

ASPECTS OF THE DIVERSITY OF BIRD FAUNA FROM RACOVA VALLEY (VASLUI COUNTY, ROMANIA)

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Abstract. Our study is the first one focused on the diversity and present status of bird fauna from the territory of Racova Valley (Vaslui County). Our monitoring activity began during the spring of 2010 year around Pușcași reservoir, next years, being extended to other reservoirs forest ecosystems and open lands from this region. We identified 157 bird species, the highest diversity being recorded in the forest ecosystems. The breeding bird fauna include 106 species, 97 being regular breeding. The aquatic and semi-aquatic bird species present a low diversity, while the most important effectives for these groups were recorded during the migration time. We present estimated effectives for the migration period, breeding season and wintering time, but also the phenology status of the bird species that need special conservation measures, being included in the Annexe 1 of the Birds Directive.

Keywords: bird fauna, diversity, effectives, habitats, Racova Valley.

Rezumat. Aspecte ale diversității avifaunei de pe Valea Racovei (județul Vaslui, România). Studiul nostru este primul ce urmărește diversitatea și starea actuală a avifaunei de pe teritoriul Văii Racovei (județul Vaslui). Activitatea de monitorizare a fost inițiată în primăvara anului 2010 în perimetrul acumulării Pușcași, ulterior, fiind extinsă la celelalte acumulări acvatice, suprafețele forestiere și teritoriile deschise din regiune. Au fost identificate 157 de specii de păsări, cea mai mare diversitate fiind întâlnită în ecosistemul forestier. Avifauna clocitoare este reprezentată de 106 specii, dintre care 97 sunt cert clocitoare. Speciile acvatice și semi-acvatice prezintă o diversitate redusă, iar efectivele cele mai importante se înregistrează în timpul migrației. Prezentăm estimări ale efectivelor unor specii pe durata migrației, în sezonul de reproducere și în perioada de iernat, precum și statutul fenologic al speciilor de păsări care fac obiectul unor măsuri speciale de management și conservare, fiind incluse în Anexa 1 a Directivei Păsări.

Cuvinte cheie: avifaună, diversitate, efective, habitate, Valea Racovei.

INTRODUCTION

The importance of knowledge regarding the diversity of the bird fauna and its population size in one territory is given by the status of bio-indicators for this group of vertebrates, recognized through their presence in the annexes of different international conventions (Bonn, Berne, Washington) but also through the Birds Directive that represents one basis of long-term conservation of biodiversity on the territory of the European Union.

There is just one old and general study regarding the diversity of the bird fauna on the territory of Vaslui County (PAPADOPOL, 1975), some data on the breeding bird species from this area being presented in CIOCHIA (1992), respectively, MUNTEANU et al. (2002). Starting from middle '90s, there were done different studies on birds presence and seasonal dynamics from the Prut River basin, but just during the last ten years, the ornithologists began to pay their attention on the bird fauna from forests and other habitats perimeters from this part of Romania related to some projects of wind farms development (GACHE & MULLER, 2010a, 2010b, 2011; GACHE & CHACHULA, 2013).

The territory of Racova Valley is a mosaic of habitats, dominants being the open lands (cultivated lands – rape, sunflower, maize, wheat, rye, barley and alfalfa, dry and humid meadows) and the forest areas (in the vicinity of villages Pușcași, Poiana lui Alexa, Poienești-Deal, Pungești, Gârceni, Dragomirești and Poienești), but also some wetlands and three small reservoirs (Pușcași, Pungești and Trohan) with reed beds, some clumps of willows and humid meadows in their tail areas. During our study period, the reservoirs Pușcași and Trohan were drained temporarily (August 2010 - May 2011, respectively, 2013 - 2014) for hydrotechnical arrangements.

The climate is temperate-continental, with very cold winters, respectively, hot and dry summers.

PERIOD OF STUDY AND METHODS

Our first fieldworks in the area of Racova Valley began during the spring of 2010 year and were focused on the perimeter of Pușcași reservoir and its vicinities - the humid meadow and meadow forest along the Racova River and the reservoir southern side that is hilly, covered by dry meadows with bushes and shrubs, small orchards and vineyards. Beginning with the winter of 2012 year, we started to visit also the forest areas, looking for the raptor birds (Accipitriformes, Falconiformes and Strigiformes) and the presence of the Common Raven (*Corvus corax* Linnaeus 1758).

Starting from June 2013, we established a large principal transect and some secondary transects inside the forest areas (with lengths of about 1 – 1.5 kilometres) for our bird fauna monitoring, in order to obtain a general image of this group presence on the whole Racova Valley, including the other two small reservoirs in our study (Pungești and Trohan). The main transect followed the national road DN 2F, some county roads (DJ 207, DJ 245 and DJ 245A) and local forest roads passing through the villages Laza, Pușcași, Poiana lui Alexa, Fântâna Blănarului, Poienești-Deal, Dragomirești Monastery (Bleșca), Ivănești and Poienești (Fig. 1). We must mention that all transects were shorter during winter period because most of the local and county roads become near impassable due to the rainfalls and snowfalls in the area.

