100		D1
Dendrocopos major	A4	0.43	0.00	0.21	100	In Romania, between 0.01 p./ha, in a beach forest, and 0.6 p./ha, in an old forest of oak (Munteanu 2012). In Europe, the highest, in mature alluvial forest of ash-elm-cherry: mean – 0.2 p./ha, maximum – 0.66 p./ha (Hagemeijer and Blair 1997).	D3
	A	0.43	0.00	0.18	100		D3
	M	0.16	0.00	0.04	100		D1
Dendrocopos medius	A4	0.00	0.20	0.10	-	0.05–0.06 p./ha (Munteanu 2012) or 0.03–0.24 p./ha, in the forests of Central Europe (Hagemeijer and Blair 1997).	D2
	A	0.00	0.15	0.09	-		D2
	M	0.00	0.03	0.02	-		D1
Erithacus rubecula	A4	0.00	0.20	0.10	-	In forests of *Quercus* from Romania, densities were between 0.03 p./ha and 0.63 p./ha (Munteanu 2012). In Europe, in favoured woodland, the breeding density can reach 1 p./ha (Hagemeijer and Blair 1997).	D2
	A	0.00	0.15	0.09	-		D2
	D5	0.00	0.49	0.47	-		D5
	D	0.00	0.27	0.27	-		D5
	M	0.00	0.05	0.04	-		D1
*Fulica atra**	F5	0.71	0.68	0.68	4.19	F5 – area of feeding. Up to 13 p./ha in the Volga Delta, 6 p./ha in Moldavia, 0.18–1.06 p./ha in Silesia etc. (Hagemeijer and Blair 1997).	D5
	F7	0.32	0.26	0.28	18.14		D3
	F	0.54	0.53	0.53	1.23		D5
	M	0.32	0.32	0.32	0.00		D4

Legend: * – species depending on wetlands. Habitat: A2 – conifer forest, A4 – riparian forest, A – forest, C1 – open pasture, C – pasture, D2 – mosaic of annual crops, in small parcels (<1ha), D5 – orchard, D – agricultural land, E2 – rural habitat, E – human habitat, F5 – water reservoir, F7 – reed-bed, F – wetland, M – mosaic of habitats. Grey cells – values of reference. Dominancy: D1 – subrecedent species, D2 – recedent species, D3 – subdominant species, D4 – dominant species, D5 – eudominant species.

Table 6. (continued)

Species	Habitat	Density, 0–50 m (p./ha)	Density, 50–100 m (p./ha)	Density, 0–100 m (p./ha)	Undetected males (pairs), 50–100 m (%)	Remarks	Dominancy
*Gallinula chloropus**	F5	0.00	0.20	0.16	-	F5 – area of feeding. In Europe, densities are highly variable: up to 5 p./ha and in average 0.03 p./ha, in the farmlands from Britain (Hagemeijer and Blair 1997).	D4
	F7	0.00	0.13	0.09	-		D2
	F	0.00	0.18	0.13	-		D3
	M	0.00	0.11	0.08	-		D2
Garrulus glandarius	A2	0.00	1.35	1.31	-	The highest density from Europe - 1.2 p./ha in the optimal mixed forest habitat (Hagemeijer and Blair 1997). In Romania, maximum 0.6 p./ha, in forests (Munteanu 2012).	D5
	A4	0.00	0.20	0.10	-		D2
	A	0.00	0.46	0.27	-		D3
	M	0.00	0.08	0.06	-		D2
*Ixobrychus minutus**	F7	0.32	0.00	0.09	100	The density of the nests varies considerably (for instance, 0.04–0.4 p./ha), being least dense when the nesting cover is discontinuous (Snow and Perrins 1998). In Romania, the Histria area, up to 2–3 p./ha (Weber 2000).	D2
	F	0.13	0.00	0.03	100		D1
	M	0.08	0.00	0.02	100		D1
Lanius colurio	A4	0.00	0.20	0.10	-	In forests from Romania: 0.3–1 p./ha, except 0.03 p./ha in a young forest of *Quercus* (Munteanu 2012). In Europe, typical breeding density in optimal habitats is 0.6 p./ha (Hagemeijer and Blair 1997).	D2
	A	0.00	0.15	0.09	-		D2
	F7	0.32	0.13	0.18	59.07		D3
	F	0.13	0.04	0.07	67.07		D3
	M	0.08	0.05	0.06	33.33		D2
*Locustella luscinioides**	F7	0.00	0.13	0.09	-	In Europe, the average of its density in representative areas is 0.21–0.88 p./ha; maximum 1.91 p./ha (Hagemeijer and Blair 1997). In Moldavia (Romania), up to 0.06 p./ha (Ion 2007).	D2
	F	0.00	0.04	0.03	-		D1
	M	0.00	0.03	0.02	-		D1
Motacilla alba	D2	-	0.62	0.62	-	In other part of Europe: 0.05 p./ha in open areas and up to 0.43 p./ha in small villages among farmland terrains (Hagemeijer and Blair 1997).	D5
	D	0.00	0.27	0.27	-		D5
	M	0.00	0.03	0.02	-		D1
*Nycticorax nycticorax**	A4	0.22	0.20	0.21	9.89	The species is, mainly, a colonial bird, and the density of the solitary pairs is unknown.	D3
	A	0.22	0.15	0.18	29.51		D3
	M	0.08	0.03	0.04	66.66		D2
Oriolus oriolus	A4	0.43	0.78	0.62	-80.21	In Romania, maximum 2 p./ha (Munteanu 2012); in other countries from Europe, up to 0.91 p./ha in riverine forests (Snow and Perrins 1998).	D4
	A	0.43	0.61	0.53	-40.96		D4
	M	0.16	0.11	0.12	33.33		D3

