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LIMNOLOGICAL CONDITIONS OF EGERSZALÓK RESERVOIR AND FUNCTIONAL FEEDING GUILDS OF AQUATIC BIRDS

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The reservoir situated at the foot of the Bükk mountains was created in 1981 along the embankment of Laskó stream. it is currently used for sports, leisure, spare-time activities, and angling. The reservoir, created 22 years ago, was subject to serious contamination from Laskó stream until 1990. The operation of a goose farm established some years ago has now stopped, which accounts for an improvement in water quality. The water quality of Laskó stream changes in the reservoir: its salt, phosphorus, and nitrogen content tend to drop substantially. The improvement of water quality is especially apparent in reed beds of small size. The benthos, phyto- and zooplankton offer a rich food for the nekton and water birds.
Cyanobacteria from Laskó stream are transported into the reservoir. The quality of water improved substantially after leaving the reservoir. After the goose farm was closed, the decrease in water levels caused problems for wildlife. Out of the 217 bird species documented, 97 species nest and 120 species migrate and wander in the vicinity of the reservoir. Notwithstanding the observed fluctuation of and decrease in water level, we have found 100 aquatic bird species along the largest water surface at the foot of the Bükk mountains. The reservoir is an essential feeding and resting location for groups of geese, mallards, and shorebirds. In the first years following the establishment of the reservoir, the migrating exporter-importer groups proved to be the first important functional feeding guilds of aquatic birds. During low water periods, the activity of shorebird species increased. recently, the ratio of the exporter-importer functional group has decreased. currently, decomposition-accelerators make up the majority of the avifauna. The ratio of nesting species within each guild is lower when compared to the avifauna of other reservoirs that were established earlier.
The results of plankton, nekton, and water chemistry studies in evaluating the functional feeding guilds of aquatic birds show that these birds play a major role in the decomposition of organic matters contained in reservoirs. Thereby, aquatic birds contribute to the progress of natural succession processes.

Key words: reservoir, phytoplankton, zooplankton, aquatic bird, feeding of birds

INTRODUCTION

During the past several decades, many ornithological studies have taken place in regions of great natural value in Hungary. Today, these regions are for the most part protected. The results of these studies have been published.

The territory of Eger Bükkalja as a small region, has not been adequately studied. Over 20% of the study area is aquatic habitat. The waterbody's official name, created in 1981, is the Egerszalók Reservoir (MAROSI & SOMOGYI 1990). Other than ornithofaunistical studies (FITALA 1998), there is no data on aquatic bird communities in the Egerszalók Reservoir.

MATERIALS AND METHODS

Study area

The reservoir (surface: 121 ha, total volume: 4,180,000 m^3, usable volume: 3,900,000 m^3) is situated 5 kms from the town of Eger, West of the Bükk Mountains, in the valleys of Laskó and Töviskesvölgyi creeks (Fig. 1). The geographical co-ordinates of the closest settlement, Egerszalók,