We identified the bird species and we estimated their effectiveness using the direct observation through the binoculars and telescope (BRUUN et al., 1990), through the visual recording and through the males' sounds, too. We followed to identify and estimate the wintering birds population, but also the diversity and the effectiveness present during the migration time and breeding period. The forest birds were counted along transects and from fixed observation points, too. For the aquatic birds recorded on the surface of the reservoirs, we counted each bird for the small groups and used the quantitative evaluation in band for the larger groups or flocks than 200 individuals.

During the period May - June, we made nocturnal monitoring too, visiting each site twice in May and June, in order to identify the presence and the effectiveness of the corncrake (*Crex crex* Linnaeus 1758), protected species in the whole distribution range. We made also a census of the breeding population of white stork (*Ciconia ciconia* Linnaeus, 1758) in the area (May - July).

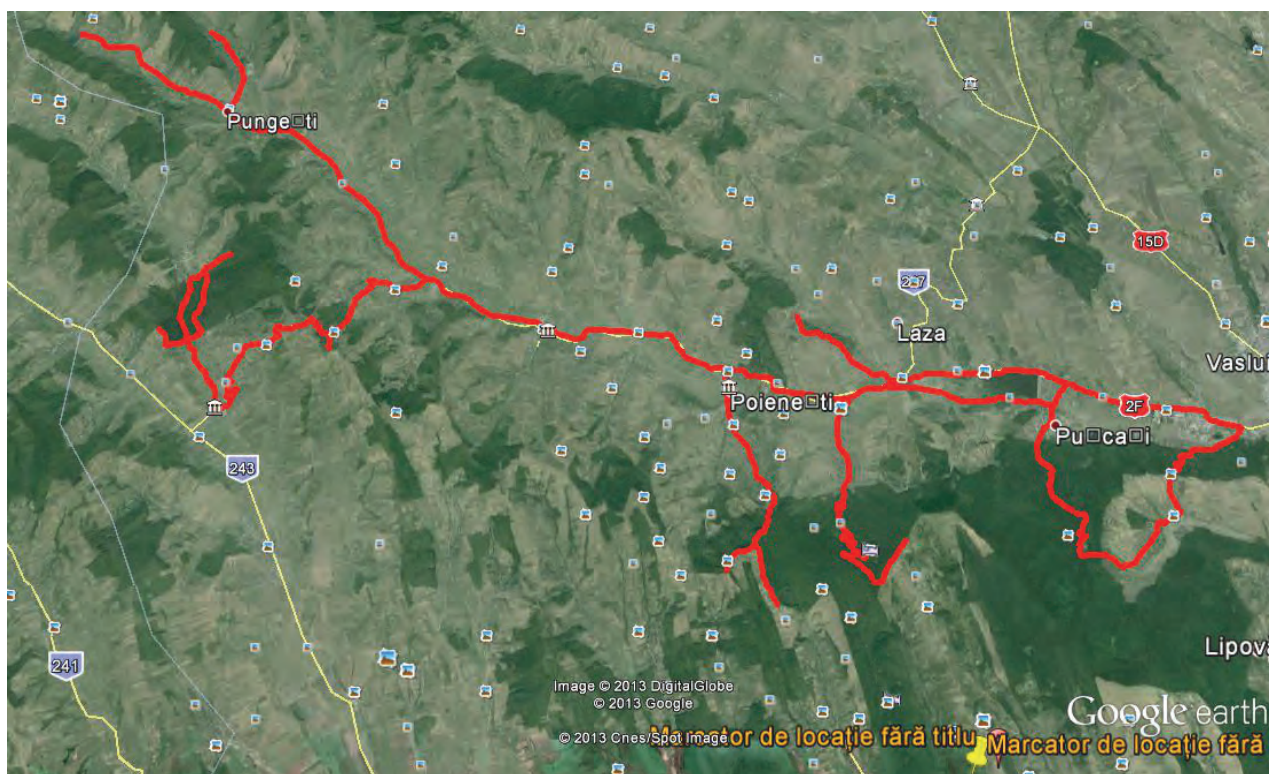


Fig. 1. Transects for bird fauna monitoring on Racova Valley (2013 - 2014), modified from maps.google.

During the migration time, in order to identify the bird species and to evaluate their effectiveness, we used the transect and fixed point counting methods, the second one being very useful for the monitoring of soaring birds (raptor birds - Accipitridae, Pandionidae and Falconidae, respectively, storks - Ciconiidae). These methods permit, also, to identify the existence of the flyways inside or nearest the site perimeter and to establish the limits of the hunting or feeding territories used by the birds in the visited area.

During the winter period, taking benefits from the better visibility due to the absence of the leaves, we tried to identify the number and the position of the large nests that could be occupied by the raptor birds or by the common raven (*Corvus corax*) in the forest areas along our observation transects and their vicinity. These birds present a calling activity starting from December till February – March, when they occupy the breeding territories and form their pairs.

RESULTS AND DISCUSSIONS

The diversity, the estimated effectiveness, the phenology and conservation status of the recorded bird fauna from Racova Valley are presented in Table 1, using Sibley & Ahlquist taxonomic system (1995) with subsequent additions and modifications (<http://avibase.bsc-eoc.org/>). For migration and wintering time, we give the minimum and maximum effective recorded for every species in one day of fieldwork, during the whole period of study. For the conservation status of birds we used like references the Annexes 1 and 2 of the Birds Directive (last revised form, 2009) and the Red Book of Vertebrates from Romania (BOTNARIUC & TATOLE, 2005).

