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Breeding birds of the Lake Iłgi Reserve (NE Poland) and changes in their composition in 1970-1988

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Abstract. Studies of the breeding avifauna of the Faunistic Lake Iłgi Reserve were carried out for 6 years altogether, in 19760-1972 and 1986-1988. A total of 113 species were found during that period, 89 of them nesting within the bounds of the reserve. The lake and peatswamps were inhabited by 30 species, e.g. from among Anseriformes: *Bucephala clangula, Mergus merganser* and *Anser anser,* from among the *Rallidae*: *Porzana porzana* and *P. parva. Milvus migrans, Tringa ochropus, Ficedula parva, Columba oenas,* etc. nested in the surrounding wet alderwoods and oak-pine woods.

Key words: breeding birds, lake, forests, changes, NE Poland.

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I. INTRODUCTION

Woodland Lake Iłgi in the Iława Lake District is a breeding area of many species of aquatic birds. It is one of the oldest nature reserves in that region, set up in 1936. In 1957 the forest around the lake was also included in the faunistic reserve. A general description of Lake Iłgi Reserve was given by PANFIL (1967, 1968), who chiefly used the results of a floristic study carried out by MŁYNEK et al. (1957). The main subjects of conservation in Lake Iłgi Reserve are birds, so far however they not only have not been given a thorough study but even no faunistic reports have been made from that area.

The present paper gives the results of studies conducted by two authors. Roch MACKOWICZ made his study in 1970-1972 and Piotr KRAJEWSKI resumed it after 13-year-long interruption, in 1986-1988. In order to minimize individual differences between the estimates made in those two study periods, the first of the authors, R. MACKOWICZ, participated also in some counts in 1986-1988. The objective of this study was to produce the first ornithological faunistic documentation after a half-century of conser-

vation of this area and the presentation of changes in the composition of the breeding avifauna during a period of 19 years (1970-1988). Both authors were occupied preparing the materials from their field notes. The first of them worked out the paper for printing.

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II. STUDY AREA

Lake Iłgi (19°44'2''N, 53°41'8''E) is situated between Lake Gil Wielki and Lake Drwęckie in the Iława Lake District (included by some authors in the Masurian Lake District). It lies in a small flat valley shaped by the secondary action of a ground moraine. The canalized River Iłga flows in the bottom of the valley and 300 m away from Lake Gil Wielki it widens to form a small lake called Iłgi. A forest covering the slopes of the valley isolates it from human settlements and economic activity (Fig. 1). As early as 1936 Lake Iłgi figured on the list of protected units as an ornithological reserve (TISCHLER 1941) and on the strength of a decision of the Minister of Forestry and Timber Industry of 23 Jan. 1957 a nature reserve was set up here, including – in addition to the lake itself – also the surrounding woodlands. The area under conservancy is 90.46 ha, altogether.

In 1845-1860 the water level in the lake was lowered in connection with the construction of the Elbląg-Ostróda canal (MŁYNEK et al. 1957), which consequently speeded up the process of overgrowing of this eutrophic water body; it is 32.5 ha in area now. Its mean depth is 0.71 m, with a maximum of 2.0 m, the places deeper than 1.0 m forming only 30.0% (8.6 ha) of the area of the lake (KOSSAKOWSKI & STANKIEWICZ 1965).

The vascular vegetation of the lake was studied by MŁYNEK et al. (1957) and the descriptions of the forests are included in the project for reserve management prepared by Forest Management Office in Olsztyn, 1988. The fact that there was no intervention by man in the process of overgrowing of the lake allowed the formation of narrow belts of aggregated plants. A belt of reedswamp, a belt of submerged plants can be easily distinguished amidst the aquatic vegetation.

The belt of reedswamp (6.30 ha, acc. to the authors' own estimation), 6-20 m wide, is composed mainly of *Phragmites communis* and runs along the northern shore. On the southern shore it occurs in isolated narrow beds, 2-10 m in width. Its unispecific aggregations include – especially in the western part of the lake – groupings of *Glyceria aquatica, Typha latifolia* and, in shallower places, *Acorus calamus.* This last species forms, together with *Stratiotes aloides*, several small floating islands in the western part of the lake.

Further towards the free sheet of water there are belts of plants with floating leaves and among them, chiefly in the western part of the lake, carpets of *Stratiotes aloides. Potamogeton natans* is less abundant, while *Nuphar luteum* forms two groupings off the south-eastern and north-western shores.

Great quantities of submerged plants cover the lake bottom. They grow not only in its deep parts but also in the belt of reedswamp. *Potamogeton lucens* and *Ceratophyllum*

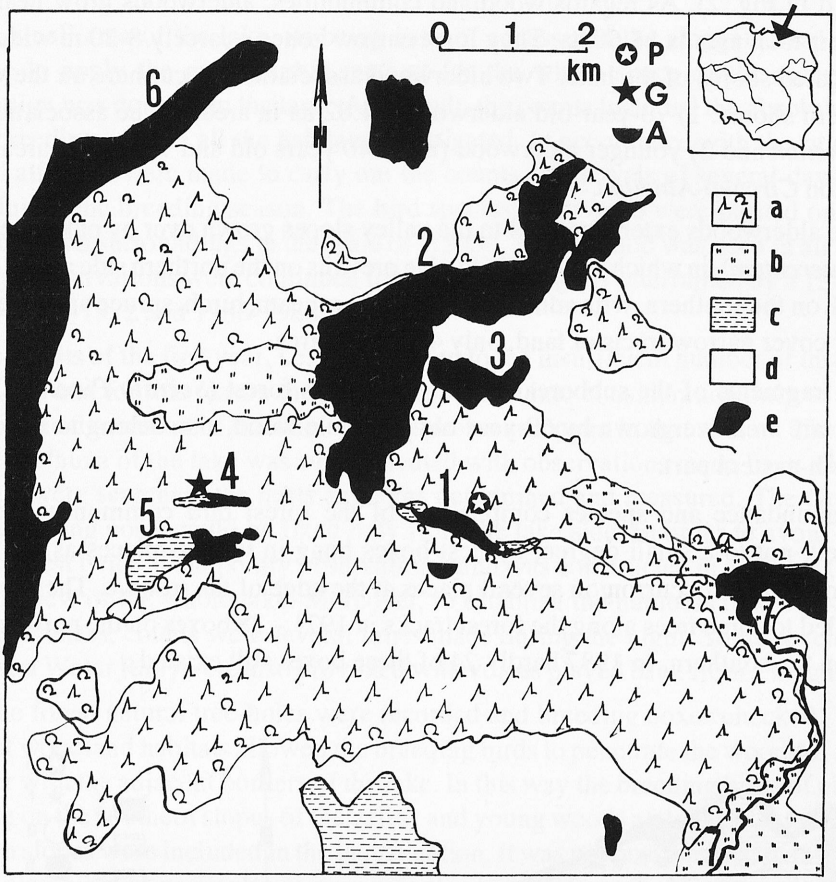

Fig. 1. Topographical sketch showing the surroundings of Lake Ługi Reserve: a – forests, b – meadows, c – marshes, d – cultivated fields, e – lake and river, P – nest of *Pandion haliaetus* (in 1971-1972), G – breeding site of *Grus grus*, A – breeding site of *Aquila pomarina* (in 1971-1972), 1 – Lake Ługi, 2 – Lake Gil Wielki, 3 – Lake Gil Mały, 4 – Glutynek marshes, 5 – fish pond (breeding ground of *Anser anser*), 6 – Lake Jeziorak, 7 – Lake Drwęckie and the River Drwęca.

demersum are most abundant. In July *Ranunculus aquatilis* burst into bloom above the water surface in a considerable part of the lake. *Charales* appear in small numbers (MŁYNEK et al. 1957).

At the mouth of the canalized River Iłga into the lake in the west and at its outflow in the east there occur fen communities: reed fens, osier fens, grass-sedge meadows, sedge meadows of the *Parvocaricetum* type and alderwoods. The sedge meadows to the west and to the east of the lake are important biotopes (e.g. for the occurrence of *Porzana porzana*). Their peaty surface forms a quagmire, always floating irrespective of ground water level.