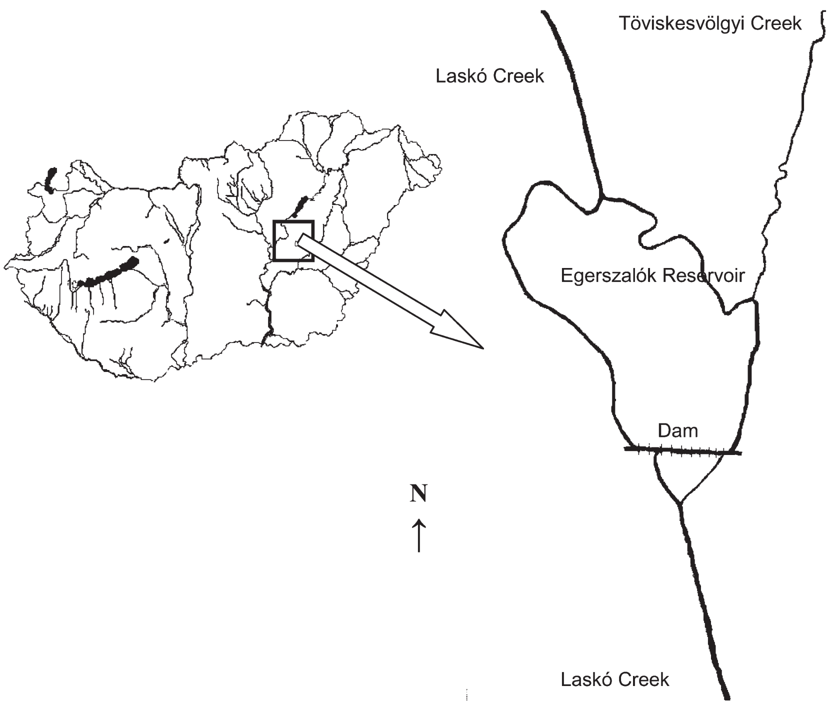

Fig. 1. Location and sketch map of the Egerszalók Reservoir (1:15.000).

are: N 47°3', E 20°19'. The area is situated on a so-called piedmont surface and a mountain foreground slope. The piedmont surface adjacent to the Bükk is divided by heavily cut-up ridges running down in a nearly north-south direction between valleys. The altitude varies between 160–250 m. The region is characterized by north-south openness, and a cut-up, eroded surface. Nearly 30% of the area in the north is covered with Oligocene stiller; marl, and sand with Trias carbonate extrusions inside. Further south, lower Miocene rhyolitic tuff can be found, which was covered with Pliocene clay-, marl deposit during several phases. The southern edge of the surface contains Pleistocene slope materials, which got mixed with loess materials via solifluction. The climate is warming temperate or temperately dry. The hours of sunshine are slightly more than 1900 per year. The annual average temperature is 9.5 – 9.8 °C. The frost-free period lasts for more than 185 days. The annual rainfall is 630 mm, out of which 380 mm falls during the growing season. The dominant wind direction is northwest–southeast. As far as the region's hydrography is concerned, watercourses run in the south–southeast direction. The water output of streams is rather low and they tend to dry out in certain years. The streams are moderately or heavily contaminated.

Vegetation around the reservoir and its surroundings

The original vegetation around the reservoir is made up of the oak forest association (*Quercetum petraeae-cerris*) (SOÓ 1962) on the higher reliefs, and a hardwood (or oak-ash-elm) association (*Fraxino pannonicae-Ulmeum*) (SOÓ 1936) in the higher flood areas of the lower reliefs. Significantly less territory was covered by the oak-hornbeam association (*Querco petraea-Carpinetum*) (SOÓ & PÓCS 1957) and the maple-oak association (*Aceri tatarico-Quercetum*) (ZÓLYOMI 1957). By now, both the landscape and the vegetation have undergone a substantial change; the hardwood (or oak-ash-elm) associations [*Fraxino pannonicae-Ulmeum*] have disappeared, yet, some loess lawn and loess oak-forests have remained sporadically. The oak-forest association [*Quercetum petraea-cerris*] has the highest ratio in this region. Further wood assemblages can be found along the Laskó and Töviskes valley creeks. Shrubberies made up of *Prunus* spinosa , and *Cornus sanguinea* are also present in the drier parts of the Laskó flooded area. In years of unfavourable water levels, the bog vegetation decreases and is replaced by weeds. The dried-up bottom of the reservoir is covered very quickly by *Polygonum* spp., *Sonchus* spp., *Bidentia* spp., *Chenopodium* spp., *Echinocloa* spp., and *Crisium* spp. On the side of Nagy-Kocs and beneath Nagymező, the old loess lawns and maple-oak forests have been replaced primarily by disturbed pastures, giving home to numerous adaptable species; however, some representatives of the ancient steppe and wood-steppe vegetation are also sporadically present.