Table 1. Bird fauna recorded from Racova Valley: presence, phenology and conservation status.

No.	Species	Presence on Racova Valley			Phenology In Romania	Birds Directive	Red Book of Vertebrates in Romania
		Breeding (pairs)	Migration (individuals)	Wintering (individuals)			
1.	<i>Coturnix coturnix</i>	18 – 27p	x	-	SV	A2	-
2.	<i>Perdix perdix</i>	16 – 24p	x	12 - 25	S	A2	-
3.	<i>Phasianus colchicus</i>	7 – 11p	x	x	S	A2	-
4.	<i>Cygnus olor</i>	+	1 - 25	5 – 11	PM	A2	-
5.	<i>Cygnus cygnus</i>	-	0 - 3	0 – 5	WV	A1	-
6.	<i>Anas platyrhynchos</i>	1 - 5p	41 - 830	56 – 148	PM, WV	A2	-
7.	<i>Anas strepera</i>	1 – 2p?	8 - 32	-	SV	A2	-
8.	<i>Anas acuta</i>	-	0 - 3	-	P, WV	A2	-
9.	<i>Anas penelope</i>	-	6 - 480	-	P, WV	A2	-
10.	<i>Anas crecca</i>	-	12 – 820	14 – 134	P, WV, SV	A2	-
11.	<i>Anas querquedula</i>	+	17 - 740	-	SV	A2	-
12.	<i>Anas clypeata</i>	-	6 - 32	-	P, SV	A2	-
13.	<i>Netta rufina</i>	-	0 - 2	-	SV, WR	A2	T
14.	<i>Tardona tadorna</i>	-	0 - 1	-	SV	-	V
15.	<i>Aythya fuligula</i>	-	2 – 20	8 - 23	P, WV, SV?	A2	-
16.	<i>Aythya marila</i>	-	0 - 4	-	P	A2	-
17.	<i>Aythya ferina</i>	+	6 - 55	-	PM	A2	-
18.	<i>Aythya nyroca</i>	-	2 - 18	-	SV, WR	A1	V
19.	<i>Bucephala clangula</i>	-	2 - 11	2 - 8	WV	A2	V
20.	<i>Mergus merganser</i>	-	0 - 1	0 – 1	WV	A2	-
21.	<i>Gavia arctica</i>	-	-	0 - 1	WV	A1	-
22.	<i>Phalacrocorax carbo</i>	-	1 - 24	-	SV	-	-
23.	<i>Ardeola ralloides</i>	1 – 2p?	1 – 3	-	SV	A1	V
24.	<i>Nycticorax nycticorax</i>	2 - 5p?	4 – 20	-	SV	A1	V
25.	<i>Egretta garzetta</i>	1 – 2p?	2 – 36	-	SV	A1	T
26.	<i>Ardea alba</i>	+	3 – 5	-	SV, WR	A1	T
27.	<i>Ardea cinerea</i>	+	6 - 44	-	SV,WR	-	-
28.	<i>Ciconia ciconia</i>	9p	18 - 156	-	SV	A1	V
29.	<i>Ciconia nigra</i>	-	0 - 3	-	SV	A1	V
30.	<i>Clanga pomarina</i>	1p?	x	-	SV	A1	V
31.	<i>Hieraaetus pennatus</i>	-	x	-	SV	A1	En
32.	<i>Buteo buteo</i>	3 – 5p	x	5 – 10	PM	-	-
33.	<i>Buteo lagopus</i>	-	x	1 – 4	WV	-	-
34.	<i>Pernis apivorus</i>	1p	x	-	SV	A1	V
35.	<i>Accipiter gentilis</i>	2 – 3p	x	1 – 5	S	-	-
36.	<i>Accipiter nisus</i>	-	x	2 – 5	S, WV	-	-
37.	<i>Circus aeruginosus</i>	-	x	-	SV	A1	-
38.	<i>Circus pygargus</i>	-	x	-	SV	A1	T
39.	<i>Circus cyaneus</i>	-	x	-	WV	A1	-
40.	<i>Falco peregrinus</i>	-	-	1 – 3	S, WV	A1	T
41.	<i>Falco columbarius</i>	-	-	5 – 7	WV	A1	-
42.	<i>Falco tinnunculus</i>	5 – 11p	x	-	PM	-	-
43.	<i>Falco subbuteo</i>	3 – 5p	x	-	SV	-	-
44.	<i>Crex crex</i>	28 – 40p	x	-	SV	A1	V
45.	<i>Gallinula chloropus</i>	4 – 6p	12 - 35	-	SV	A2	-
46.	<i>Fulica atra</i>	5 – 42p	12 - 277	12 - 38	PM	A2	-
47.	<i>Gallinago gallinago</i>	-	1 – 40	-	P	A2	-
48.	<i>Lymnocyptes minimus</i>	-	0 – 8	-	P	A2	-
49.	<i>Numenius arquata</i>	-	0 – 32	-	SV	A2	-
50.	<i>Limosa limosa</i>	-	3 - 48	-	P, SV	-	-
51.	<i>Actitis hypoleucos</i>	-	1 – 11	-	P	-	-
52.	<i>Tringa ochropus</i>	-	2 – 18	-	P	-	-
53.	<i>Tringa glareola</i>	-	4 – 32	-	P	A1	-
54.	<i>Tringa nebularia</i>	-	3 – 12	-	P	A2	-
55.	<i>Tringa totanus</i>	-	17 - 29	-	P	A2	-
56.	<i>Tringa erythropus</i>	-	18 – 46	-	P	A2	-
57.	<i>Philomachus pugnax</i>	-	12 – 88	-	P	A1	-
58.	<i>Himantopus himantopus</i>	1p?	0 – 5	-	SV	A1	T
59.	<i>Vanellus vanellus</i>	7 – 18p	12 – 78	-	SV	A2	-
60.	<i>Charadrius dubius</i>	1 – 2p	2 - 6	-	SV	-	-
61.	<i>Larus cachimans</i>	1 – 2p	12 - 124	4 – 12	S	A2	-
62.	<i>Larus minutus</i>	-	1 – 11	-	SV	A1	-
63.	<i>Chroicocephalus ridibundus</i>	1 – 5p	23 - 533	5 - 36	PM	A2	-
64.	<i>Sterna hirundo</i>	2 – 5p	7 – 21	-	SV	A1	-
65.	<i>Chlidonias hybrida</i>	17 – 67p	12 – 32	-	SV	A1	-
66.	<i>Chlidonias niger</i>	+	0 – 11	-	SV	A1	-
67.	<i>Podiceps cristatus</i>	4 – 25p	5 – 45	-	SV	-	-