Lake Ługi lies amidst woodlands (Fig. 1); only a narrow strip of forest, directly surrounding the lake, has been included in the nature reserve; further parts of the woodland are under the regular forest management scheme. The study was carried out in an area in

many places widened by approximately 20-metre belts of forest neighbouring upon the reserve (d in Fig. 2). As regards woodland communities, alderwoods grow nearest the lake. Their total area is 11.60 ha. They form narrow zones, scarcely 8-20 m wide, along the elongated shores of the lake. Two alderwood associations occur here on the western and eastern shores: 1) 70-year-old alderwoods (4.02 ha in area) of the association *Ribo nigri-Alnetum* and 2) younger alderwood (up to 40 years old and 7.58 ha in area) of the association *Circaeo-Alnetum.*

These alderwoods extend parallel to the valley slopes grown over by oak-pine forests (*Pino-Quercetum*), in which 165-year-old pine prevails on the northern side and 110-year-old beech on the southern, with admixture of oak, hornbeam, birch, spruce and alder. They however cover narrow tracts of land, only 4.95 ha in area.

Two fragments of the subboreal mixed coniferous forest (*Serrato-Pinetum*), whose 1.64-hectare area overgrown by 60-year-old pine pole wood, also belong to the reserve, in its north-eastern part.

The abundance and species composition of the forest bird community were also influenced, not to a small degree, by nest-boxes hung in various places as well as the clusters of spruces occurring in several places at the edge of the reserve. The nest-boxes were nailed to some trees along the forest tracks in 1971 – 28 boxes on the northern shore and 26 on the southern. In 1987 hardly 24 of these boxes still existed.

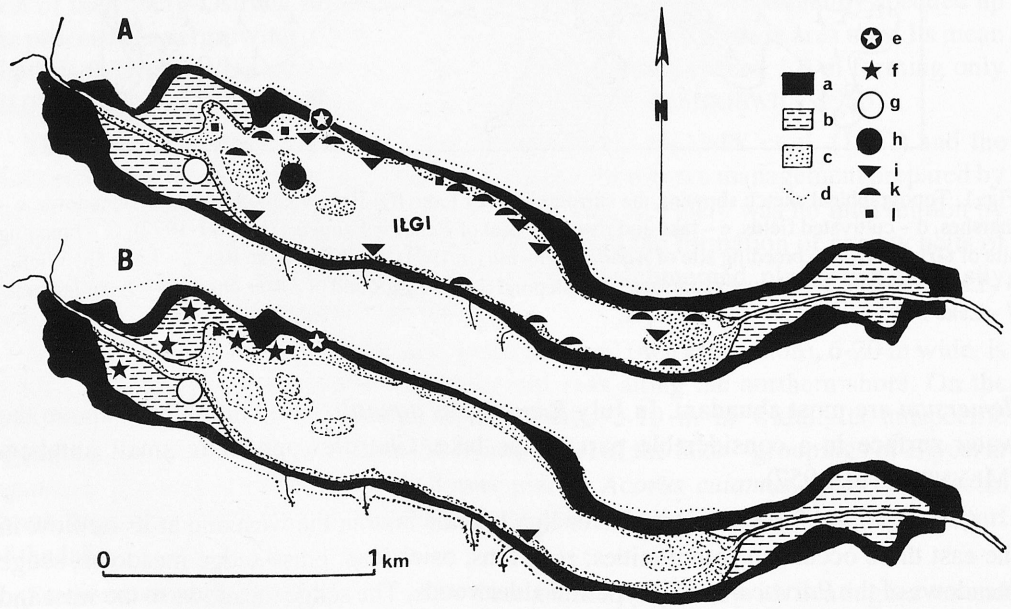

Fig. 2. Sketch showing the distribution of various forms of vegetation in Lake Ługi Reserve and the situation of nests of some bird species. A – state in 1971, B – state in 1988, a – woodlands of the reserve (their external margin forms the boundary of the reserve), b – peatbogs, c – emersed vegetation of the lake, d – boundary of the study area outside the reserve, e – nest of *Milvus migrans*, f – places of calling males of *Porzana porzana*, g – nest of *Cygnus olor*, h – breeding colony of *Chlidonias nigra*, i – nest of *Podiceps cristatus*, k – nest of *Fulica atra*, l – nest of *Tachybaptus ruficollis.*

III. METHODS

The small area of the lake, its being easy of access and the elongate shape made it possible to apply the cartographic method for the whole space of the reserve. Most observation was done from the land. As a result, the counts included the absolute number of the breeding pairs in all the habitats investigated. In accordance with the rules of this method attempts were made to carry out the counts at intervals of several days, several times during the breeding season. The bird species discovered were plotted on maps of the lake and its surroundings in the scale of 1:5000. This method was used in all the years of study. Observations were continued for a period of 6 years interrupted by a 13-year-old break – 1970-1972 and 1986-1988.

The results of the first year, i.e. 1970, owing to the insufficient number of inspections, are not full and for this reason they have been taken into consideration only to a limited extent in the discussion of the numbers of species and pairs in that season. The study of the ornithofauna of the lake was supplemented with observations made from a boat. The reedbeds were searched, the nests and eggs determined and measured. The Great Reed Warblers' song posts could be fixed only from the lake side. In order to avoid counting the same nest twice, a temporary observation stand was constructed in a tree on the shore, giving a view of the whole lake. Moreover, to establish the numbers of species of night vocal activeness, counts were several times made during the night. Some species (Little Grebe and Water Rail) were also provoked with voices played back from a magnetic tape.

In the forest natural tree-holes were recorded and breeding boxes checked. The little width of woodland habitats allowed the breeding birds to penetrate the woods of all types, together with the adjacent borders of the lake. In this way the breeding birds of old forests growing on the southern slopes of the valley and young woods and pine plantations on the northern slopes were included in the investigation. It was not possible to separate the pairs of breeding birds of particular narrow woodland strips from each other and so they are discussed here all together.

The birds observed in the study area are listed in Table I. They are classified according to four categories of occurrence: A – species nesting outside the study area, visiting it only or foraging in it, B – species whose nesting was regarded as possible in accordance with the criteria of the methods of mapping, C – species regarded as breeding on the basis of the results of the cartographical method, which however was not confirmed by the discovery of their nests and D – species represented by nests found with clutches or by egg shells, chicks and other proofs of nesting. Likewise, 4 categories were applied to define the frequency of occurrence irrespective of the abundance of species: vr – very rarely met with during the three-year cycles of study, r – come upon more rarely than in a half of inspections, f – frequently encountered and vf – always or nearly always found in the reserve. In the case of species occurring only in one season of the three-year cycle of investigations, the year is given in which the data concerning the occurrence and frequency of the species were collected.

The counts were carried out by the combined cartographical method (TOMIAŁOJĆ 1968) and complemented by seeking out the nests. Species included in categories C and D were regarded as breeding.