Methods

The study areas have been observed regularly between 1989 and 2002. The dissolved oxygen was determined by the Winkler method. All phosphorus forms were measured using spectrophotometry as dissolved orthophosphate phosphorus. The ammonia was determined the application of the oxidimetrical method, with sulphuric acid. The NO_3^- was determined by the sodium salicylate method.

Phyto- and zooplankton were studied. A sample of 100 ml water was obtained via dipping for algae identification. In order to collect suitable zooplankton samples, sixty liters of water were filtered with the plankton net. The sample was preserved in a 4% formaldehyde solution. Fish were collected in the spring and fall. Fish, amphibians and reptiles were cooperatively identified by the authors and the experts from Bükk National Park.

Surveys focused mainly on aquatic birds. Bird song monitoring was used to map reed songbird habitat. During the nesting season (May–June), foraging birds around the reservoir were recorded. Surveys took place ten times per year during the nesting season. On a survey day, water chemistry, botanical, plankton, fish, and bird surveys were carried out between 7.00 a.m.–10.00 a.m., 10.00 a.m.–1.00 p.m., 1.00 p.m.–4.00 p.m. and 4.00 p.m.–7.00 p.m. Based on their feeding habits, aquatic birds in the reservoir were grouped into three functional feeding guilds (Tables 6–9) (OLÁH 2003 & OLÁH *et al*. 2006). Bird density per one hundred hectares was estimated. Diversity was calculated according to the Shannon-Weaver formula.

RESULTS

Hydrochemistry

With an average water depth of 3.5 m, the Egerszalók Reservoir is a shallow water body, which circulates freely in summer. The results of the water chemistry are shown in Table 1. The reservoir is hypertrophic according the OECD trophic classification system based on total phosphorus and water transparency (VOLLENWEIDER & KEREKES 1980).

Water quality is highly affected by the pollution from the villages located in the watershed. Sewage treatment in the villages is non-existent; therefore, the water iis directly loaded by sewage generated in households and pollutants resulting from livestock husbandry. As a result of intensive agricultural farming activities, some artificial fertilizers used in the watershed are washed into the reservoir.

The significant amount of terrestrial plant remains on the reservoir bottom has a great impact on water quality. The reservoir bed was not carefully cleaned before flooding; therefore the reservoir had a significant organic matter load from the start. The designated sample sites were suitable for the identification of individual pollutants and adequately represented both the clean and contaminated sections within the reservoir.

The reservoir – similarly to its tributary – is of the Ca-Mg-SO_4-HCO_3 type. The oxygen saturation in Laskó Creek was higher; this difference can be explained by the presence of flowing water (Table 1). The oxygen saturation decreases where the creek reaches the reservoir, which is attributable to the backwater effect of the reservoir and the load generated by the large amount of organic matter coming from the village of Egerbakta. The highest values for oxygen content in the reservoir were measured at the reeds and on the reed-grass field. The phosphorus and nitrogen are typical of polytrophic conditions in the summer. The nitrogen and phosphorus levels indicate that sufficient amounts of plant nutrients are available for the phytoplankton. As for nitrogen and phosphorus available for plants, the development of a rich alga population is restricted primarily by phosphorus. Some bacte-

Table 1. Water characteristics of the Egerszalók Reservoir (summer 2000).