Legend: * – species depending on wetlands. Habitat: A2 – conifer forest, A4 – riparian forest, A – forest, C1 – open pasture, C – pasture, D2 – mosaic of annual crops, in small parcels (<1ha), D5 – orchard, D – agricultural land, E2 – rural habitat, E – human habitat, F5 – water reservoir, F7 – reed-bed, F – wetland, M – mosaic of habitats. Grey cells – values of reference. Dominancy: D1 – subrecedent species, D2 – recedent species, D3 – subdominant species, D4 – dominant species, D5 – eudominant species.

Table 6. (continued)

Species	Habitat	Density, 0–50 m (p./ha)	Density, 50–100 m (p./ha)	Density, 0–100 m (p./ha)	Undetected males (pairs), 50–100 m (%)	Remarks	Dominancy
Otus scops	A4	0.00	0.20	0.10	-	Up to 8.33 p./ha in areas of aggregation, usually much rarer (Snow and Perrins 1998).	D2
	A	0.00	0.15	0.09	-		D2
	M	0.00	0.03	0.02	-		D1
Parus caeruleus	A4	0.22	0.20	0.21	9.89	In Romania, in forests: 0.04–1.17 p./ha, in relation to their type and age (Munteanu 2012). In Europe, in forests of alder, ca. 0.3 p./ha or 1–1.2 p./ha, in riverine woods (Snow and Perrins 1998).	D3
	A	0.22	0.15	0.18	29.51		D3
	M	0.08	0.03	0.04	66.66		D2
Parus major	A2	0.00	1.35	1.31	-	In Romania, up to 1.16 p./ha (Munteanu 2012); in Europe, over 5 p./ha, in *Quercus* optimal habitat, and bellow 0.1 p./ha, in coniferous (Hagemeijer and Blair 1997).	D5
	A4	1.09	0.39	0.72	63.95		D5
	A	1.08	0.61	0.80	43.61		D5
	M	0.40	0.11	0.18	73.33		D4
Passer domesticus	E2	0.00	0.52	0.49	-	In optimum habitat, 1–4 p./ha (Hagemeijer and Blair 1997); in Romania, in parks and orchards, up to 1.63 p./ha (Munteanu 2012).	D5
	E	0.00	0.52	0.49	-		D5
	M	0.00	0.03	0.02	-		D1
Passer montanus	F7	0.00	0.13	0.09	-	In Romania, up to 5.5 p./ha, in orchards, and 1.6 p./ha, in forests (Munteanu 2012). Typically, 0.1–0.4 birds/ha (Hagemeijer and Blair 1997).	D2
	F	0.00	0.04	0.03	-		D1
	M	0.00	0.03	0.02	-		D1
Phylloscopus collybita	A4	0.43	0.39	0.41	9.89	Between 0.03 and 1.20 p./ha in diverse habitats from Romania (Munteanu 2012) and up to 1.5 p./ha in riverine forests from Germany (Hagemeijer and Blair 1997).	D4
	A	0.43	0.30	0.36	29.51		D4
	F7	0.32	0.00	0.09	100		D3
	F	0.13	0.00	0.03	100		D3
	M	0.24	0.05	0.10	77.77		D4
Pica pica	A2	0.00	2.02	1.96	-	F7 – breeds in reed-bed with isolated trees. In Romania, the densities varied between 0.03 p./ha and 0.08 p./ha (Munteanu 2012). In Europe, up to 0.33 p./ha in urban areas and up to 0.42 p./ha in the rural ones (Hagemeijer and Blair 1997).	D5
	A4	0.43	0.98	0.72	-125.26		D5
	A	0.43	1.21	0.89	-181.93		D5
	E2	0.00	0.52	0.49	-		D5
	E	0.00	0.52	0.49	-		D5
	F7	0.00	0.13	0.09	-		D2
	F	0.00	0.04	0.03	-		D1
	M	0.16	0.27	0.24	-66.66		D4