Table I

A survey of birds observed in Lake Iłgi Reserve in breeding seasons of 1970-1972 and 1986-1988, giving categories of their occurrence (A-D) and frequency (vr, r, f, vf). Explanation in text

Species	1970-1972		1986-1988	
	occurr-ence	frequen-cy	occurr-ence	frequen-cy
1	2	3	4	5
Tachybaptus ruficollis (PALLAS, 1764)	D	vf	C	f
Podiceps cristatus (LINNAEUS, 1758)	D	vf	D	vf
Podiceps grisegena (BODDAERT, 1783)	–		A	vr
Phalacrocorax carbo (LINNAEUS, 1758)	A	f	A	f
Ixobrychus minutus (LINNAEUS, 1766	D	r	–	
Ardea cinerea LINNAEUS, 1758	A	vf	A	vf
Ciconia nigra (LINNAEUS, 1758)	A	r	–	
Cygnus olor (GMELIN, 1789)	D	vf	D	vf
Anser anser (LINNAEUS, 1758)	A	f	D	f
Anas crecca LINNAEUS, 1758	C	f	C	f
Anas platyrhynchos LINNAEUS, 1758	D	vf	D	vf
Anas querquedula LINNAEUS, 1758	C	f	A	r
Anas strepera LINNAEUS, 1758	C	f	C	f
Aythya ferina (LINNAEUS, 1758)	–		C	f
Aythya fuligula (LINNAEUS, 1758)	–		D	vf
Aythya nyroca (GÜLDENSTÄDT, 1770)	–		A	vr
Bucephala clangula (LINNAEUS, 1758)	D	vf	D	vf
Mergus albellus LINNAEUS, 1758	A	vr	–	
Mergus merganser LINNAEUS, 1758	A	f	D	f
Pandion haliaetus (LINNAEUS, 1758)	A	vf	A	vr
Milvus migrans (BODDAERT, 1783)	D	vf	D	f
Haliaeetus albicilla (LINNAEUS, 1758)	A	r	A	vr
Circus aeruginosus (LINNAEUS, 1758)	A	f	A	f
Accipiter gentilis (LINNAEUS, 1758)	A	vr	A	vr
Buteo buteo (LINNAEUS, 1758)	A	vr	A	vr
Aquila pomarina BREHM, 1831	A	f	–	
Falco subbuteo LINNAEUS, 1758	A	vr	–	
Grus grus (LINNAEUS, 1758)	A	vf	A	vf
Rallus aquaticus LINNAEUS, 1758	D	f	C	f
Porzana parva (SCOPOLI, 1769)	–		C	vr
Porzana porzana (LINNAEUS, 1766)	–		C	r
Gallinula chloropus (LINNAEUS, 1758)	–		B	vr

Table I ctd

1	2	3	4	5
Fulica atra LINNAEUS, 1758	D	vf	D	f
Vanellus vanellus (LINNAEUS, 1758)	C	f	C	vf
Tringa ochropus LINNAEUS, 1758	C	vf	D	vf
Scolopax rusticola LINNAEUS, 1758	C	r	–	
Gallinago gallinago (LINNAEUS, 1758)	C	vf	C	vf
Larus ridibundus LINNAEUS, 1776	A	vf	A	vf
Chlidonias nigra (LINNAEUS, 1758)	D	vf 1971	A	vr
Sterna hirundo LINNAEUS, 1758	A	r	A	r
Columba oenas LINNAEUS, 1758	C	r 1972	C	f
Columba palumbus LINNAEUS, 1758	D	vf	C	f 1986
Streptopelia turtur (LINNAEUS, 1758)	C	f	C	f
Cuculus canorus LINNAEUS, 1758	C	vf	C	vf
Strix aluco LINNAEUS, 1758	–		C	f
Alcedo atthis (LINNAEUS, 1758)	A	vr	–	
Upupa epops LINNAEUS, 1758	A	r	A	r
Jynx torquilla LINNAEUS, 1758	C	f	C	f
Picoides major (LINNAEUS, 1758)	D	vf	D	vf
Picoides minor (LINNAEUS, 1758)	D	f	C	r 1986
Dryocopus martius (LINNAEUS, 1758)	C	vf	C	vf
Picus viridis LINNAEUS, 1758	C	f 1972	C	f
Lullula arborea (LINNAEUS, 1758)	C	vf	C	r 1986
Alauda arvensis LINNAEUS, 1758	C	r	–	
Hirundo rustica LINNAEUS, 1758	A	f	A	f
Motacilla alba LINNAEUS, 1758	C	vf	C	vf
Anthus pratensis (LINNAEUS, 1758)	C	r 1971	–	
Anthus trivialis (LINNAEUS, 1758)	D	vf	C	f
Lanius collurio LINNAEUS, 1758	C,B	r	C	r
Troglodytes troglodytes (LINNAEUS, 1758)	D	vf	C	vf
Erithacus rubecula (LINNAEUS, 1758)	C	vf	C	vf
Luscinia luscinia (LINNAEUS, 1758)	C	f 1972	–	
Luscinia svecica (LINNAEUS, 1758)	C	r 1972	–	
Phoenicurus phoenicurus (LINNAEUS, 1758)	C	f	–	
Saxicola rubetra (LINNAEUS, 1758)	C	r 1971	–	
Turdus iliacus LINNAEUS, 1766	C	r	–	
Turdus merula LINNAEUS, 1758	D	vf	D	vf
Turdus philomelos BREHM, 1831	D	vf	D	vf
Turdus pilaris LINNAEUS, 1758	C	f	–	
Turdus viscivorus LINNAEUS, 1758	D	f	C	r 1987
Locustella fluviatilis (WOLF, 1810)	C	r 1971	–	
Locustella luscinioides (SAVI, 1824)	C	r 1971	C	f
Locustella naevia (BODDAERT, 1783)	C	r 1971	–	

Table I ctd

1	2	3	4	5
Acrocephalus arundinaceus (LINNAEUS, 1758)	D	vf	D	vf
Acrocephalus palustris (BECHSTEIN, 1798)	A	vr	–	
Acrocephalus schoenobaenus (LINNAEUS, 1758)	C	f	C	f 1987
Acrocephalus scirpaceus (HERMAN, 1804)	D	vf	D	vf
Sylvia atricapilla (LINNAEUS, 1758)	C	vf	C	vf
Sylvia borin BODDAERT, 1783)	C	vf	C	vf
Sylvia communis LATHAM, 1787	C	f	–	
Sylvia curruca (LINNAEUS, 1758)	C	vf	C	f 1987
Sylvia nisoria (BECHSTEIN, 1795)	C	r 1971	C	r 1987
Phylloscopus collybita (VIELLOT, 1817)	C	vf	C	vf
Phylloscopus sibilatrix (BECHSTEIN, 1793)	C	vf	C	vf
Phylloscopus trochilus (LINNAEUS, 1758)	C	vf	C	vf
Regulus regulus (LINNAEUS, 1758)	C	vf	C	f
Ficedula hypoleuca (PALLAS, 1764)	D	vf	D	vf
Ficedula parva (BECHSTEIN, 1794)	C	f 1972	C	f
Muscicapa striata (PALLAS, 1764)	C	f 1971	C	f 1986
Aegithalos caudatus (LINNAEUS, 1758)	D	r	–	
Remiz pendulinus (LINNAEUS, 1758)	A	r	–	
Parus ater LINNAEUS, 1758	C	f	–	
Parus caeruleus LINNAEUS, 1758	D	f	D	f
Parus cristatus LINNAEUS, 1758	C	f	C	f 1986
Parus major LINNAEUS, 1758	D	vf	D	vf
Parus montanus CONRAD VON BALDENSTEIN, 1827	C	f	C	f 1988
Parus palustris LINNAEUS, 1758	C	vf	C	r 1988
Sitta europaea LINNAEUS, 1758	D	vf	D	vf
Certhia brachydactyla BREHM, 1820	C	r	C	r 1986
Certhia familiaris LINNAEUS, 1758	C	vf	C	vf
Emberiza citrinella LINNAEUS, 1758	C	vf	D	vf
Emberiza schoeniclus (LINNAEUS, 1758)	C	vf	C	vf
Fringilla coelebs LINNAEUS, 1758	D	vf	D	vf
Carduelis carduelis (LINNAEUS, 1758)	C	f	C	f 1986
Carduelis chloris (LINNAEUS, 1758)	C	f	–	
Carduelis spinus (LINNAEUS, 1758)	C	f	–	
Carpodacus erythrinus (PALLAS, 1770)	C	f 1971	C	f 1987
Pyrrhula pyrrhula (LINNAEUS, 1758)	C	vf	C	f
Coccothraustes coccothraustes (LINNAEUS, 1758)	C	f	C	f 1987
Sturnus vulgaris LINNAEUS, 1758	D	vf	D	vf
Oriolus oriolus (LINNAEUS, 1758)	C	f	–	
Garrulus glandiarus (LINNAEUS, 1758)	D	vf	C	vf
Corvus corax LINNAEUS, 1758	A	vf	A	vf

IV. RESULTS

A total of 113 bird species were found in the area of Lake Iłgi Reserve in 1970-1972 and 1986-1988. In Table I all these species are listed and the categories of their occurrence and frequency are given. Out of them, 89 species were numbered among the breeding birds and they constituted the main subject of our quantitative study.