68.	<i>Podiceps grisegena</i>	-	1 – 5	-	SV	-	-
69.	<i>Podiceps nigricollis</i>	1 - 3p	3 – 8	-	SV	-	-
70.	<i>Tachybaptus ruficollis</i>	1 – 2p	4 - 13	-	SV	-	-
71.	<i>Columba palumbus</i>	+C	x	-	SV, WR	A2	-
72.	<i>Streptopelia turtur</i>	+C	x	-	SV	A2	V
73.	<i>Streptopelia decaocto</i>	+C	x	x	S	A2	-
74.	<i>Cuculus canorus</i>	+C	x	-	SV	-	-
75.	<i>Caprimulgus europaeus</i>	+C	x	-	SV	A1	-
76.	<i>Athene noctua</i>	+C	x	x	S	-	-
77.	<i>Asio otus</i>	+C	x	x	S	-	-
78.	<i>Strix aluco</i>	+C	x	x	S	-	-
79.	<i>Upupa epops</i>	+C	x	-	SV	-	V
80.	<i>Merops apiaster</i>	+C	x	-	SV	-	-
81.	<i>Picus canus</i>	+C	x	x	S	A1	-
82.	<i>Picus viridis</i>	+C	x	x	S	-	-
83.	<i>Dendrocopos major</i>	+C	x	x	S	-	-
84.	<i>Dendrocopos syriacus</i>	+C	x	x	S	A1	-
85.	<i>Dendrocopos medius</i>	+C	x	x	S	A1	-
86.	<i>Jynx torquilla</i>	+C	x	-	SV	A1	T
87.	<i>Oriolus oriolus</i>	+C	x	-	SV	-	-
88.	<i>Lanius collurio</i>	+C	x	-	SV	A1	-
89.	<i>Lanius minor</i>	+C	x	-	SV	A1	-
90.	<i>Lanius excubitor</i>	-	x	x	SV	-	-
91.	<i>Pica pica</i>	+C	x	x	S	A2	-
92.	<i>Garrulus glandarius</i>	+C	x	x	S	A2	-
93.	<i>Corvus monedula</i>	+C	x	x	S	A2	-
94.	<i>Corvus frugilegus</i>	+C	x	x	S	A2	-
95.	<i>Corvus cornix</i>	+C	x	x	S	-	-
96.	<i>Corvus corax</i>	+C	x	x	S	-	T
97.	<i>Alauda arvensis</i>	+C	x	-	PM	A2	-
98.	<i>Galerida cristata</i>	+C	x	x	S	-	-
99.	<i>Hirundo rustica</i>	+C	x	-	SV	-	-
100.	<i>Delichon urbicum</i>	+C	x	-	SV	-	-
101.	<i>Riparia riparia</i>	+C	x	-	SV	-	-
102.	<i>Phylloscopus collybita</i>	+C	x	-	SV	-	-
103.	<i>Phylloscopus sibilatrix</i>	+C	x	-	SV	-	-
104.	<i>Locustella fluviatilis</i>	+C?	x	-	SV	-	-
105.	<i>Locustella luscinioides</i>	+C	x	-	SV	-	-
106.	<i>Acrocephalus arundinaceus</i>	+C	x	-	SV	-	-
107.	<i>Acrocephalus scirpaceus</i>	+C	x	-	SV	-	-
108.	<i>Acrocephalus schoenobaenus</i>	+C	x	-	SV	-	-
109.	<i>Hippolais icterina</i>	+C	x	-	SV	-	-
110.	<i>Sylvia communis</i>	+C	x	-	SV	-	-
111.	<i>Sylvia curruca</i>	+C	x	-	SV	-	-
112.	<i>Sylvia borin</i>	+C	x	-	SV	-	-
113.	<i>Sylvia atricapilla</i>	+C	x	-	SV	-	-
114.	<i>Panurus biarmicus</i>	+C	x	-	PM	-	-
115.	<i>Ficedula albicollis</i>	+C	x	-	SV	A1	-
116.	<i>Ficedula parva</i>	+C?	x	-	SV	A1	-
117.	<i>Muscicapa striata</i>	+C	x	-	SV	-	-
118.	<i>Oenanthe oenanthe</i>	+C	x	-	SV	-	-
119.	<i>Saxicola rubetra</i>	+C	x	-	SV	-	-
120.	<i>Saxicola torquata</i>	+C	x	-	SV	-	-
121.	<i>Phoenicurus phoenicurus</i>	+C	x	-	SV	-	-
122.	<i>Phoenicurus ochruros</i>	+C	x	-	SV	-	-
123.	<i>Erithacus rubecula</i>	+C	x	-	SV	-	-
124.	<i>Luscinia luscinia</i>	+C	x	-	SV	-	-
125.	<i>Luscinia megarhynchos</i>	+C	x	-	SV	-	-
126.	<i>Turdus merula</i>	+C	x	x	SV	A2	-
127.	<i>Turdus philomelos</i>	+C	x	-	SV	A2	-
128.	<i>Turdus iliacus</i>	-	x	-	P	A2	-
129.	<i>Turdus viscivorus</i>	-	x	-	P	A2	-
130.	<i>Turdus pilaris</i>	-	-	x	PM, WV	A2	-
131.	<i>Sturnus vulgaris</i>	+C	x	-	PM	A2	-
132.	<i>Sitta europaea</i>	+C	x	x	S	-	-
133.	<i>Certhia familiaris</i>	+C	x	x	S	-	-
134.	<i>Troglodytes troglodytes</i>	+C	x	x	S	-	-
135.	<i>Poecile palustris</i>	-	x	-	P	-	-
136.	<i>Poecile lugubris</i>	+C	x	x	S	-	-
137.	<i>Parus major</i>	+C	x	x	S	-	-
138.	<i>Cyanistes coeruleus</i>	+C	x	x	S	-	-
139.	<i>Passer domesticus</i>	+C	x	x	S	-	-

