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Monitoring of breeding water birds in Lithuania: organisation and sampling designs

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The first Lithuanian national programme of monitoring breeding water birds was launched in 1999, although in 2000 year some parts had to be suspended, but from 2001 it will be continuous again. The programme is funded by the Ministry of Environment Protection of Lithuania and is coordinated by the Institute of Ecology. The subjects of sampling methods and of project organization were studied and evaluated with particular care before the work began. Planning was affected both by the limited funds and the non-uniform distribution of skilled observers. A network of 78 monitoring points was set up in 19 of the 43 districts. Despite the fact that a random approach could not be applied to the sampling design, the sample reflects the geographical distribution and represents the ecological variety of Lithuanian wetlands. The area covered by the monitoring points comprises 37 lakes of 7 ecological types, two fish pond complexes, parts of two water reservoirs , 32 gravel and clay banks and pits, and sections of 5 rivers, large and small. The areas are situated in relatively natural or urban landscape. The majority of the 18 observers worked in National and Regional parks, or in Strict Regime reserves. They gathered data on the numbers and distribution of 29 common and rare waterbird species.

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1. Introduction

The original purpose of the Lithuanian programme of monitoring breeding water birds was to identify long-term trends in the development of waterbirds, for such data are required to plan and realize more effective wetland avifauna protection and relevant management measures than had been possible previously. Cardinal changes in the waterbird fauna community and in the environment itself occurred in Lithuania since the 1950s. The most important of these changes include:

1. Rapid intensification of agriculture.
2. Hyper-eutrophication of traditional 'bird-lakes' resulting in drastic declines in number of the mass of waterfowl species (Stanevičius 1999).
3. Large-scale landscape and agricultural melioration policies introduced from the 1960s onwards,.
4. Regulation of lake water levels.
5. Cessation of grazing and hay-making on lake islands and in lake-side meadows (resulting in the degradation of these important habitats).
6. Systematic development of large fishpond complexes (and the recent tendency for them to go out of use) (Švažas & Stanevičius 1999).
7. Creation of several large water reservoirs and numerous smaller man-made water bodies.
8. Introduction of some mammalian predator species, such as American mink *Mustela vison* and raccoon

Nyctereutes procyonoides.

9. Reintroduction of Greylag Goose *Anser anser* and Cormorant *Phalacrocorax carbo*, which through persecution became extinct in Lithuania; their breeding populations are now increasing.

The registration of breeding species new to Lithuania, such as Great Egret *Egretta alba* is a possibility in the near future. The impact of global climate warming on waterbirds has already been identified in Lithuania (Žalakevičius 1998, 1999), and is a new and compelling argument for maintaining the monitoring of breeding waterbirds.

The Lithuanian programme of monitoring breeding waterbirds can be compared to other European national programs (see Gibbons 1999). Our programme was designed to take into account the circumstances arising from the enormous recent changes in Lithuanian society, which have had both subjective and objective effects. In time, the programme overlaps with the efforts to combine national programmes into the Pan-European programme (Gibbons 1999). Like other eastern European projects, the Lithuanian programme is affected greatly by lack of funds and the shortage and non-uniform distribution of skilled observers. The main obstacle to achieving a unified approach is the variety of earlier ways of counting waterbirds (and their variable methodology design and application), circumstances brought about by local and uncoordinated work in the past. Both national and European monitoring approaches have their own merits and shortcomings. Ignorance of local peculiarities is characteristic of imposed and non-systematic programmes, leading to loss of some valuable information (Gibbons 1999). On the other hand, lack of comparability of national data reduces their value. At the present stage of our monitoring work we would like to believe that some comparison of data is reliable (Strien & Pannekoek 1999). In the first year of such a project, organization and methodical aspects are of great importance (Szép & Gibbons 1999). The major purpose of the Lithuanian monitoring in its initial stage is to prepare and test the preliminary design of the methodology, which would be sufficient to evaluate the significance of developments in Lithuanian waterbird populations. To allow these aims to be achieved, we have tried to create a representative network of monitored sites, to perform waterbird counts on selected wetlands and to determine the primary characteristics of waterbirds in the sites being monitored.

The above aims mean that any elaboration of the study area selection criteria and of the count methods described in my paper will come from the feedback from my work. Consequently, the feedback and the modified criteria must be discussed in objective detail. The methodology and area selection criteria previously used and cited in scientific papers in Lithuania are inadequate for the work of the present monitoring programme and should now be discarded.

2. Methods

The practices employed by a number of authors were studied before selecting a method of implementing counts of breeding waterbirds (*e.g.* Borowiec *et al*. 1981, Haldin & Ullfvens 1987, Klett *et al*. 1986, Maxson *et al*. 1986-1987, Rumble & Flake 1982). The method reflected adaptations to cope with monitoring waterbirds in Lithuanian conditions. We also considered the experience we gained in the traditional year on year nest search and survey of all

Great Crested Grebes Podiceps cristatus and Coot Fulica atra at Lake Žuvintas. In the end, our counting methods of breeding waterbirds included:

1. Total nest searches.
2. Evaluation of breeding population size by:
   a. Voices.
   b. Pairs.
   c. Isolated mated males using waiting places.
   d. Broods.
   e. Species-specific breeding behaviour.