The counts of pairs nesting on the lake in successive years of the study are presented in Table II. Table III gives such results obtained for woodland areas. The distribution of the breeding pairs of species selected was plotted on maps separately for both cycles of study (Fig. 2). In spite of these surveys some species seem to call for wider discussions, this being true of both the breeding species and those visiting the reserve to forage. Among them we, above all, number all the species mentioned in the Polish Red Data Book of Animals (GŁOWACIŃSKI 1992), whose quantitative changes were considerable and distinct or in a way characteristic or eventually dependent on other species of the community.

Podiceps cristatus. The number of Great Crested Grebes was exceptionally high and steady in the first period of study. In 1970-1972 7 pairs nested in the reserve; the reproductivity of this species was however very low (19 July 1971 12 adults led hardly 8 chicks). The breeding pairs inhabited mainly the reedbeds on the northern and southern shores. One of the nests was situated in a patch of *Equisetum limosum* in the eastern bay of the lake (Fig. 2A). A decrease in size of the breeding population and its decline were observed in 1986-1988; in 1986 one pair still led one chick, in 1987, although a pair incubated eggs, no chick were seen and in 1988 a pair stayed on the lake only till 16 May and then left the nest.

Phalacrocorax carbo. Single Cormorants often flew over from the colony in Czerwica Reserve (13 km away) to forage in the middle of the lake. The number of birds staying at the same time did not exceed 4 individuals.

Ciconia nigra. A pair of Black Storks nested in the forest surrounding Lake Gil Wielki in the proximity of Lake Iłgi in 1971-1972. They often visited the reserve and foraged on the eastern water-course connecting Lake Iłgi with Lake Drwęckie.

Cygnus olor. A pair of Mute Swans had been nesting in the middle of the waterlogged quagmirs on the south-western shore of the lake for 20 years (Fig. 2 A, B). The measurements of the nest taken in 1971 permitted the supposition that it had been used then for at least several years. TISCHLER (1941) mentions the nesting even of two pairs on Lake Iłgi as early as 1936. Attempts made by two pairs to locate their nests in the reserve in the study period failed owing to bitter fights of the males. In 1986 it was only on 18 June that a pair of Mute Swans appeared with two chicks on the lake (perhaps from Lake Gil Wielki). Breeding success varied from year to year. Two pairs led 7 chicks in 1936 and one pair 4 chicks in 1937; on the other hand, a pair led as many as 8 chicks in 1971 and only 3 in 1987.

Anser anser. A pair of Grey Lags nested in the western part of the lake and raised 4 chicks in 1986; in that year however there were no Mute Swans on the lake. In the next years furious fights that the Grey Lags carried on with the male Swan for several days prevented them from breeding. The geese besides nested on the nearby ponds (at a distance

Table II

Changes in the numbers (N), dominance (%) and mean density (D – from three-year periods) of pairs of breeding bird species on the lake (32.5 ha) and in the adjacent non-woodland plant communities (30,9 ha) in particular years of study

	1970		1971		1972		D	1986		1987		1988		D
	N	%	N	%	N	%	1970-1972	N	%	N	%	N	%	1986-1988
Acrocephalus arundinaceus	15	21.4	31	27.2	30	32.3	7.8	7	12.5	6	10.7	3	5.3	1.6
Anas platyrhynchos	5	7.1	15	13.2	9	9.7	3.0	7	12.5	5	8.9	7	12.3	1.9
Acrocephalus scirpaceus	8	11.4	10	8.8	11	11.8	3.0	6	10.7	9	16.1	3	5.3	1.8
Fulica atra	12	17.1	12	10.5	10	10.8	3.5	1	1.8	1	1.8	0	0	0.2
Bucephala clangula	6	8.6	2	1.8	1	1.1	0.9	7	12.5	6	10.3	8	14.0	2.2
Emberiza schoeniclus	3	4.3	5	4.4	6	6.5	1.4	4	7.1	4	7.1	5	8.8	1.3
Podiceps cristatus	4	5.7	7	6.1	7	7.5	1.8	1	1.8	1	1.8	1	1.8	0.3
Anas crecca	5	7.1	5	4.4	4	4.3	1.4	2	3.6	2	3.6	3	4.3	0.7
Rallus aquaticus	3	4.3	2	1.8	4	4.3	0.9	3	5.4	3	5.4	4	7.0	1.0
Porzana porzana	0	0	0	0	0	0	0	1	1.8	7	12.5	5	8.8	1.4
Tachybaptus ruficollis	2	2.9	3	2.6	3	3.2	0.8	2	3.6	0	0	2	3.5	0.4
Aythya fuligula	0	0	0	0	0	0	0	4	7.1	2	3.6	3	5.3	0.9
Gallinago gallinago	1	1.4	2	1.8	1	1.1	0.4	1	1.8	1	1.8	2	3.5	0.4
Motacilla alba	1	1.4	3	2.6	0	0	0.4	1	1.8	1	1.8	2	3.5	0.4
Anas strepera	1	1.4	1	0.9	2	2.2	0.4	1	1.8	1	1.8	1	1.8	0.3
Cygnus olor	1	1.4	1	0.9	1	1.1	0.3	1	1.8	1	1.8	1	1.8	0.3
Chlidonias niger	0	0	6	5.3	0	0	0.6	0	0	0	0	0	0	0
Anas querquedula	2	2.9	1	0.9	2	2.2	0.5	0	0	0	0	0	0	0
Aythya ferina	0	0	0	0	0	0	0	2	3.6	1	1.8	2	3.5	0.5
Acrocephalus schoenobaenus	1	1.4	3	2.6	0	0	0.4	0	0	1	1.8	0	0	0.1
Porzana parva	0	0	0	0	0	0	0	1	1.8	1	1.8	2	3.5	0.4
Vanellus vanellus	0	0	0	0	1	1.1	0.1	1	1.8	1	1.8	1	1.8	0.3
Locustella luscinioides	0	0	1	0.9	0	0	0.1	0	0	1	1.8	2	3.5	0.3
Mergus merganser	0	0	0	0	0	0	0	2	3.6	1	1.8	0	0	0.3
Ixobrychus minutus	0	0	1	0.9	1	1.1	0.2	0	0	0	0	0	0	0
Anser anser	0	0	0	0	0	0	0	1	1.8	0	0	0	0	0.1
Anthus pratensis	0	0	1	0.9	0	0	0.1	0	0	0	0	0	0	0
Locustella naevia	0	0	1	0.9	0	0	0.1	0	0	0	0	0	0	0
Saxicola ruberta	0	0	1	0.9	0	0	0.1	0	0	0	0	0	0	0
Luscinia svecica	0	0	0	0	1	1.1	0.1	0	0	0	0	0	0	0
Total in years of study: breeding pairs – sum	70		114		94		$\bar{x}$=	56		56		57		$\bar{x}$=
in lake habitats	68		106		91		88.3	52		46		47		48.3
in non-woodland areas	2		8		3		4.3	4		10		10		8.0
density, pairs/10 ha:														
in lake habitats		20.9		32.6		28.0	27.2		16.0		14.2		14.5	14.9
in non-woodland areas		0.7		2.6		0.7	1.3		1.3		3.2		3.2	2.6

Mean density in lake habitats (from all 6 years) – 21.0 pairs/10 ha

Mean density in non-woodland areas (from all 6 years) – 2.0 pairs/10 ha

Table III

Changes in the numbers (N), dominance (%) and mean density (D – from three-year periods) of pairs of breeding bird species in the forests of the reserve (27.0 ha) in particular years of study