	Laskó Creek	Dam	Eastern bank	Center of the reservoir	Reeds	Laskó Creek (Újlőrincfalva)
Water temperature (°C)	14.0	16.0	16.0	16.0	16.3	14.5
Transparency (cm)	6.0	13	8.0	15	11	–
pH	8.1	7.9	8.0	7.9	8.0	8.28
m-alkalinity	15.3	7.2	8.2	6.2	7.1	15.8
p-alkalinity	2.1	1.2	1.3	1.4	0.6	2.5
Na^+ (mg/l)	14.1	13.0	13.4	13.1	13.2	14.8
K^+ (mg/l)	4.8	4.1	4.6	4.3	4.2	5.0
Ca^{2+} (mg/l)	110	93	98	97	98	120
Mg^{2+} (mg/l)	14.5	13.4	12.4	12.6	13.0	14.8
Fe^{2+} (mg/l)	0.53	0.00	0.71	0.68	0.00	0.67
HCO_3^- (mg/l)	546	317	336	329	359	648
CO_3^{2-} (mg/l)	126	72	69	24	36	150
SO_4^{2-} (mg/l)	98	89	90	89	90	100
Cl^- (mg/l)	30	28	29	28	28.3	35
Total salt (mg/l)	740	480	500	493	482	763
Conductivity(µS/cm)	850	550	590	580	560	890
Dissolved O_2 (mg/l)	9.4	12.0	11.4	10.7	13.3	13.6
Oxygen saturation (%)	101	123	120	111	132	144
Orthophosphate phosphorus (mg/l)	0.077	0.056	0.021	0.028	0.027	0.013
Total phosphorus (mg/l)	0.38	0.32	0.29	0.18	0.16	0.11
Ammonia (mg/l)	0.57	0.20	0.13	0.15	0.20	0.11
NO_2^- (mg/l)	0.09	0.12	0.80	0.05	0.06	0.15
NO_3^- (mg/l)	5.20	3.85	3.80	2.83	2.80	2.00
$TOCKMnO_4$ (mg/l)	8.3	7.2	7.4	7.1	7.0	8.0

ria and cyanobacteria species are capable of fixing nitrogen, and the range of nitrogen that can be taken is wider than that of the phosphorus. Low transparency measured in the reservoir reflects its eu-polytrophic water quality (LAKATOS 1996).

Plankton

The development of a rich algae population was supported by the high nutrient content of the reservoir; however, the distribution of individual algae groups reflects a significant seasonal difference (MILINKI 1991). Poorer algae density was typical of winter samples, whereas the spring and fall were characterized by two diatom peaks (*Asterionella formosa*, *Fragillaria crotonensis*), which is specific of high tropic level waters. The optimal temperature for diatoms is lower than the one required by cyanobacteria or green algae; furthermore, their light-utilizing ability is better in muddy waters with lower transparency. With the temperature increasing and light conditions improving, green algae tend to occur in larger numbers (e.g. *Oocystis lacustris*). Cyanobacteria prevail in samples taken at the beginning of the summer. Among the cyanobacteria, *Microcystis aeruginosa* colonies represented the highest number. Their high productivity could be observed most frequently on the eastern bank exposed to wave action, and several "blooms" occurred in the summer period. *Microcystis aeruginosa*, occasionally *Aphanizomenon* and *Anabaena* species were also present. Therefore, we can conclude that phytoplankton species diversity increases until summer, and gradually decreases from early summer onwards. Species of smaller size were dominant in the spring, whilst species of larger size were dominant in samples taken at the beginning of the summer. The species number and density of the phytoplankton are critical factors for zooplankton feeding. The density of smaller algae is reduced by zooplankton. The number of species of larger sizes and with jelly-coats grows within the algae stands. The large amount of phytoplankton in the reservoir ensures the development of zooplankton. The usual groups constituting zooplankton (Rotatoria, Copepoda, and Cladocera) were present in the samples with different ratios and different species compositions relating to season. In winter, species tend to endure the unfavourable conditions in an anabolic state. Rotatoria and Cladocera survived the unfavourable period by creating resting eggs.