Legend: * – species depending on wetlands. Habitat: A2 – conifer forest, A4 – riparian forest, A – forest, C1 – open pasture, C – pasture, D2 – mosaic of annual crops, in small parcels (<1ha), D5 – orchard, D – agricultural land, E2 – rural habitat, E – human habitat, F5 – water reservoir, F7 – reed-bed, F – wetland, M – mosaic of habitats. Grey cells – values of reference. Dominancy: D1 – subrecedent species, D2 – recedent species, D3 – subdominant species, D4 – dominant species, D5 – eudominant species.

Table 6. (continued)

Species	Habitat	Density, 0–50 m (p./ha)	Density, 50–100 m (p./ha)	Density, 0–100 m (p./ha)	Undetected males (pairs), 50–100 m (%)	Remarks	Dominancy
*Podiceps cristatus**	F5	0.24	0.14	0.16	42.51	F5 – area of feeding; often, breeds at the margin of the reed-bed. On many large lakes in N, W and Central Europe, between 0.15 and 0.30 p./ha (Hagemeijer and Blair 1997).	D5
	F	0.13	0.09	0.10	34.15		D3
	M	0.08	0.05	0.06	33.33		D2
Sitta europaea	A4	0.22	0.00	0.10	100	In forests from Romania: 0.04–0.80 p./ha (Munteanu 2012). In rich deciduous forests from other parts of Europe – up to 1 p./ha (Hagemeijer and Blair 1997).	D2
	A	0.22	0.00	0.09	100		D2
	M	0.08	0.00	0.02	100		D1
Sturnus vulgaris	A4	0.43	0.20	0.31	54.94	In Romania: 0.06–3.5 p./ha (Munteanu 2012). In Poland: 1.70–8.09 p./ha (Snow and Perrins 1998).	D4
	A	0.43	0.15	0.27	64.75		D4
	M	0.16	0.03	0.06	83.33		D3
Sylvia atricapilla	A4	0.43	0.20	0.31	54.94	In Romania: 0.06–1.1 p./ha (Munteanu 2012) and, in Europe, up to 6 p./ha, in deciduous forests (Hagemeijer and Blair 1997).	D4
	A	0.43	0.15	0.27	64.75		D4
	M	0.16	0.03	0.06	83.33		D3
Sylvia borin	A4	0.22	0.20	0.21	9.89	In optimal habitat, in Europe, up to 5 p./ha. Generally, in Central Europe, between 0.01, in farmland, and 0.05 p./ha, in woodland (Hagemeijer and Blair 1997).	D3
	A	0.22	0.15	0.18	29.51		D3
	M	0.08	0.03	0.04	66.66		D2
Sylvia curruca	A4	0.22	0.20	0.21	9.89	In Romania: 0.03–1.2 p./ha (Munteanu 2012). In Europe, up to 0.49 p./ha, in gardens (Hagemeijer and Blair 1997).	D3
	A	0.22	0.15	0.18	29.51		D3
	M	0.08	0.03	0.04	66.66		D2
Turdus philomelos	A4	0.43	0.00	0.21	100	In Romania: 0.05–0.56 p./ha, in forests (Munteanu 2012). Other values from Eastern Europe, 0.05–0.3 p./ha (Hagemeijer and Blair 1997).	D3
	A	0.43	0.00	0.18	100		D3
	M	0.16	0.00	0.04	100		D1
Turdus pilaris	A4	0.22	0.00	0.10	100	A4 - alder forest. In Romania, 0.14 p./ha, in a town park (Munteanu 2012). Up to 0.7 p./ha in suburban zones (Hagemeijer and Blair 1997).	D2
	A	0.22	0.00	0.09	100		D2
	M	0.08	0.00	0.02	100		D1