	1970		1971		1972		D 1970-1972	1986		1987		1988		D 1986-1988
	N	%	N	%	N	%		N	%	N	%	N	%	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Fringilla coelebs	20	13.4	21	11.5	19	10.6	7.4	25	17.5	21	12.8	32	18.0	9.6
Phylloscopus collybita	10	6.7	12	6.6	11	6.1	4.1	13	9.1	12	7.3	13	7.3	4.7
Sturnus vulgaris	8	5.4	10	5.5	14	7.8	4.0	9	6.3	8	4.9	10	5.6	3.3
Ficedula hypoleuca	9	6.0	10	5.5	11	6.1	3.7	11	7.7	9	5.5	8	4.5	3.5
Phylloscopus sibilatrix	5	3.4	6	3.3	4	2.2	1.9	9	6.3	18	11.0	15	8.5	5.2
Phylloscopus trochilus	3	2.0	5	2.7	3	1.7	1.4	11	7.7	15	9.1	19	10.7	5.6
Parus major	8	5.4	8	4.4	12	6.7	3.5	7	4.9	9	5.5	11	6.2	3.3
Sylvia atricapilla	5	3.4	7	3.8	5	2.8	2.1	5	3.5	9	5.5	8	4.5	2.7
Erithacus rubecula	8	5.4	5	2.7	8	4.4	2.6	5	3.5	3	1.8	8	4.5	2.0
Turdus merula	3	2.0	8	4.4	5	2.8	2.0	5	3.5	6	3.7	4	2.3	1.9
Turdus philomelos	7	4.7	6	3.3	5	2.8	2.2	4	2.8	3	1.8	4	2.3	1.4
Certhia familiaris	7	4.7	6	3.3	5	2.8	2.2	3	2.1	3	1.8	5	2.8	1.4
Troglodytes troglodytes	5	3.4	5	2.7	3	1.7	1.6	2	1.4	5	3.0	5	2.8	1.5
Sitta europaea	4	2.7	3	1.6	4	2.2	1.4	5	3.5	3	1.8	2	1.1	1.2
Anthus trivialis	4	2.7	5	2.7	3	1.7	1.5	0	0	3	1.8	5	2.8	1.0
Sylvia borin	2	1.3	3	1.6	5	2.8	1.2	3	2.1	6	3.7	1	0.6	1.2
Picoides major	1	0.7	1	0.5	2	1.1	0.5	4	4.8	5	3.0	4	2.3	1.6
Parus caeruleus	2	1.3	3	1.6	5	2.8	1.2	3	2.1	2	1.2	1	0.6	0.7
Regulus regulus	3	2.0	5	2.7	4	2.2	1.5	0	0	1	0.6	1	0.6	0.2
Pyrrhula pyrrhula	2	1.3	3	1.6	3	1.7	1.0	2	1.4	3	1.8	0	0	0.6
Emberiza citrinella	2	1.3	3	1.6	2	1.1	0.9	3	2.1	1	0.6	2	1.1	0.7
Jynx torquilla	2	1.3	2	1.1	2	1.1	0.7	1	0.7	3	1.8	3	1.7	0.9
Parus palustris	4	2.7	3	1.6	3	1.7	1.2	0	0	0	0	1	0.6	0.1
Tringa ochropus	2	1.3	2	1.1	2	1.1	0.7	0	0	2	1.2	2	1.1	0.5
Dryocopus martius	1	0.7	2	1.1	2	1.1	0.6	1	0.7	1	0.6	2	1.1	0.5
Parus montanus	3	2.0	2	1.1	1	0.6	0.7	0	0	0	0	3	1.7	0.4
Sylvia curruca	2	1.3	4	2.2	1	0.6	0.9	0	0	1	0.6	0	0	0.1
Columba palumbus	2	1.3	2	1.1	2	1.1	0.7	1	0.7	0	0	0	0	0.1
Lullula arborea	2	1.3	2	1.1	2	1.1	0.7	1	0.7	0	0	0	0	0.1
Streptopelia turtur	0	0	1	0.5	2	1.1	0.4	1	0.7	1	0.6	1	0.6	0.4

Table III ctd.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Turdus viscivorus	1	0.7	2	1.1	2	1.1	0.6	0	0	1	0.6	0	0	0.1
Coccoth. coccothraustes	1	0.7	1	0.5	2	1.1	0.5	0	0	2	1.2	0	0	0.2
Garrulus glandarius	1	0.7	1	0.5	1	0.6	0.4	1	0.7	1	0.6	1	0.6	0.4
Parus cristatus	1	0.7	1	0.5	1	0.6	0.4	3	2.1	0	0	0	0	0.4
Sylvia communis	0	0	3	1.6	2	1.1	0.6	0	0	0	0	0	0	0
Picoides minor	1	0.7	2	1.1	1	0.6	0.5	1	0.70	0	0	0	0	0.1
Ficedula parva	0	0	0	0	2	1.1	0.2	0	0	2	1.2	1	0.6	0.4
Phoenicurus phoenicurus	2	1.3	1	0.5	2	1.1	0.6	0	0	0	0	0	0	0
Milvus migrans	1	0.7	1	0.5	1	0.6	0.4	0	0	0	0	1	0.6	0.1
Columba oenas	0	0	0	0	1	0.6	0.1	0	0	2	1.2	1	0.6	0.4
Carduelis spinus	1	0.7	2	1.1	1	0.6	0.5	0	0	0	0	0	0	0
Carduelis carduelis	1	0.7	1	0.5	1	0.6	0.4	1	0.7	0	0	0	0	0.1
Picus viridis	0	0	0	0	1	0.6	0.1	1	0.7	0	0	1	0.6	0.2
Turdus pilaris	0	0	2	1.1	1	0.6	0.4	0	0	0	0	0	0	0
Oriolus oriolus	0	0	2	1.1	1	0.6	0.4	0	0	0	0	0	0	0
Parus ater	0	0	1	0.5	2	1.1	0.4	0	0	0	0	0	0	0
Certhia brachydactyla	0	0	1	0.5	1	0.6	0.2	1	0.7	0	0	0	0	0.1
Strix aluco	0	0	0	0	0	0	0	0	0	1	0.6	1	0.6	0.2
Turdus iliacus	1	0.7	1	0.5	0	0	0.2	0	0	0	0	0	0	0
Luscinia luscinia	0	0	0	0	2	1.1	0.2	0	0	0	0	0	0	0
Sylvia nisoria	0	0	1	0.5	0	0	0.1	0	0	1	0.6	0	0	0.1
Muscicapa striata	0	0	1	0.5	0	0	0.1	1	0.7	0	0	0	0	0.1
Alauda arvensis	1	0.7	1	0.5	0	0	0.2	0	0	0	0	0	0	0
Lanius collurio	0	0	0	0	1	0.6	0.1	0	0	0	0	1	0.6	0.1
Aegithalos caudatus	1	0.7	0	0	1	0.6	0.2	0	0	0	0	0	0	0
Carpodacus erythrinus	0	0	1	0.5	0	0	0.1	0	0	1	0.6	0	0	0.1
Carduelis chloris	0	0	1	0.5	1	0.6	0.2	0	0	0	0	0	0	0
Scolopax rusticola	0	0	0	0	1	0.6	0.1	0	0	0	0	0	0	0
Locustella fluviatilis	0	0	1	0.5	0	0	0.1	0	0	0	0	0	0	0
Total in particular years of study: breeding pairs	149		183		179		$\bar{x}$= 170.3	143		164		177		$\bar{x}$= 161.3
Total in particular years of study: density of pairs	55.2		67.8		66.3		$\bar{x}$= 63.1	53.0		60.7		65.6		$\bar{x}$= 59.8

Mean density (from both three-year periods) – 61.5 pairs/10 ha

of 2 km from the lake) and in Glutynek marshes (cf. Fig. 1). Flocks of non-breeding Grey Lags (up to 11 individuals) visited the eastern part of the lake (the farthest from the breeding site of the Mute Swan).