As the temperature increases in the spring, rotifers with shells or lorica become more dominant (e.g. *Keratella*, *Brachionus* spp.). The rotifer assemblages disappear suddenly, in parallel with the Copepoda–Rotatoria increase in feeding. In spring, *Daphnia* species of larger sizes become typical among the Cladocera. Copepods are present continuously and evenly throughout the whole year. As food gradually diminishes at the end of the summer, the "K" strategist species come to the fore: those which are better at adapting themselves to changes in the environment and tolerating the competitors. When the species number and density of Copepoda decrease, Cladocera become dominant in the composition of the zooplankton, but to a lesser extent. Cyclopoidea dominate in the summer and the algae population decreases with the increase in zooplankton density. Most species making up the zooplankton consume algae and selectively graze the phytoplankton – depending primarily on the size of the latter (*Eucyclops serrulatus*, *E. macrurus*). As the trophic level increase, the size and number of Rotatoria and Crustacea decrease. With the increasing trophic level, the density of certain species decrease e.g. *Daph-*

Table 2. Number of species of phytoplankton in the Egerszalók Reservoir (1996–1997).

	Laskó Creek	Dam	Eastern shore	Central part of the Reservoir	Reeds
Cyanophyta	4	4	4	2	1
Euglenophyta	6	8	7	3	3
Chrysophyta	24	16	14	9	10
Chlorophyta	6	9	9	16	16
Pyrrophyta	0	1	1	1	0
Total	40	38	35	31	30

Table 3. Number of species of zooplankton in the Egerszalók Reservoir (1996–1997).

	Laskó Creek	Dam	Eastern shore	Central part of the Reservoir	Reeds
Rotatoria	2	17	16	11	10
Copepoda	2	4	6	4	4
Cladocera	1	2	3	2	6
Ostracoda		1			
Altogether	5	24	22	17	20

nia cucullata, *D. cristata*, *D. longispina*. The dominance of the following increases: *Keratella cochl*earis, *K. quadrata*, *Pompholyx sulcata*, *Filina longiseta*, *Brachionus* spp., *Chydorus sphaericus*, *Bosmina longirostris*. There are some species, however, that do not reflect the trophic level (e.g. *Calanoidea* spp.). According to investigations, zooplankton deteriorate rapidly during cyanobacteria blooms in summer, and the prevalence of cyanobacteria leads to an extensive decrease in the number of filtering organisms. Even a small density of *Microcystis aeruginosa* creates a filtering inhibition. According to findings, the *Bosmina* species of smaller size have developed a higher tolerance towards cyanobacteria. Different species compositions were observed at each sample site. Several euplanktonic elements were found in the water samples taken a few meters away from the shore. In the reeds and the reed-grass stands, guest zooplanktic elements living among the vegetation were also present. (e.g. *Leydigia leydig*, *Scapholeberis mucronata* var. *cornuta*, and *Moina* spp.). In addition, some rare species were also observed on the surface of the sediment (e.g. *Euchlanis dilatata*, *Lepadella ovalis*, *Trichocerca bicristata*, *Notholca squamula*, *Testudinella mucronata*, *T. parva* var. *bidentata*, *Sinantherina socialis*, *Macrocyclops albidus*, *Paracyclops fimbriatus*, and *P. poppei*) (Tables 2 & 3).

Fish, amphibians, and reptiles

Nekton and invertebrates are the most important food source for aquatic birds. Tables 4 and 5 show the most common species found around the reservoir (FITALA 1998).

Table 4. Taxa of the fish identified in the Egerszalók Reservoir (1989–1998).

Fish (Pisces)	
Esox lucius	*Cyprinus carpio*
Ctenopharyngodon idella	*Hypophthalmichthys molitrix*
Scardinius erythrophthalmus	*Aristichthys nobilis*
Leuciscus leuciscus	*Noemacheilus barbatulus*
Leuciscus cephalus	*Silurus glanis*
Phoxinus phoxinus	*Ictalurus nebulosus*
Aspius aspius	*Lota lota*
Alburnus alburnus	*Lepomis gibbosus*
Blicca bjoerkna	*Micropterus salmoides*
Abramis brama	*Perca fluviatilis*
Abramis ballerus	*Gymnochephalus cernuus*
Abramis sapa	*Gymnochephalus schraetzer*
Vimba vimba	*Stizostedion lucioperca*
Gobio gobio	*Zingel zingel*
Carassius carassius	*Cottus gobio*
Tinca tinca	

Table 5. Taxa of amphibians and reptiles in the Egerszalók Reservoir.