140.	<i>Passer montanus</i>	+/C	x	x	S	-	-
141.	<i>Anthus campestris</i>	+/C	x	-	SV	A1	-
142.	<i>Anthus trivialis</i>	+/C	x	-	SV	-	-
143.	<i>Anthus pratensis</i>	+/C	x	-	SV	-	-
144.	<i>Motacilla alba</i>	+/C	x	-	PM	-	-
145.	<i>Motacilla flava</i>	+/C	x	-	SV	-	-
146.	<i>Fringilla coelebs</i>	+/C	x	x	PM	-	-
147.	<i>Fringilla montifringilla</i>	-	-	x	WV	-	-
148.	<i>Pyrrhula pyrrhula</i>	-	-	x	S	-	-
149.	<i>Coccothraustes coccothraustes</i>	+/C	x	x	S	-	-
150.	<i>Carduelis spinus</i>	-	x	x	PM	-	-
151.	<i>Carduelis chloris</i>	+/C	x	-	SV	-	-
152.	<i>Carduelis carduelis</i>	+/C	x	x	S	-	-
153.	<i>Carduelis cannabina</i>	+/C	x	-	PM	-	-
154.	<i>Emberiza calandra</i>	+/C	x	-	PM	-	-
155.	<i>Emberiza hortulana</i>	+/C	x	-	SV	A1	-
156.	<i>Emberiza citrinella</i>	+/C	x	x	S	-	-
157.	<i>Emberiza schoeniclus</i>	+/C	x	-	PM	-	-

Legend:

Presence on Racova Valley: Breeding: + - summer present but not breeding species; +/C – breeding species, not recorded effectives; +/C? – probably breeding species, not recorded effectives; 1 – 2p? – probably breeding species; Migration & Wintering: x – present species, not recorded effectives.

Phenology: S – sedentary species; SV – summer visitor species; PM – partial migratory species; WV – wintering visitor species; WR – wintering rare species; P – passage species.

Birds Directive: A1 – species from Annexe 1; A2 – species from Annexe 2.

Red Book of Vertebrates in Romania: V – vulnerable species; T – threatened species; En – endangered species.

The elements that define the vegetation of one territory are essentially for bird populations. As we mentioned above, on the Racova Valley territory, the habitats of forest and open lands are dominant, so, the passerines and other bird species that are breeding and feeding inside these habitats are dominant, being represented by 105 species in the bird fauna list of the area. Despite the small sizes of reservoirs and wetlands on this territory (including the largest one, Pușcași reservoir, if we compare it with other reservoirs from Vaslui County), the bird fauna list includes 55 aquatic or semi-aquatic bird species and some passerines species that use these habitats to feed or breed.

Looking for the birds phenology on Racova Valley, we notice some deviations from their status in Romania, explained especially through the absence or small surfaces of suitable habitats for the breeding season. For example, the recorded aquatic birds in the area need large reed beds in order to build their nests, so, their summer presence is done by immature individuals that are not breeding, using these territories in order to avoid the feeding competition with the adult birds (*Cygnus olor* Linnaeus 1758, *Anas querquedula* Linnaeus 1758, *Larus cachinnans* Pallas 1811, *Chroicocephalus ridibundus* Linnaeus 1766, etc.).