Bucephala clangula. The Goldeneye is a characteristic bird of the lake and the most numerous diving duck in the reserve. The number of Goldeneyes was low (1-2 pairs) in 1971-1972, whereas in 1986-1988 it reached as many as 8 pairs. Relatively large flocks of Goldeneyes – up to 18 individuals – stopped on small Lake Iłgi in the spring season. Quiet, wooded shores, readily available food and the surrounding old beech-trees with natural holes or those made by Black Woodpeckers, constitute ideal habitat conditions for this boreal species.

Mergus merganser. Pairs of Goosanders stayed on the lake in the spring months of each year. It was not before 1986, however, that two pairs were found nesting and on 15 Aug. 1987 one of the females led as many as 15 chicks. In the other years breeding was not observed and frequent flights of birds to Lake Gil Wielki, at a distance of 300 m, made it difficult to establish the nature of occurrence and the number of breeding pairs. Their foraging area on the lake included surroundings of the mouth of the Iłga River, west of the floating islets.

Pandion haliaetus. A pair of Ospreys nested at the edge of the partly felled stamd of old pines, 500 m away from the northern shore of the lake, in 1971 and 1972 (Fig. 1). Their main preying territory was the eastern bay of Lake Iłgi. The shallowness of the lake ensured them effectiveness of attacks. Unfortunately, the pine with the nest was cut down together with the other surrounding trees of the stand in the mid-seventies and towards the end of that decade the Masurian population of Ospreys practically ceased to exist. It was not until 13 years later, on 15 Sep. 1987, that an Osprey again hunted on the lake. It was probably a migrating young individual.

Milvus migrans. In 1970-1972 a Black Kite pair nested in a pine on the northern shore of the lake (Fig. 2 A). In 1971 and 1972 their breeding was successful. During the field studies of 1986-1987 the nest was not occupied and single birds flew over from the north to prey on the lake. In 1988 a pair returned to the reserve (Fig. 2 B).

Haliaeetus albicilla. In 1971-1972 single adult White-tailed Eagles visited the lake regularly to prey. They were probably a pair nesting by Lake Jeziorak, 5 km away from Lake Iłgi. In the eighties an adult White-tailed Eagle was observed in the reserve (8 May 1988).

Aquila pomarina. Lesser Spotted Eagles nested in the forests bordering upon the reserve on the southern side (Fig. 1). In 1971 they visited the reserve rarely and in 1972 three birds courting at the same time were observed over the lake; in 1986-1988 they were not seen at all. This may have been due to the intense felling of the old trees in the southern part of the forest adjacent to the reserve.

Grus grus. From 1970 to 1988 a pair of Cranes flew over to the reserve from the Glutynek marshes, at a distance 2 km, where it constantly nested. It foraged in the sedge peatswamp and in the clearing neighbouring upon the reserve on the south-western side. Lake Iłgi had been a breeding site of Cranes before, according to HOFFMANN (1938, after TISCHLER 1941).

Rallus aquaticus. Water Rails nested at the border of sedge swamps and patches of reeds and sweet flags overgrowing the northern shore of the lake. Their nests were not discovered, while the number of pairs was estimated on the basis of their voices. Eggshells were also found.

Porzana parva. Little Crakes' voices were heard several times in 1986 (18 June) and 1988 (16 Apr. and 17 May) in the belt of reed and sedge swamps on the northern shore of the lake. In view of the fact that these birds utter calls infrequently unless lured by voice, the species has been placed in category C in spite of a small number of observations. The inaccessibility of the swamps inhabited by these birds made it impossible to confirm their breeding.

Porzana porzana. In spite of night watching the presence of the Spotted Crake was not confirmed in the seventies. Many years' draught, causing the lowering of the water level of most Mazurian lakes, may have changed the water level in the sedge swamps on the western shore of the lake and thus contributed to the appearance of such a big population (up to 7 pairs) of Spotted Crakes in 1986-1988 (Fig. 2 B).

Fulica atra. A permanent drop was observed in the numbers of Coots. In 1970-1971 they formed one of the most numerous breeding species. At that time 12 pairs occupied all the groupings of emerged vegetation (nests were found in reed, sweet flag, broad-leaved reed mace and bog horse-tail) both on the northern and southern shores and on the floating islets in the western part (Fig. 2 A). The reed and sedge swamp zones, not very wide, limited the possibility of hiding the nests, which were on the average 2 m distant from the sheet of water. Breeding success was however little – on 20 July 1971 12 pairs led 32 chicks. In 1972 ten pairs nested in the reserve and, after the break, in 1986 only one pair led 4 chicks, in 1987 there was only one pair and it did not succeed in rearing any young and in 1988 no Coots were observed on the lake.

Tringa ochropus. Two pairs of Green Sandpipers bred in the reserve every year: one pair lived in the western part of the lake and in the surrounding stands of trees and the other pair nested in the woods surrounding the eastern outlet of the River Iłga from the lake. In 1987 a Green Sandpiper was observed while incubating eggs in the nest of a Song Thrush at a height of 6 m at the top of a broken beech. The first two chick hatched on 22 May. These birds were also seen in July. This evidences the availability of food in the reserve and contradicts KRAATZ and BEYER'S (1982, 1984) statement that chicks-leading birds move to other biotopes in search of food.

Columba oenas. In 1972 and 1988 a pair and in 1987 two pairs of Stock Doves nested in the beechwoods on the southern shore. Hollow beeches and those with holes scooped out by Black and Green Woodpeckers provide favourable conditions for the nesting of the Stock Dove, which is relatively rare breeding species in the Olsztyn region.

Picoides major. The number of Great Spotted Woodpecker increased in the reserve with the aging of the trees. In 1970-1971 one breeding pair and in 1972 two pairs were discovered, while in 1986-1988 the number of nesting birds was estimated at 4-5 pairs. The density of the Great Spotted Woodpecker corresponded with that found for them by WESOŁOWSKI and TOMIAŁOJĆ (1984) in the coniferous stands of the Białowieża Forest. The abundance of food in old withering trees and the elongate shape of the wooded aerea

made it possible for these birds living nearly in seclusion to occur here in such great concentrations. Also Great Spotted Woodpeckers coming from the outside of the reserve appeared feeding in it (24 Apr. 1986 – 8 individuals and on 8 May 1988 as many as 11).

Acrocephalus arundinaceus, Acrocephalus palustris, Acrocephalus schoenobaenus, Acrocephalus scirpaceus. The specific nature of the biotopes of the reserve is most distinctly revealed by the occurrence of the *Acrocephalus* species. The Sedge Warbler and Marsh Warbler did not find habitats which would have suited them: the former did not nest here every year, the latter virtually did not appear before the nomadic season (July 1971). The Reed Warbler lived in its characteristic habitats, between the shore and the thick reed, exclusively on the northern side of the lake, where the shore was grown over by osier. This species occurred, as a rule, in 2-3 groups resembling colonial nesting. The inaccessibility of these places made it difficult to estimate the size of the population exactly and so it may have been underestimated (BOROWIEC & RANOSZEK 1984). The Great Reed Warbler achieved the highest possible density on the lake in 1971 and 1972 (in relation to the area of the reedbed). In the eastern part of the northern shore (a belt of reed 900 m long) there were 23 singing males (370 m^2 per male), while 8 males were singing (650 m^2 per male) in the eastern part of the belt (500 m long) – altogether in 1971 each of the 31 territorial males occupied an area of reedbed averaging 450 m^2. Such levels of density are known only from optimum conditions: on ponds (BOCHEŃSKI 1958) and small reservoir (DYRCZ 1980); the density of these birds on lakes is many times lower (JABŁOŃSKI 1969; WESOŁOWSKI 1975). In 1986-1988 the numbers of Great Reed Warblers were several times smaller (cf. Table II), which may have been connected with a regress observed in this species in several places in Mazuria, among others, on Lake Pogubie Wielkie (MACKOWICZ 1987) as well as in whole Central Europe (GLUTZ VON BLOTZHEIM 1991).