Amphibians	Reptiles
Triturus vulgaris	*Anguis fragilis*
Pelobates fuscus	*Lacerta agilis*
Bufo bufo	*Lacerta viridis*
Bufo viridis	*Coronella austriaca*
Hyla arborea	*Natrix natrix*
Bombina bombina	*Natrix tessellata*
Rana temporaria	*Emys orbicularis*
Rana dalmatina	
Rana esculenta	
Rana lessonae	
Rana ridibunda	

Table 6. Material-transporting aquatic birds of the Egerszalók Reservoir (N: nesting species, M: migration species, SN: individuals, D: density, H': diversity, Ei. Cn.: Export-importer consuming nekton, g.i.: grazing importer, E-i.: Export-importer).

Taxa	N	M	SN (ind.)	D (ind./100 ha)	H'	Guild
Phalacrocorax carbo		+	41	33.88	0.25	Ei. Cn.
Botaurus stellaris		+	1	0.83	0.02	Ei. Cn.
Nycticorax nycticorax		+	20	16.53	0.16	Ei. Cn.
Ixobrychus minutus	+		3	2.48	0.04	Ei. Cn.
Egretta alba		+	18	17.87	0.15	Ei. Cn.
Egretta garzetta		+	6	4.96	0.06	Ei. Cn.
Ardea cinerea		+	44	36.36	0.27	Ei. Cn.
Ardea purpurea		+	6	4.96	0.06	Ei. Cn.
Platalea leucorodia		+	6	4.96	0.06	Ei. Cn.
Pandion haliaetus			7	5.78	0.07	Ei. Cn.
Anser fabalis		+	1	0.83	0.02	g.i.
Anser albifrons		+	60	49.58	0.32	g.i.
Anser anser		+	5	4.13	0.05	g.i.
Grus grus		+	1	0.83	0.02	E-i.
Ciconia nigra		+	3	2.48	0.04	E-i.
Ciconia ciconia	+		4	3.31	0.05	E-i.
Vanellus vanellus	+		76	62.81	0.37	E-i.
Larus ridibundus		+	60	49.58	0.32	E-i.
Larus canus		+	5	4.13	0.05	E-i.
Larus fuscus		+	3	2.48	0.04	E-i.
Larus cachinnans		+	1	0.83	0.02	E-i.
Rissa tridactyla		+	1	0.83	0.02	E-i.
Sterna caspia		+	6	4.96	0.06	E-i.
Sterna sandvicensis		+	1	0.83	0.02	E-i.
Sterna hirundo		+	4	3.31	0.05	E-i.
Chlidonias hybrida		+	2	1.65	0.03	E-i.
Chlidonias niger	+		106	87.60	0.43	E-i.
Chlidonias leucopterus		+	14	11.57	0.12	E-i.
Alcedo atthis		+	15	12.39	0.13	E-i.
Merops apiaster	+		100	82.64	0.42	E-i.
Riparia riparia	+		2	1.65	0.03	E-i.
Hirundo rustica	+		6	4.96	0.06	E-i.
Delichon urbica	+		6	4.96	0.06	E-i.
Total	8	24	634	526.9	3.84	

Table 7. Decomposition accelerating aquatic birds at the Egerszalók Reservoir (N: nesting species, M: migration species, SN: individuals, D: density, H': diversity, O: Omnivore, Mf.: Macrophyta consumer, Mz.: Macrozoobenthos consumer, P: Plankton consumer, B: Benthos consumer, N: Nekton consumer).