Legend: * – species depending on wetlands. Habitat: A2 – conifer forest, A4 – riparian forest, A – forest, C1 – open pasture, C – pasture, D2 – mosaic of annual crops, in small parcels (<1ha), D5 – orchard, D – agricultural land, E2 – rural habitat, E – human habitat, F5 – water reservoir, F7 – reed-bed, F – wetland, M – mosaic of habitats. Grey cells – values of reference. Dominancy: D1 – subrecedent species, D2 – recedent species, D3 – subdominant species, D4 – dominant species, D5 – eudominant species.

was much smaller, i.e. between 1.6 and 3.8 individuals/ha in a non-native Black Pine plantation from the lower Siret meadow – Romania (Dragomir et al. 2017). Species dependent on wetlands totalised 2.66 p./ha, the ones of forest, 1.88 p./ha, the species of bushes, 0.08 p./ha, the ones of anthropogenic areas, 0.06 p./ha, and the ubiquist ones, 0.02 p./ha. While 20 minutes were used for every point of observations, according to some studies (Fuller and Langslow 1984, Dawson et al. 1997), the real densities of the birds can be even higher considering the registration rate curve and this depends on the detectability of each species that it is strong related to the vegetation cover. To approach as much possible to the real densities, the number of points should be bigger and, also, the time on point, but the increasing is however relatively low. In addition, by enlarging of the time, some species can move inside the area, into the area or leave the area and these can cause errors. The effective count of the nests is the best option, but it is hardly to put in practice.

If we consider the dominancy according to the estimated number of pairs per 100 ha (Tab. 6, Fig. 4), we find that the eudominant species (D5) are present in all habitats (subtypes of habitats), with the exception of C4 – the wet meadow, their number being quite low (maximum 4 in F5 – the water reservoir, respectively F7 – the reed-bed). The dominant species appeared in the riparian forest (A4), the forest (A), the water reservoir (F5), the wetland (F) and the mosaic of habitats (M), their maximum of 8 being recorded in M. The subdominant species appeared in A4, A, F5, F7, F and M, their maximum of 7 being recorded in A. The recedent species appeared in A4, A, F7, F and M, their maximum of 9 being recorded in M. The subrecedent species appeared only in F and M (the last with the most – 16).

Considering the estimated number of pairs per 100 ha of mosaic of shore habitats, depending on the relationship index, Passeriformes was the only overdominant order (77.45%), the other orders (Podicipediformes – 1.70%, Ciconiiformes – 2.12%, Anseriformes – 2.55%, Gruiformes – 8.51%, Charadriiformes – 0.42%, Cuculiformes – 0.42%, Strigiformes – 0.42%, Coraciiformes – 5.10% and Piciformes – 1.27%) being complementary.

2. Observations inside the square.

As mentioned at the beginning, because the observation points were not sufficient to determine the number of breeding pairs for all species dependent on wetland within the observation square, we also used the itinerary method. Thus, 28 species were identified, 14 of them (*Anas clypeata*, *A. crecca*, *A. querquedula*, *A. strepera*, *Ardea cinerea*, *Ardeola ralloides*, *Aythya ferina*, *Charadrius dubius*, *Chlidonias hybridus*, *Ciconia nigra*, *Egretta garzetta*, *Emberiza schoeniclus*, *Himantopus himantopus* and *Podiceps nigricollis*) apart from the 14 ones observed through the fixed point method of observations inside the circle with a radius of 100 m.

For 4 species (*Anas platyrhynchos*, *Fulica atra*, *Gallinula chloropus*, *Ixobrychus minutus*), the estimated number of pairs ranged between the limits observed through the itinerary method and for one species (*Locustella luscinioides*) the es-