Certhia brachydactyla, Certhia familiaris. In the woods of the reserve Tree Creepers occurred in relatively high densities whereas Short-toed Tree Creepers confined their presence to beechwoods on the southern shore of the lake. In this last species the eastern boundary of distribution extends not far away (VOOUS 1962).

Corvus corax. A pair of Ravens nested in the forest adjacent to the reserve on the northern side all through the years of study and thence penetrated the reserve and the forest to the south of the lake. Besides the breeding pair and its young, flocks of Ravens from the outside of the reserve visited the study area as well (e.g. 19 May 1971 – 15 birds). The Ravens should be held responsible – among other agents – for the reduction in the breeding populations of aquatic species such as Coots, Mallards and Great Crested Grebes.

V. COMMENTS

During the study period of 6 years a total of 113 bird species were found in the reserve, including 89 breeding species (Table I). In conformity with VOOUS'S (1962) categories, out of these 113 species, 26 (23.0%) constituted the Holarctic element, 18 (15.9%) the European, as many as 49 (43.4%) the Palearctic, 3 (2.6%) the Siberian and 17 (15.0%) the Europeo-Turkmenian element. The proportions of particular faunistic elements coincides with the results obtained by NOWAK (1983) for the Mazurian Lake District.

The small and shallow Lake Iłgi belongs – in accordance with PALMGREN'S classification (after DOBROWOLSKI 1961) – to the lakes of the *Nyroca* type and in the classification suggested by BOROWIEC (1981), to the eutrophic lakes of northern Poland. Considering the woodland surroundings of Lake Iłgi, *Bucephala clangula* occurs among its characteristic bird species, while *Anas crecca* distinctly predominates over *Anas querquedula.* Although, in BOROWIEC'S (1981) opinion, the Goldeneye belongs to the characteristic species of the oligotrophic lakes of northern Poland, its occurrence on Lake Iłgi may be associated with the accessibility of breeding treeholes in the surroundings of the lake. This is indicated by HUNDRIESER's (after TISCHLER 1941) observations of incubating female Goldeneyes, whose numbers on the nearby Lake Czos increased by many times after artificial treeholes had been hung up. Also NOWAK (pers. comm.) contributed to the increase of the numbers of Goldeneyes and Goosanders on Lake Leginskie by hanging up nest-boxes and so did WIATR (pers. comm.) in the Gorzowskie Lake District. On the other hand, MIZERA (1980) signalled a rise in the numbers of Goldeneyes in Poland and TOMIAŁOJĆ (1990) numbered the Ostróda region (in which Lake Iłgi lies) among the places of the fairly numerous occurrence of this bird.

The density of breeding pairs computed for the small area of the lake (Table II) is high. Nevertheless, its calculation for the area of the belt of immersed vegetation indicates that the data obtained on Lake Iłgi are comparable with the results of studies on other lakes many times as large in area (JABŁOŃSKI 1969; WESOŁOWSKI 1975; MACKOWICZ 1987). In general, the numbers of common species per 1 km of the shore of Lake Mamry coincide with the results obtained for Lake Iłgi despite the differences between the study methods applied (DOBROWOLSKI 1969), the Teal and Goldeneye, however show here greater densities. Among the birds nesting on the lake and in the unforested areas of the reserve the Anseriformes average a third of the number of species, its other two-thirds consisting of the remaining Non-Passeriformes and Passeriformes (Table IV, Fig. 3). These last reach the highest mean number of breeding pairs, showing at the same time the greatest fluctuation of this number (26-51%).

Species nesting in the narrow belt of woods surrounding the lake were twice as many as those on the lake, and their mean density, 61.5 pairs/10 ha (Table III), represents an average level. In connection with the biotopic differentiation, the structure and very elongated shape of the wood sample plot (cf. Study Area, Fig. 2) the comparison of our results with those obtained in typical sample plots (homogenous, compact, devoid of ecotones, etc.) can be only general and approximate. And so MRUGASIEWICZ (1974, after DYRCZ et al. 1991) noted a similar density in alderwoods; a similar density was also pointed out in a mixed coniferous forest near Motyczyn in Lower Silesia (TOMIAŁOJĆ 1974). In the *Carici elongate-Alnetum* woodlands of Białowieża Forest (the *Ribo nigri-Alnetum* wet alderwood occurring in the Lake Iłgi Reserve acc. to MATUSZKIEWICZ (1981) forms a part of the association formely called *Carici elongate-Alnetum*) and in the *Pino-Quercetum* pine-oak forest, and, therefore, in two woodland associations making up the forests of the reserve, TOMIAŁOJĆ et al. (1984) found densities, the mean values of which agree with the results obtained at present, the similarity of species compositions being fairly great (QS = 63.2% in the case of these two plots). In the sample plot of the pine-oak forest (*Pino-Quercetum*) in the Ojcow National Park TOMEK (1992) found densities above 100 pairs/10 ha in 1973-1977 and, in consequence of the degradation

Table IV

Numbers and percentages of species and breeding pairs of birds from the order Anseriformes from the remaining orders of Non-Passeriformes and Passeriformes on the lake and in the non-woodland areas (63.46 ha) of the reserve in particular years of study

		1970		1971		1972		1986		1987		1988		Total	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
Anseriformes	species	6	38	6	27	6	35	9	43	8	38	7	37	10	33
	pairs	20	29	25	22	19	20	27	48	19	34	25	44		
Remaining orders of Non-Passeriformes	species	5	31	7	32	7	41	8	38	7	33	7	37	10	33
	pairs	22	31	33	29	27	29	11	20	15	27	17	30		
Passeriformes	species	5	31	9	41	4	24	4	19	6	29	5	26	10	33
	pairs	28	40	56	49	48	51	18	32	22	39	15	26		
Total in particular years of study	species	16	100	22	100	17	100	21	100	21	100	19	100	30	
	pairs	70	100	114	100	94	100	56	100	56	100	57	100		100

of the environment caused by industrial pollutions, on the average 70.4 pairs/10 ha in 1979-1990 – and so in spite of the degradation it was clearly higher than in the Lake Iłgi Reserve.

The number of species and breeding pairs and their density relative to the situation of the nests of forest birds in the reserve are given in Table V and Fig. 4. Most, on average 33.6%, pairs were tree-hole nesters (20.7 pairs/10 ha). That was due to a considerable number of old hollow trees and those with breeding boxes fixed to them (however, only one-quarter of the boxes were occupied); anyway, the density was lower than that recorded from parks and woodlands of the Legnica region (TOMIAŁOJĆ 1974). On the other hand, in the Białowieża forests (TOMIAŁOJĆ et al. 1984) the density of tree-hole nesters was lower than in the reserve forests under study, and in the Carpathian beechwoods of Babia Góra the tree-hole nesters were the least numerous, scarcely 16.8% of the community (KIEŚ 1991).

The above-mentioned density of breeding pairs in the forests of Lake Iłgi Reserve, comparable with that of other woodland areas studied, is at the same time accompanied by a distinctly greater number of breeding species. In the years of investigation their number fluctuated between 31 and 52, whereas in the coniferous forest of Ojców National Park (TOMEK 1992) there were 18 to 25 species in an area of 10 ha. This difference between the ratios of the number of species to the density seems possibly to result, on the one hand, from very differentiated nature of the forests in the reserve (wet alderwoods, clearings and young woods), which exerted an influence upon the rise in number of species and, on the other hand, from the shape of the area studied: a narrow strip, reaching several tens metres in width, together with occurring breeding territoriality and despite its remarkable length, may have been responsible for the limitation of the number of pairs of particular species.