Taxa	N	M	SN (ind.)	D (ind./100 ha)	H'	Guild
Cygnus olor		+	7	5.78	0.03	O
Anas platyrhynchos	+		730	603.27	0.53	Mf.
Anas crecca		+	210	173.54	0.35	Mf.
Anas acuta		+	34	28.10	0.10	Mf.
Anas querquedula	+		230	190.07	0.37	Mf.
Anas clypeata		+	20	16.53	0.07	Mf.
Aythya ferina	+		51	42.15	0.14	O
Aythya nyroca		+	10	8.26	0.04	O
Bucephala clangula		+	22	18.18	0.08	Mz.
Anas penelope		+	27	22.31	0.09	Mf.
Aythyia fuligula		+	40	33.06	0.12	O
Anas strepera		+	2	1.65	0.01	Mf.
Aythya marila		+	1	0.83	0.01	O
Clangula hyemalis		+	1	0.83	0.01	Mz.
Rallus aquaticus	+		8	6.61	0.03	B+N
Fulica atra	+		236	195.03	0.37	Mf.
Gallinula chloropus	+		20	16.53	0.07	O
Recurvirostra avosetta	+		2	1.65	0.01	P
Porzana porzana	+		10	8.26	0.04	Mf.
Porzana parva	+		1	0.83	0.01	Mf.
Charadrius hiaticula	+		16	13.22	0.06	B
Charadrius dubius	+		23	19.01	0.08	B
Vanellus vanellus	+		76	62.81	0.18	B
Mergus albellus		+	6	4.96	0.03	B
Mergus serrator		+	2	1.65	0.01	B
Mergus merganser		+	2	1.65	0.01	N
Gavia stellata		+	2	1.65	0.01	N
Gavia arctica		+	3	2.48	0.02	N
Tachybaptus ruficollis	+		8	6.61	0.03	N
Podiceps cristatus	+		22	18.18	0.07	N
Podiceps grisegena	+		16	13.22	0.06	N
Podiceps nigricollis		+	56	46.28	0.15	N
Total	15	17	1894	1565.2	3.18	

Table 8. Bioturbing aquatic birds of the Egerszalók Reservoir (N: nesting species, M: migration species, SN: individuals, D: density, H': diversity, S: Searching type, B.: Biting type).

Taxa	N	M	SN (ind.)	D (ind./100 ha)	H'	Guild
Calidris minuta		+	11	9.09	0.17	S
Calidris ferruginea		+	2	1.65	0.05	S
Calidris alpina		+	22	18.18	0.27	S
Philomachus pugnax		+	55	45.45	0.45	B
Gallinago gallinago		+	25	20.66	0.29	B
Numenius phaeopus		+	2	1.65	0.05	B
Numenius arquata		+	2	1.65	0.05	B
Tringa erythropus		+	4	3.31	0.08	B
Tringa totanus	+		16	13.22	0.22	B
Tringa nebularia		+	20	16.53	0.26	B
Tringa glareola		+	70	57.85	0.49	B
Actitis hypoleocus		+	50	41.32	0.43	B
Haematopus ostralegus		+	2	1.65	0.05	S
Pluvialis apricaria		+	1	0.83	0.03	B
Pluvialis squatarola		+	4	3.31	0.08	B
Calidris alba		+	16	13.22	0.22	S
Limicola falcinellus		+	2	1.65	0.05	S
Lymnocryptes minimus		+	1	0.83	0.03	B
Arenaria interpres		+	1	0.83	0.03	S
Total	1	18	306	252.87	3.28	

Functional water bird feeding guilds (1989–2002)

Environmental factors affecting the region have contributed to the creation of numerous living assemblages. Various habitats are home to 97 bird species. According to estimates, some 120 other non-nesting species are also present, meaning a total of 217 species (FITALA 1998). The composition of both nesting and migrating species substantially shifted in the early 1990's due to the significant and permanent lowering of water levels in the reservoir. The diverse group of passeriformes was also affected by these changes, although these birds are connected to the water ecosystem only indirectly, via the insects of the reservoir (Table 9).