Such a diversity of methods used in counting waterbirds is practically inevitable (Borowiec *et al*. 1981). We discussed all the above methods with all the participants and used an appropriate selection to accord with the local characteristics of each wetland surveyed.

It is essential that counters use the same methods every year in the same wetlands, although counting methods may differ between sites. I recognize that the variety of methods could result in differences in precision of the estimations. Nevertheless, if the method-introduced error remains the same every year (the same method always being used on any particular site) it will not preclude the correct evaluation of the direction and magnitude of changes.

Counts of breeding water birds were performed every two weeks, commencing in early April and ending in mid-July, which achieved a total of 6-7 counts per monitoring site. Participants received a special count card. For each wetland, each year, a dedicated card recorded all (6-7) counts performed. After each count, additional data were added to the cards in the appropriate columns devoted to nests, groups comprised of paired birds, lone pairs, single males, single females, single unsexed birds, groups of <6 males and broods.

After the count season, completed cards were returned to the project coordinator in the Institute of Ecology (Bird Ecology Laboratory). Count data are stored in computer on Excel data sheets in two locations, the Institute of Ecology and the Ministry of Environmental Protection. There are plans to create a database.

3. Results and Discussion

3.1. Criteria of sampling designs

We attempted to select monitoring sites in such a way that we could identify changes in breeding water bird populations in time and space. To achieve this, when selecting monitoring sites we ensured that they were separated as far from each other as possible. To avoid false conclusions, we attempted to count birds in wetland types that differed ecologically, which is why the sample includes wetlands of different carrying capacity, from unproductive mire lakes in moss bogs to mesotrophic and eutrophic lakes of agricultural landscapes. Some of the sites were selected as 'hotspots' so as to not to overlook dynamic developments in waterbird populations and their environments. Such developments included highly eutrophic lakes subject to rapid overgrowth and urban wetlands.

3.2. Sampling geography

Counts were performed on 78 sites (Fig. 1) distributed over 19 of the 43 administrative districts. Some of these points included compact groups of small wetlands, each of which was evaluated as a separate

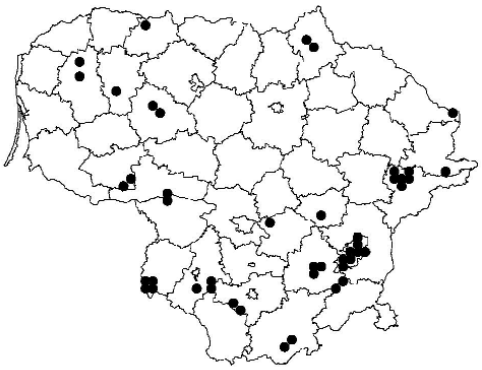

Fig. 1. Network of breeding waterbird monitoring sites in Lithuania (Although only 46 of 78 sites are indicated, eight of the mapped sites include all the remaining 32 sites, which are wetlands, but these comprise aggregations of smaller waterbodies).

point, despite not being distinguished as such within the site records. For example separate points in the city of Vilnius each designate groups of several clay pits.

The uneven distribution of the monitoring sites was the inevitable consequence of the location (and geography) of the protected sites where the skilled observers normally worked, because to minimize the programme costs, the sites were selected predominantly within or in the vicinity of their normal work areas. Additionally, the monitoring network scheme was shaped to some extent by the distribution of lakes in Lithuania. The consequence was that there was a higher concentration of counts along the geographical perimeter of the country than in the central part (see Fig. 1).

3.3. Classification of monitoring sites

From the outset, all wetlands in the monitoring sample were classified into lakes and their components (bays, arms and backwaters), water reservoirs and large

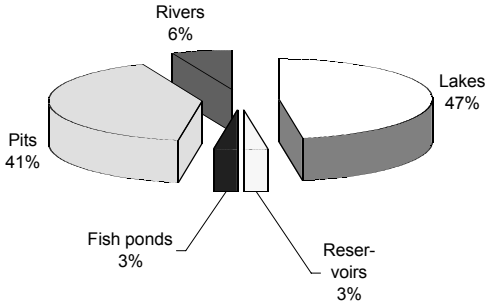

Fig. 2. Numbers of different wetland types in the breeding waterbirds monitoring sample (n=78) in 1999.

ponds >1.5ha, , fishponds and small ponds <1.5ha, banks and pits , and river sections. Figs. 2 and 3 illustrate roughly the ecological structure of the monitoring sample, in which the majority of sites contain lakes and small wetlands (*e.g.* pits, sand, clay and peat banks and small ponds) and most of the area of the sites comprises open water- (*e.g.* lakes and fish ponds). The sample thus represents rather well the real situation in Lithuania concerning wetlands. The sample's omission of some streams can be regarded as a shortcoming.