The highest bird fauna diversity was recorded during spring, in March – April, when we met 133 bird species, while during winter time, the bird fauna list includes just 52 bird species, most of them being passerines and woodpecker sedentary species.

The raptor birds group presents a high diversity during winter time, but their effectives were unexpectedly low for one territory with large forest areas. *Buteo buteo* Linnaeus 1758 was the dominant species through the effectives and number of presence in recording points, being followed by *Buteo lagopus* Pontoppidan 1763, *Accipiter nisus* Linnaeus 1758, *Falco peregrinus* Tunstall 1771 and *Falco columbarius* Linnaeus 1758. After the middle February, we recorded an obvious diminution of these species effectives in the investigated area, while in March, we recorded just *Buteo buteo* and *B. lagopus* from the raptor birds winter visitors, respectively, the passage species (*Clanga pomarina* Brehm 1831, *Hieraaetus pennatus* Gmelin 1778, *Circus cyaneus* Linnaeus 1766 or *C. pygargus* Linnaeus 1758) and the arrival of the summer visitor species (*Buteo buteo*, *Pernis apivorus* Linnaeus 1758, *Falco tinnunculus* Linnaeus 1758 and *F. subbuteo* Linnaeus 1758).

In the last decade of February, the nocturnal raptor birds (*Asio otus* Linnaeus 1758 and *Strix aluco* Linnaeus 1758), but also the Common Raven (*Corvus corax*) were identified by their calling activity, but also were observed with mating display behaviour or in matting flying sequences.

On Pușcași reservoir, we recorded 11 aquatic bird species in the wintering period, but we must emphasize the idea that, usually, all the aquatic surfaces are frozen starting from middle December till middle February, sometimes, March beginning, so, these bird species (*Cygnus olor*, *C. cygnus* Linnaeus 1758, *Anas platyrhynchos* Linnaeus 1758, *A. crecca* Linnaeus 1758, *Aythya fuligula* Linnaeus 1758, *Bucephala clangula* Linnaeus 1758, *Mergus merganser* Linnaeus 1758, *Gavia arctica* Linnaeus 1758) are present just during the mild winters, with small effectives.

We cannot exclude completely the possibility of existence of some flyways for soaring birds in this region but we did not meet very large flocks of diurnal raptor birds or storks during the spring or autumn migration period. The largest flocks were recorded for the white stork (*Ciconia ciconia*), formed by 18 – 156 individuals, during the last decade of March or first days of April.

During the summer time, 112 bird species are present on the territory of Racova Valley, but we assess that 97 are regular breeding species and another 9 bird species are probable or irregular breeding species (we recorded adult birds presence, with parental behaviour but also juvenile birds presence in the last part of the breeding season in the area).

If we look for the ecological groups related to the suitable habitats for nest building, the breeding bird fauna on Racova Valley comprises especially forests and open lands typically birds, the passerines being dominant with 63 breeding species (64.28% from the total of the breeding bird fauna). From these, 57 passerine species use to build their nests inside forests, in shrubs and bushes or on the soil, between herbs in open lands, the other 6 passerine species being related to reed beds (*Locustella* sp., *Acrocephalus* sp. and *Emberiza schoeniclus* Linnaeus 1758).

The dry meadows with scattered bushes and shrubs, but also the cultivated lands from Racova Valley territory represent suitable breeding and feeding habitats for some passerines species that use to build their nests between herbs (*Alauda arvensis* Linnaeus 1758, *Galerida cristata* Linnaeus 1758, *Oenanthe oenanthe* Linnaeus 1758, *Anthus campestris* Linnaeus 1758, *Motacilla flava* Linnaeus 1758 or *M. alba* Linnaeus 1758) or inside bushes and shrubs (*Lanius collurio* Linnaeus 1758, *L. minor* Gmelin 1788, *Saxicola rubetra* Linnaeus 1758, *S. torquata* Linnaeus 1758, *Emberiza calandra* Linnaeus 1758 and *E. hortulana* Linnaeus 1758). In these habitats, we observed also the three species of galliforms (*Perdix perdix* Linnaeus 1758, *Coturnix coturnix* Linnaeus 1758 and *Phasianus colchicus* Linnaeus 1758), all of them being game birds with discreet life and cryptic plumage that make difficult their census. We used the calling activity of males in order to estimate their effectives in the investigated area.

The presence of the Corncrake (*Crex crex*) is one of the most important bio-indicators used to assess the quality of environment in one rural area with large surfaces covered by humid meadows or mosaic of meadows with cultivated lands (wheat, rye, barley and alfalfa). The breeding population of corncrake on Racova Valley was estimated at about 28 – 40 pairs, neither met nor only on the suitable habitats, but also in the forests edge areas from the vicinity of cultivated lands.

The suitable habitats for the riparian bird species occupy small areas – some river banks, clay extraction quarries and some open clay grounds resulted through landslide phenomenon. The most important was met on the south-western side of Pușcași Lake, where we recorded one mixed breeding colony formed by 11 pairs of *Merops apiaster* Linnaeus 1758, 32 pairs of *Riparia riparia* Linnaeus 1758, 8 pairs of *Passer montanus* Linnaeus 1758 and 12 pairs of *P. domesticus* Linnaeus 1758.