Some species (such as herons, mallards, water-rails, warblers) that live in the reeds, nest on the open water, or occur here only temporarily, have decreased in number or have disappeared (Tables 6 & 7). In parallel with this process other species (lapwing, *Vanellus vanellus*, little ringed plover, *Charadrius dubius*, common redshank, *Tringa totanus*, wagtail, *Motacilla* sp. have appeared in greater numbers

Table 9. Birds consuming aquatic insects in the Egerszalók Reservoir (N: nesting species, M: migration species, SN: individuals).

Taxa	N	M	SN (inds)	Food type
Motacilla flava	+		4–10 pairs+40	Different insect orders
Motacilla cinerea		+	3	Aquatic flying insects
Motacilla alba	+		112	Culicidae, Chironomidae
Locustella naevia	+		1	Insects and molluscs
Locustella fluviatilis	+		8-10 pairs	Locusts and caterpillars
Locustella luscinioides	+		12 pairs	Aracnids, insects
Acrocephalus schoenobaenus	+		1 pair	Different small arthropods
Acrocephalus palustris	+		1	Different insect orders
Acrocephalus scirpaceus	+		2 pairs	Aphids, Chironomidae
Acrocephalus arundinaceus	+		3 pairs	Odonata larvae, small fish
Hippolais icterina	+		1	Insects, arachnids
Panurus biarmicus	+		1 pair	Insects, seeds
Remiz pendulinus	+		4–6 pairs	Ants, aphids, seeds
Emberiza schoeniclus	+		2-3	Small animals, seeds

Table 10. Species number, density, and diversity of all aquatic bird guilds observed at Egerszalók Reservoir (SN: individuals, D: density, H: diversity, Hmax: max. diversity, J: Evenness, N: number of nesting species, M: number of migrating species)

N	M	SN (ind.)	D (ind./100 ha)
H'	H_{max}	J'	Guild
8	24	634	526.9
3.84	5.00	0.769	Material-transporters
15	17	1894	1565.2
3.18	5.00	0.636	Decomposition accelerators
1	18	303	252.87
3.28	4.25	0.773	Bioturbing

(Table 8). Furthermore, some species are characteristic of wet meadows and shallow lowland lakes with silty shorelines, or require special habitats (Table 10).

DISCUSSION

Increasing water levels in 1995 (caused by excess rainfall and lack of water draw-off), and disappearing silt surfaces had a negative impact on migrating plovers and shorebirds. By September 1998, the water level drop was approximately 1 m. The occasional "shrinking" of the reservoir, it remains the largest waterbody in Bükkalja, and being so, it is an essential resting and foraging site for migrating geese and shorebirds.

Out of the birds observed in the territory of the reservoir, 101 species can be grouped in functional feeding guilds. In the material-transporting guild, *Larus ridibundus*, *Chlidonias niger*, and *Ardea cinerea* are the most important species (Table 6). Decomposition-accelerator omnivore species and decomposition-accelerators consuming nekton are highlighted in Table 7. Species classified as belonging to the seating and biting types in the bioturbing guild are present in nearly equal numbers (18 and 14 species), but their numbers vary greatly during the migration period (Table 8). Several songbird species stop for a shorter or longer period in the fall during their migration from the north or from the Bükk Mountains. Other species seek terrestrial or aquatic insect food while nesting in the reeds. Ihese species maximally utilize the wide range of food source available (Table 9).

The relatively young reservoir has an extremely diverse aquatic bird fauna, where the decomposition-accelerator guild consuming nekton, benthos, as well as (macrophyta) dominates. In addition to the rapidly changing aquatic bird population, a small nesting number typical of oligotrophic waters was also observed. Zooplankton in high densities, which is characteristic of eutrophic waters, are transferred to the feeding level of nekton remain in the aquatic material cycle, The aquatic insects mainly emerge from the water and are transferred terrestrial biomass through the passerin songbirds.

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