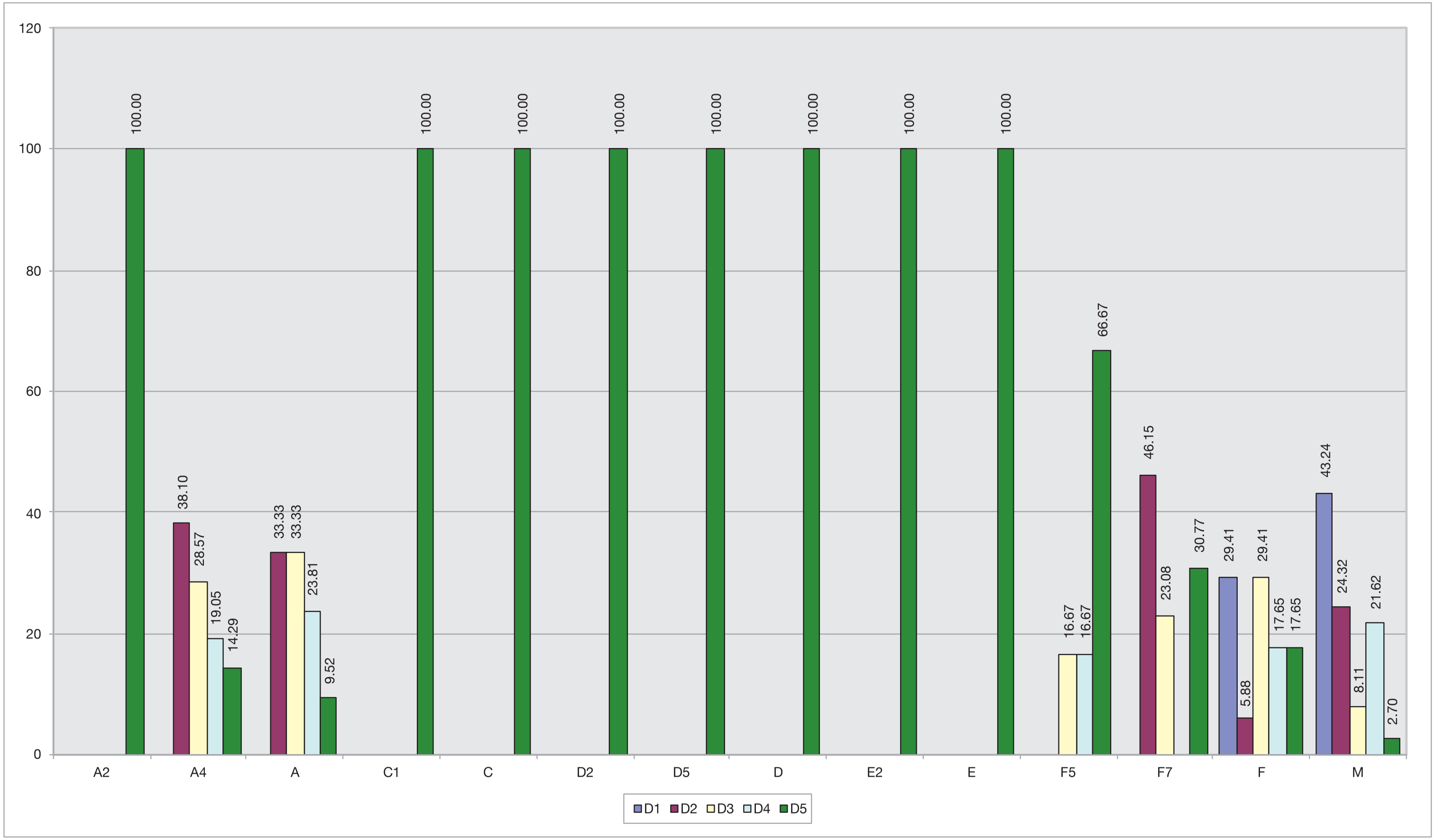

Figure 4. The distribution of species by categories of dominancy and habitats (subtypes of habitat), depending on their density per 100 ha (D1 – subrecedent species, D2 – recedent species, D3 – subdominant species, D4 – dominant species, D5 – eudominant species).

timated number was below the one derived from direct observations. Species recorded on a single field observation (*Anas clypeata*, *Ardeola ralloides*, *Chlidonias hybridus*, *Himantopus himantopus*, *Ixobrychus minutus*, *Podiceps nigricollis*) show uncertain breeding status. *Acrocephalus palustris* has been identified as having the largest number of breeding pairs (between 15 and 60 observed pairs in the four days of observations through the itinerary method and 70 estimated pairs through the fixed point method of observations), summing up as much as all other Silviidae species dependent on wetlands. *Anas platyrhynchos* (with 7–17 observed pairs and 11 estimated pairs) among the Anseriformes, and *Fulica atra* (with 4–12 observed pairs and 7 estimated pairs), among the Gruiformes (Tab. 7) worth to be remarked.