Inside the villages, along the principal transect, we identified 9 nests occupied by the white stork (*Ciconia ciconia*). In one nest from Laza village, near Pușcași Reservoir, the pair had four hatchlings every year, starting from 2010 year, excepting the breeding season of 2013 year when there were just three hatchlings.

As we expected, we met the highest diversity during the birds breeding season inside the forest ecosystems, especially in the sector from the south-eastern part of Racova Valley (Pușcași – Poieniști-Deal), but also in the forests from Gârceni and Pungești. From the typical forest bird species group, the passerines are dominant through their diversity and effectives, but significant effectives were recorded for the woodpeckers (*Picus viridis* Linnaeus 1758, *Picus canus* Gmelin 1788, *Dedrocopos major* Linnaeus 1758, *D. medius* Linnaeus 1758 and *Jynx torquilla* Linnaeus 1758), respectively, for the pigeons and doves (*Columba palumbus* Linnaeus 1758 and *Streptopelia turtur* Linnaeus 1758).

We recorded four diurnal raptor breeding bird species – two falcons (*Falco tinnunculus* and *F. subbuteo*), respectively, common buzzard (*Buteo buteo*) and European honey buzzard (*Pernis apivorus*), but we cannot exclude the breeding presence of *Clanga pomarina* in the wooden area Pușcași – Poieniști-Deal, because we met constantly adult and juvenile birds feeding in the vicinity of Pușcași Lake starting with 2010 spring. From the nocturnal raptor birds group, we observed and recorded calling activity of *Strix aluco* in suitable breeding habitat (forest edge with old trees), while *Asio otus* was recorded with calling activity in forest edges but also in clumps of trees.

On the territory of Racova Valley Pușcași and Pungești reservoirs represent stopover points, breeding and feeding areas for 55 aquatic and semi-aquatic bird species. More than these, there are present also seven passerine species related to the reed beds for the nesting period (warblers – *Acrocephalus* sp. and *Locustella* sp., bearded reedling – *Panurus biarmicus* Linnaeus 1758 and common reed bunting – *Emberiza schoeniclus*). Another four passerine species were observed feeding around the perimeters of the reservoirs: *Hirundo rustica* Linnaeus 1758, *Delichon urbicum* Linnaeus 1758, *Riparia riparia*, *Motacilla alba* and *Motacilla flava*.

As we can see in Table 1, the aquatic and semi-aquatic breeding bird species present a low diversity on Racova Valley territory, being represented by small breeding effectives. We recorded just some pairs of *Anas platyrhynchos* and two rails species that present varying breeding effectives from one year to other: *Gallinula chloropus* Linnaeus 1758 and *Fulica atra* Linnaeus 1758. We cannot exclude the breeding presence of *Anas strepera*, species with negative trend in Romania. The most important groups through its diversity and effectives are represented by grebes (*Podiceps cristatus* Linnaeus 1758, *P. nigricollis* Brehm 1831 and *Tachybaptus ruficollis* Pallas 1764), terns (*Sterna hirundo* Linnaeus 1758 and *Chlidonias hybrida* Pallas 1811) and gulls (*Larus cachinnans* and *Chroicocephalus ridibundus*) that form a mixed breeding colony on Pușcași Reservoir. The species *Podiceps cristatus* and *Chlidonias hybrida* are dominant, their effectives recording an obviously positive trend, especially if we compare the populations recorded during the summers of 2013 – 2014 with that from 2010 – 2011 summers.

From the group of herons, we did not exclude the breeding presence of *Ardeola ralloides* Scopoli 1769, *Nycticorax nycticorax* Linnaeus 1758 and *Egretta garzetta* Linnaeus 1766 on the tail area from Pușcași Reservoir. Between the wader species, we recorded two certainly breeding species (*Vanellus vanellus* Linnaeus 1758 and *Charadrius dubius* Scopoli 1786), respectively, one probable breeding species (*Himantopus himantopus* Linnaeus 1758).

In the meadow forest along the Racova River, nearest the tail of Pușcași Reservoir, we recorded like breeding species two woodpecker species (*Picus viridis* and *Dendrocopos major*) and different passerines like *Oriolus oriolus* Linnaeus 1758, *Sylvia* sp., *Hippolais icterina* Vieillot 1817, *Luscinia* sp., *Poecile palustris* Linnaeus 1758, *Parus major* Linnaeus 1758, *Cyanistes caeruleus* Linnaeus 1758, *Sturnus vulgaris* Linnaeus 1758, etc.

The autumn migration begins during the first part of August in the area, when some breeding bird species in the forests and woodland areas leave this region (*Cuculus canorus* Linnaeus 1758, *Streptopelia turtur* etc.). In fact, starting even from July, numerous typical forest bird species form small or larger flocks, assembling juvenile and adult birds, and begin to rove searching more abundant food resources, swinging between the forest skirts and nearest agricultural lands, sometime touching the limit of the villages (warblers – *Sylvia* sp., flycatchers – *Ficedula* sp., redstarts – *Phoenicurus* sp., and finches – *Fringilla* sp. and *Carduelis* sp.). In the ending August, some bird species can bring together tens and hundreds individuals, forming the flocks before the migration start (for example, *Sturnus vulgaris*). Most of the bird species typical for the forests and woodlands still search their food inside the forests perimeter.