It should be stressed that the grouping of lakes is characterized by great internal diversity, which covers small acid mire lakes located in moss bogs, lakes which have formed where underground gypsum layers have dissolved, small mesotrophic forest lakes and large mesotrophic and

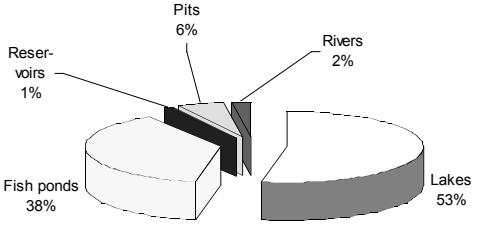

Fig. 3. Proportion of different wetland types in the total area of 3595.6ha covered by monitoring counts in 1999.

eutrophic lakes. Furthermore, the trophic level of the latter types varies within wide limits. A group may comprise large, moderately eutrophic lakes, highly eutrophic lakes and hyper-eutrophic lakes with features of distrophy. Our classification of lakes accords with Kavaliauskiene (1996). The limnological parameters of the monitoring sites will be evaluated in the near future.

3.4. Avifauna of Monitored Sites

The results from first year of the programme cannot be used to evaluate the status and perspectives of Lithuanian waterbird populations. However, they show what we can expect to obtain in future. A total of 29 species of waterbirds was counted in 1999 on the 78 wetlands that comprise the monitoring site network. Mallard Anas platyrhynchos, Great Crested Grebe and Coot rank as the most abundant species, followed by Tufted Duck *Aythya fuligula* and Goldeneye *Bucephala clangula* (Fig. 4). Black-headed Gull *Larus ridibundus* deserves special evaluation because of its large breeding concentrations on very few sites. On the other hand, the large numbers in the sample of Garganey *Anas querquedula*, a species with dominant negative trends over most of its breeding range (Farago & Zomerdijk 1997) may be one of those of first useful and unexpected discoveries provided by monitoring.

Mallard, Goldeneye, Coot and Great Crested Grebe, the most abundant species (Fig. 4) also appear to be the most widely distributed (Fig. 5). Only Tufted Duck had narrower breeding habitat requirements than the above species, an d narrower too than Mute Swan *Cygnus olor* and also Garganey, Teal *Anas crecca* and Goosander *Mergus merganser*. These constraints can be demonstrated in the Tufted Duck's avoidance of small shallow wetlands, which are abundant in the sample. In contrast, the Mute Swan tends to occupy such habitats. Although Mute Swan is by no means abundant in comparison with smaller species, because it is territorial

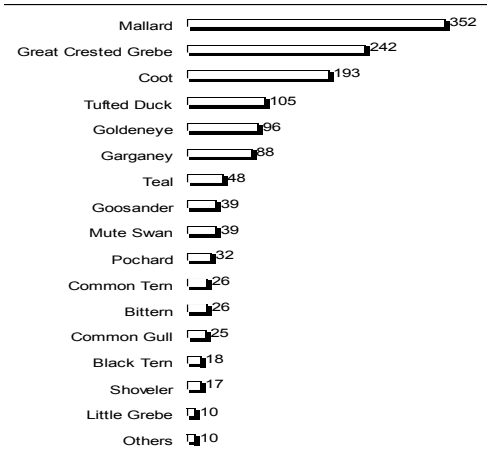

Fig. 4. Number of pairs of 16 (out of 29) breeding waterbird species counted on 78 monitoring sites in 1999. The list does not include Black-headed Gull whose 2224 nests were found in only 3 sites.

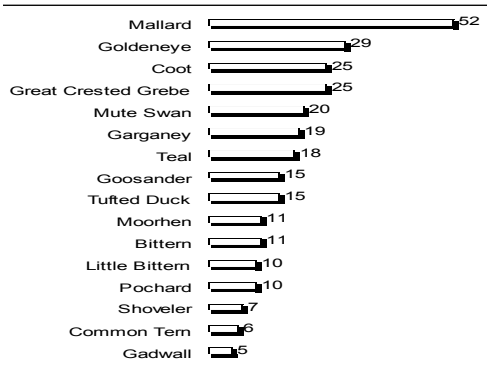

Fig. 5. Occurrence of 16 (out of 29) breeding water bird species on the wetlands monitored. Columns indicate numbers of wetlands in which particular species bred in 1999.

and avoids its congeners, it is able to disperse widely to obtain a breeding site. As expected, the colonial Black-headed Gull was not widely distributed throughout the monitored wetlands. Garganey and Teal attain high rank in the variety of wetlands occupied, that of Teal being explained by its comparatively dominant share of wetlands located in forested landscapes, the-same being true for Goldeneye.

Five other species that were observed frequently on monitoring sites, namely Grey Heron *Ardea cinerea*, Cormorant, Little Gull *Larus minutus*, Herring Gull *L. argentatus* and White-winged Tern *Chlidonias leucopterus* are likely to be found breeding there in the future.

In retrospect, we can say that the results of the first year's work proved that the network of monitoring sites appeared to be quite representative, despite the constraints placed on our management of the programme and on the extent to which we could choose sites randomly. The most abundant and widely-distributed species in the monitoring sample have the same status on country-wide scale (Žalakevičius *et al.* 1995).

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