Other species observed beyond the circle of 100 m radius, in flight or through the itinerary method are: *Accipiter nisus*, *Alauda arvensis*, *Apus apus*, *Buteo buteo*, *Calidris ferruginea*, *Columba palumbus*, *Corvus corax*, *C. corone* (*cornix*), *Cygnus olor*, *Delichon urbica*, *Falco tinnunculus*, *Hirundo rustica*, *Lanius minor*, *Larus argentatus* (*michahellis*), *L. minutus*, *L. ridibundus*, *Luscinia megarhynchos*, *Merops apiaster*, *Miliaria calandra*, *Motacilla flava*, *Parus ater*, *P. palustris*, *Phalacrocorax pygmeus*, *Phasianus colchicus*, *Phoenicurus ochruros*, *Picus viridis*, *Riparia riparia*, *Saxicola rubetra*, *S. torquata*, *Streptopelia decaocto*, *S. turtur*, *Sylvia communis*, *Tringa nebularia*, and *Turdus merula*, so a total number of 85 species were observed in the considered area.

Conclusions

During May–July 2013, 85 species of birds were observed on Zigoneni Lake from ROSPA0062 - The dam basins of the Argeș River.

Among them, 37 breeding species were observed through the method of the fixed point of observations within a radius of 100 m.

Because most of the species and specimens have been identified in July, at the beginning of the passage, the observations made now should only be used to confirm the breeding and not to determine the density of breeding species.

In the points of observation with the most subtypes of habitats, the fewest species represented by the lowest number of specimens were recorded, and vice versa, which supports the assertion that habitat fragmentation leads to a decrease in biodiversity.

Because the vast majority of the birds need specialized habitats, only two species (5.40% of the total) were found in all points of observation: *Fulica atra*, a species characteristic of wetlands, and *Pica pica*, a species of dry land but with large ecological valences.

The main subtypes of habitats as the area (the riparian forest, 19.32% of all, the water reservoir, 37.91% of all, and the reed-bed, 21.67% of all) determined an increased similarity of the avicenoses of the points of observation in which they were present.

Table 7. The number of breeding pairs of the species dependent on the wetlands from the WE86 square estimated through the itinerary method and compared to that estimated through the point counts.

No.	Species	May 4		May 21		June 16		July 13		Itinerary method		Point counts
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
1	*Acrocephalus palustris* Bechstein, 1798	40	60	40	50	30	40	15	30	15	60	70
2	*Acrocephalus scirpaceus* Hermann, 1804	6	10	5	10	5	8	4	6	4	10	27
3	*Acrocephalus schoenobaenus* (Linnaeus, 1758)	6	10	5	10	4	8	2	4	2	10	20
4	*Acrocephalus arundinaceus* (Linnaeus, 1758)	6	10	5	10	4	6	4	6	4	10	20
5	*Actitis hypoleucos* (Linnaeus, 1758)*	1	1					3	3	1	3	1
6	*Alcedo atthis* (Linnaeus, 1758)*	2	3	2	3	1	2	2	3	1	3	4
7	*Anas clypeata* Linnaeus, 1758*			2	2					2	2	-
8	*Anas crecca* Linnaeus, 1758*					2	3	1	2	1	3	-
9	*Anas platyrhynchos* Linnaeus, 1758*	7	9	13	15	15	17	11	13	7	17	11
10	*Anas querquedula* Linnaeus, 1758*	5	5	1	2	4	5			1	5	-
11	*Anas strepera* Linnaeus, 1758*	1	1					1	1	1	1	-
12	*Ardea cinerea* Linnaeus, 1758*	1	1	1	1	1	1	3	3	1	3	-
13	*Ardeola ralloides* (Scopoli, 1769)*			1	1					1	1	-
14	*Aythya ferina* (Linnaeus, 1758)*	2	2			2	2			2	2	-
15	*Aythya fuligula* (Linnaeus, 1758)*	4	4			3	3	4	4	3	4	5
16	*Charadrius dubius* Scopoli, 1786*	3	4	2	3	1	2			1	4	-
17	*Chlidonias hybridus* (Pallas, 1811)*					1	2			1	2	-
18	*Ciconia nigra* (Linnaeus, 1758)*	0	1					0	1	0	1	-
19	*Egretta garzetta* (Linnaeus, 1766)*			1	1	1	1	2	2	1	2	-
20	*Emberiza schoeniclus* (Linnaeus, 1758)*	1	2			2	3			1	3	-
21	*Fulica atra* Linnaeus, 1758**	8	10	10	12	10	12	4	6	4	12	7
22	*Gallinula chloropus* (Linnaeus, 1758)*	4	6	2	3			1	3	1	6	2
23	*Himantopus himantopus* (Linnaeus, 1758)*			1	1					1	1	-
24	*Ixobrychus minutus* (Linnaeus, 1766)*							1	2	1	2	2
25	*Locustella* luscinioides (Savi, 1824)	4	6	4	6	4	5			4	6	2
26	*Nycticorax nycticorax* (Linnaeus, 1758)*	1	1	1	2			1	2	1	2	5
27	*Podiceps cristatus* (Linnaeus, 1758)*	4	5	9	10	9	10	2	3	2	10	13
28	*Podiceps nigricollis* Brehm, 1831*			1	4					1	4	-