During this period the birds present a very intensive mobility, including the sedentary species, searching food in order to accumulate a thick grease stratum necessary to survive in the wintering time, respectively, for the flying efforts during the migration period. Practically, the birds present daily movements on large distances, flying from the overnight, resting and refuge sites (woodland surfaces, bushes, shrubs, etc.) to the open lands, where can find various and rich food resources. The typical forest birds were met wandering in small groups between the forest skirts and the nearest open lands (dry meadows, agricultural lands), using the food resources generated through the crop harvesting and appeared in the herbal vegetation ending periods (fruits, seeds).

While inside the forests and in the open lands perimeter the diversity of birds becomes lower every month beginning with late August; the aquatic and semi-aquatic bird groups present the highest annual diversity during the autumn migration period, due the arrival of the passage species that breed in northern territories. Very different from the spring migration time, when the birds quickly leave this area in order to arrive in their northern breeding territories, during this passage period, the birds stay for longer time, sometimes even for ten – twelve days, feeding in the rich wetlands around Pușcași and Pungești Reservoirs, accumulating lipid reserves necessary for the long flying to the southern wintering areas.

Starting from August, the aquatic and semi-aquatic bird species appear in larger or smaller flocks, especially, on Pușcași Reservoirs, forming mixed feeding flocks on the sector from the reservoir tail area. The waders and herons appear in flocks of tens individuals, while the gulls are present in flocks of tens to hundreds individuals. The ducks arrival begins in late August, but from September, the ducks become dominant inside the aquatic bird species through their diversity and effectiveness till the end of November.

Due to the importance of some bird species for the biodiversity monitoring schemes and ecological management plans development/implementation, we present the conservation status of the recorded bird species in Table 1, very important being the species that are included in the Annexes of the Birds Directive. So, the bird species included in Annexe 1 like species that need special conservation measures concerning their habitats in order to ensure their survival and the reproduction in their distribution range, while those included in Annexe 2 can be object of hunting without threatening the aim to maintain long-term stable populations on the territory of the European Union.

During our study period, we recorded 36 bird species from Annexe 1 of the Birds Directive, 15 of these being included also in the Red Book of Vertebrates from Romania (BOTNARIUC & TATOLE, 2005), other 42 species being present in Annexe 2 of the Birds Directive, three of them being included in the Red Book of Vertebrates from Romania, too.

We must mention the presence of 16 regular breeding and another five probable or irregular breeding bird species in Annexe 1 of the Birds Directive. Between these, we notice the presence like breeding bird species for two big size raptor bird species (*Clanga pomarina* and *Pernis apivorus*), but also of the corncrake (*Crex crex*), protected species in the whole distribution range.

We cannot forgot to mention the presence of some breeding species that present negative trend on the territory of the European Union like *Emberiza hortulana*, *Ficedula albicollis* Temminck 1815, *F. parva* Bechstein 1792, *Upupa epops* Linnaeus 1758 or *Jynx torquilla*, but also of shrikes (*Lanius minor* and *L. collurio*), which present concentrated breeding populations in our country.

On the bird fauna list of Racova Valley, we recorded 21 species that are included in the Red Book of Vertebrates from Romania, most of them being vulnerable species. The passage species group is well represented (*Tadorna tadorna* Linnaeus 1758, *Aythya nyroca* Gldenstdt 1770, *Bucephala clangula*, *Nycticorax nycticorax* și *Ciconia nigra* Linnaeus 1758); five species (*Ciconia ciconia*, *Pernis apivorus*, *Crex crex*, *Streptopelia turtur* and *Upupa epops* Linnaeus 1758) are regular breeding species and another two (*Ardeola ralloides* and *Clanga pomarina*) are probably breeding species in the investigated territory.

We notice the passage presence of *Hieraaetus pennatus*, endangered species in Romania and of 8 threatened bird species – from these, *Jynx torquilla* and *Corvus corax* breed in the woodlands from the Racova Valley territory, *Egretta garzetta* and *Himantopus himantopus* could breed on the tail of Pușcași Reservoir, while *Netta rufina* Pallas 1773, *Ardea alba* Linnaeus 1758 and *Circus pygargus* are passage bird species, *Falco peregrinus* being winter visitor in this area.

CONCLUSIONS

The bird fauna list of Racova valley territory comprises 157 bird species, the highest diversity being recorded during the spring migration period (133 bird species in prevernal aspect, March - April).

The breeding bird fauna includes 97 regular breeding bird species and 9 probable or irregular breeding bird species; the biggest diversity was recorded in the woodlands and vicinity of forest edges.

The reservoirs from the investigated territory – Pușcași and Pungești – represent stopover points and feeding territories during the migration time, while the suitable habitats for the breeding season cover small surfaces. Normally, the lakes are frozen during winter period, so, the aquatic birds winter here just during the mild winters.

The greatest effectives of aquatic and semi-aquatic bird species were recorded during the migration time (March, respectively, October - November).

From the observed bird fauna, 36 species appear in Annexe 1 of Birds Directive, 16 of them being breeding species in the area and other 5 species could breed in this territory.

42 bird species appear in Annexe 2 of Birds Directive.

21 species from the recorded bird species are included in the Red Book of Vertebrates from Romania, like vulnerable species (12), threatened species (8) or endangered species (one).

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