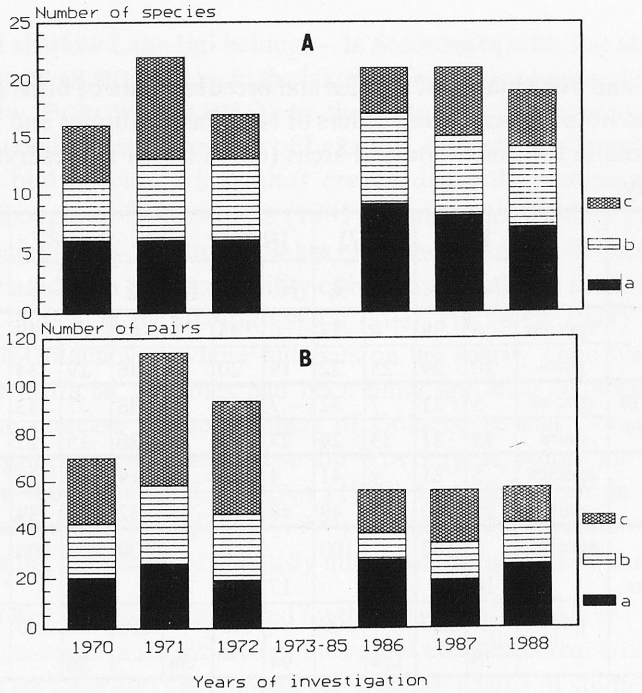

Fig. 3. Numbers of species (A) and breeding pairs (B) on the lake and unforested areas of the reserve in the successive years of study: a – Anseriformes, b – remaining Non-Passeriformes, c – Passeriformes.

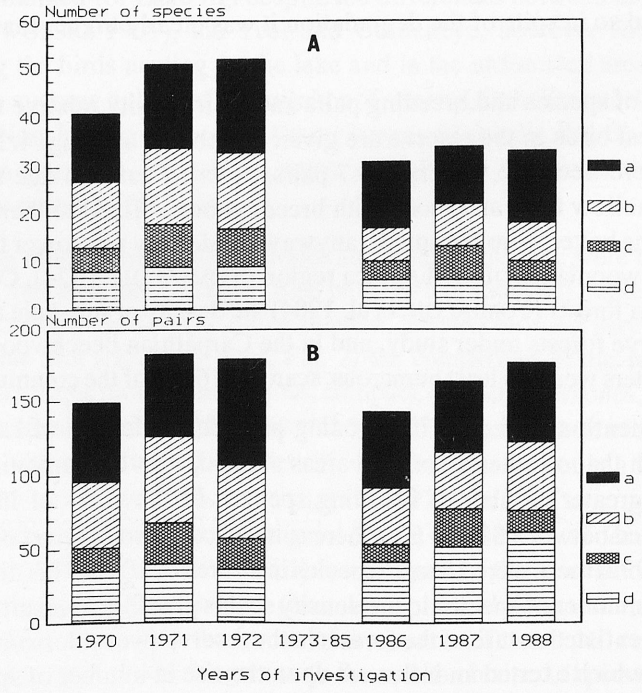

Fig. 4. Numbers of species (A) and breeding pairs (B) of the bird groups in the woodlands of the reserve, acc. to the situation of nests, in the successive years of study: a – in tree-holes (and nest boxes), b – in tree crowns, c – in shrubs, d – in herb layer.

Table V

Numbers and percentages of species and breeding pairs in the forests of the reserve, acc. to the nesting sites, in particular years of study

Nesting site		1970		1971		1972		1986		1987		1988		Total of group	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
in tree-holes and breeding boxes	species	14	34	17	33	19	37	14	45	12	35	15	45	21	35.6
	pairs	53	35.6	57	31.1	72	40.2	51	35.7	48	29.3	54	30.5		
in trees	species	14	34	16	31	16	31	7	23	9	26	8	24	17	28.8
	pairs	45	30.2	58	31.7	50	27.9	38	26.6	38	23.2	46	26.0		
in shrubs	species	5	12	9	18	8	15	4	13	7	21	4	12	10	17.0
	pairs	16	10.7	28	15.3	21	11.8	12	8.4	26	15.9	15	8.5		
in herb layer	species	8	20	9	18	9	17	6	19	6	18	6	18	11	18.6
	pairs	35	23.5	40	21.9	36	20.1	42	29.4	52	31.7	62	35.0		
Total in particular years of study	species	41	100	51	100	52	100	31	100	34	100	33	100	59	100
	pairs	149	100	183	100	179	100	143	100	164	100	177	100		

In spite of the great similarity in species composition and the structure of dominance between the communities of birds inhabiting the lake and the unforested areas of the Lake Ilgi Reserve in particular years of study (Table VI), the changes in the fauna composition over a period of 19 years were noticeable. They affected both the species composition, although the numbers of breeding species in either three-year cycle were the same, and the numbers of individuals in particular species. These numbers do not include single pairs of ephemerals, found only in one year, such as the Grasshopper Warbler, Bluethroat, Whinchat and Meadow Pipit or more or less incidental occurrence of a small colony of Black Terns in 1971; in the second period of study Garganeys and Little Bitterns did not nest at all and a gradual reduction in the numbers of Coots and Great Crested Grebes led to the complete disappearance of the populations of these species in the last year of study. The disappearance of the two last species seems to have been, at least partly, caused by the pressure of predators, mainly the Raven and the population of musk rats, which was increasing in number. Instead, diving ducks – the Pochard and Tufted Duck – as well as the Goosander, Spotted Crake and Little Crake appeared as a new breeding species in 1986-1988. Attempts made by the Grey Lag to nest for good failed as a result of competition with the stronger Mute Swan (see the section Results, p. 6). To be sure, these new species of the bird community on the lake made up the losses in the general number of species, but they did not manage to compensate the decrease in number of Great Reed Warblers.

The values of the indices of similarity for the community of forest birds in the reserve in particular years of study (Table VII), although mostly high, indicate the changes that

Table VI

Indices of similarity of the qualitative composition (QS) and quantitiative dominance (Re) between the bird faunas of particular years of study on the lake and the peatswamps

		QS					
		1970	1971	1972	1986	1987	1988
Re	1970	*	87	83	75	75	73
	1971	85	*	87	73	73	68
	1972	80	81	*	71	71	74
	1986	71	69	70	*	71	72
	1987	69	71	68	76	*	84
	1988	74	69	69	78	82	*

Table VII

Indices of similarity of the qualitative composition (QS) and quantitiative dominance (Re) between the bird faunas of particular years of study in the forests of the reserve

		QS					
		1970	1971	1972	1986	1987	1988
Re	1970	*	84	88	77	76	74
	1971	75	*	80	64	70	68
	1972	79	81	*	74	70	74
	1986	63	57	60	*	88	88
	1987	61	52	56	80	*	90
	1988	50	47	47	78	68	*

occurred particularly in the structure of dominance between the two three-year cycles of investigation. And so, first of all, in the 1970-1972 cycle 41-52 bird species nested in the woods of the reserve in particular years, whereas in 1986-1988 only 31-34; out of the species breeding here at the beginning of the seventies, 14 were not found to nest in the eighties (cf. Table III). Three of them were ephemerals (Thrush Nightingale, Woodcock and River Warbler). A fall in the number of Redstarts and Whitethroats may have been, at least partly, connected with a general decrease in the size of their populations in Poland and Europe (GLUTZ VON BLOTZHEIM 1988, 1991; TOMIAŁOJĆ 1990) or, e.g., with the

overgrowing of clearings (Skylark). In the second period of study only one new species appeared, namely, the Tawny Owl. It may be supposed that in the case of rare species occurring in the number of 1 or 2 pairs, their inclusion in the community of breeding birds may be, to a certain degree, incidental (seeing the small width of the belt of woods under study, the shifting of a nesting territory by several tens of metres may have been of decisive importance in this respect). A distinct rise or decrease in the size of the population can be observed in many species. This is also true of dominant species, whose number oscilated between 4 in 1971 and 7 in 1987, and only 2 of them, i.e., the Chaffinch and Chiffchaff belonged to this group in all the six years of investigation.

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