Legend: * – species targeted through the itinerary method.

The largest biodiversity hosted the riparian forest, regardless of the considered categories of distance.

Acrocephalus palustris, *A. scirpaceus*, *A. arundinaceus*, *Alcedo atthis*, *Fulica atra*, *Oriolus oriolus* and *Parus major* were the most frequent species observed in the 100 m radius. Also, *Acrocephalus palustris* and *Fulica atra* were the most numerous ones.

The indices of diversity and evenness show that there were relatively large discrepancies between the strengths of the species, which also results from the analysis of dominancy.

The processed data demonstrates the overall decrease in the efficiency of the point counts method with the increase of the monitoring range, which is especially obvious for the species: *Acrocephalus palustris*, *A. scirpaceus*, *A. schoenobaenus*, *A. arundinaceus*, *Alcedo atthis*, *Anas platyrhynchos*, *Fulica atra*, *Nycticorax nycticorax*, *Parus caeruleus*, *P. major*, *Phylloscopus collybita*, *Podiceps cristatus*, *Sturnus vulgaris*, *Sylvia atricapilla*, *S. borin* and *S. curruca*.

Although the observations were made on the edge of an accumulation lake, the most species (18, 48.64% of the total) were typical of forest and only 14 (37.83%) were dependent on wetlands. The density of species dependent on wetlands (2.66 p./ha) was, however, higher than that of the typical forest species (1.88 p./ha).

Acrocephalus palustris (2.53 p./ha) and *A. scirpaceus* (1.26 p./ha) in the reed-bed, *Pica pica* (1.96 p./ha), *Garrulus glandarius* and *Parus major* (each with 1.31 p./ha) in the coniferous forest, had the highest densities, so that, in the mosaic of habitats, *Acrocephalus palustris* (0.88 p./ha), *A. scirpaceus* and *Fulica atra* (each with 0.32 p./ha) and *Acrocephalus schoenobaenus*, *A. arundinaceus*, *Phylloscopus collybita* and *Pica pica* (each with 0.24 p./ha) had the highest estimated densities.

The density estimated in the habitat subtypes was the highest in the reed-bed (7.19 p./ha), in the riparian forest (6.47 p./ha) and in the conifer forest (4.58 p./ha), so the mosaic of habitats from the area had 4.70 p./ha.

Passeriformes was the only overdominant order, the rest being complementary.

Even though 14 new breeding species dependent on wetlands were identified through the itinerary method, it was found that the number of specimens resulting from the method of fixed points of observations was generally higher than the number of specimens evaluated through the itinerary method. It is possible because, on the one hand, all the specimens in the supervised area were not observed through the itinerary method and, on the other hand, the results calculated in the mosaic of habitats from the waterfront can not always be extrapolated to the extended and uniform habitats.

By the itinerary method, among Passeriformes, *Acrocephalus palustris* was noted as having the highest number of breeding pairs, among Anseriformes, *Anas platyrhynchos*, and, among Gruiformes, *Fulica atra*.

For a greater accuracy of results the number of observation points should be supplemented in order to adequately cover all types and subtypes of habitats from the area.

Due to the severe silting process, that developed from 39% in 2008 to 44% in 2011 (Marcu 2014), which causes gradual change of habitats, the breeding situation is expected to evolve from one year to the next.

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