POPULATION TRENDS OF BREEDING WATERBIRDS ON FISHPONDS IN SOUTH-EASTERN POLAND DURING 30 YEARS

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Abstract

The abundance of breeding waterbirds species on fishponds was analysed between 1985 and 2014 in south-eastern Poland. Significant decreasing trends were observed for *P. grisegena*, *F. atra*, *A. ferina*, *A. fuligula* and *P. nigricollis*. However, *C. olor*, *A. anser*, *M. strepera*, *A. platyrhynchos*, *T. ruficollis* and *P. cristatus* showed increasing trends. Although the studies were carried out on a regional microscale, the results for some species were convergent with European and national trends.

Key words: waterbirds, breeding period, fishponds, population trends

Introduction

The abundance and distribution of European bird species are constantly monitored in order to determine their global, European, and national trends, and conservation status. In this paper an attempt has been made to determine trends for some breeding water and wetland birds species on a regional scale. This group of birds was chosen because they are excellent bioindicators of the environment's status (Wetlands International 2012). Strong anthropopressure has had an unfavorable effect on natural wetlands and waterbodies. The disappearance of wetland habitats and negative changes in natural waterbodies connected with human activities has caused that fishponds are often a basic substitute for the natural environment for waterbirds. This phenomenon affects mainly the central and southern regions of Poland, which are the poorest in terms of the occurrence of natural reservoirs and a lack of lakelands but where there are the largest areas of carp ponds (Bocheński 1996, Guziur et al. 2003). The Lublin region is a farmland area where surface waters constitute only about 0.8%; however, it belongs among the leaders in Poland in terms of area occupied by fishponds, which cover 6707 ha (Uziak, Turski 2008, GUS 2017). Therefore,

reservoirs such as semi-natural fishponds, have become an important breeding habitat for birds in this region and they are an important component of some bird refuge of international importance in Poland (Wilk et al. 2010).

Many ponds were created in the Middle Ages, becoming a permanent element of the landscape together with birds, for which they became important habitats in Central and Eastern Europe (Dobrowolski 1995, Bocheński 1996, IUCN 1997, Kozulin et al. 1998, Kalivodova, Feriancova-Masarova 1999, Vogrin 1999, Kren 2000, Svazas, Stanevicius 2000). Fishponds are usually shallow and strongly eutrophic, with richly developed submerged and emergent vegetation (Michael 1987). Thanks to good management, they do not overgrow completely. As a result, they usually provide good conditions for bird reproduction and provide high species diversity of breeding water and wetland birds (Bukacińska et al. 1996). These types of habitats are willingly colonized by ducks, geese, swans, grebes and rails in the breeding period (Hagemeijer, Blair 1997, Konter 2001, Sikora et al. 2007).

Materials and methods

The analysis of population trends of breeding waterbirds was made on the basis of data from 16 fish pond complexes (total surface ca. 3150 ha), positioned in various parts of south-eastern Poland, mainly in the Lublin region and partly in the Podkarpackie voivodship (*50°30'-51°37' N, 22°03'-23°44' E*, Fig. 1.).

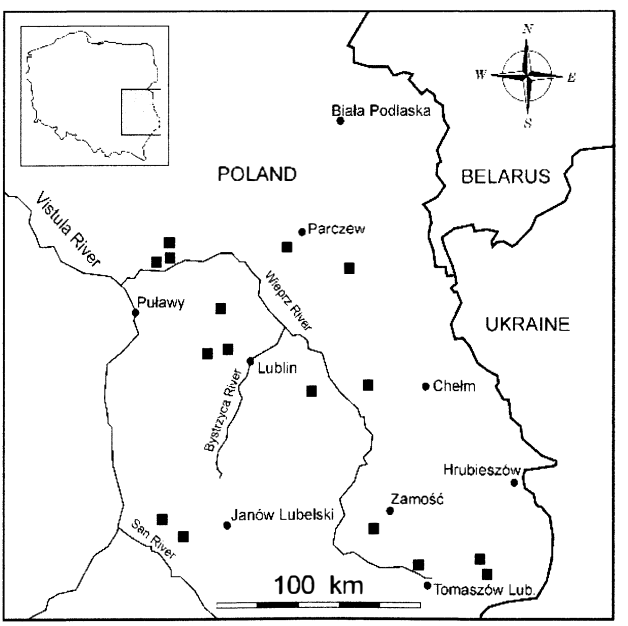

Figure 1. Location of the studied fishpond complexes represented by squares on the map.

The largest groups of fish pond complexes are situated in the north and north-east of the region in the Valley of the Lower Wieprz, Tyśmienica valleys, and Polesie Lubelskie; in the south in Janowskie and the Lipskie Forests; and in the west in the Lublin Upland close to the Vistula River. Individual complexes are scattered in the agricultural landscape of the Lublin Upland near Lublin and in the south between Zamość, Hrubieszów, and Tomaszów Lubelski. The surveys included complexes located in different landscapes, because the surroundings of ponds affect their biodiversity (Bukacińska et al. 1996). Most of the ponds are located in agricultural lands, which is dominant in this region with a various share of fields, meadows, settlements and forests in the vicinity of the complexes. The four fishpond complexes are situated completely in woodland.

The research was made to determine trends in the abundance and distribution of 15 species of birds belonging to waterfowl (Anatidae - 10 species), grebes (4 species), and for the coot *Fulica atra* under farm pond conditions. The data came from journals, MA theses, and reports, as well as from monitoring and scientific activity carried out by cooperating ornithologists from Lublin Ornithological Society and Lublin research institutions. The data were collected from two fifteen-year periods during 1985-1999 and 2000-2014. Fish complexes were selected, for which bird censuses and valuation numbers of breeding pairs were made in both periods and for all species taken into account in this paper, following standard ornithological procedures (Ranoszek 1983, Koskimies, Väisänen 1991, Chylarecki et al. 2015). To include the data from various breeding seasons in the studied period, the median was calculated from the number of breeding pairs of given certain species coming from many annual observations for each fishpond complex separately. The Wilcoxon paired-range test was used as a statistical method to compare differences in the abundance of breeding pairs between two studied periods of observations.

Results

The dominating species of birds were: mallard *Anas platyrhynchos*, coot, pochard *Aythya ferina* and tufted duck *Aythya fuligula* (mean share amounted to 11-32%), which were breeding on all complexes in both study periods (Tab. 1.).

Table 1. Occurrence of breeding species on fishpond complexes.

Species	Mean proportional abundance (%) of breeding pairs (1985-99)	Mean proportional abundance (%) of breeding pairs (2000-14)	Frequency (proportions) (1985-99)	Frequency (proportions) (2000-14)
Cygnus olor	1.2	2.2	0.8	0.8
Anser anser	0.6	2.2	0.3	0.4
Bucephala clangula	0.2	0.1	0.1	0.1
Aythya ferina	18.4	12.5	1.0	1.0

Species	Mean proportional abundance (%) of breeding pairs (1985-99)	Mean proportional abundance (%) of breeding pairs (2000-14)	Frequency (proportions) (1985-99)	Frequency (proportions) (2000-14)
Aythya fuligula	17.3	11.1	1.0	1.0
Spatula querquedula	1.1	0.9	0.6	0.6
Spatula clypeata	0.5	0.7	0.3	0.3
Mareca strepera	1.4	2.4	0.4	0.5
Anas platyrhynchos	22.1	31.6	1.0	1.0
Anas crecca	0.4	0.3	0.3	0.3
Tachybaptus ruficollis	2.2	4.8	0.9	0.8
Podiceps grisegena	4.1	1.1	0.9	0.4
Podiceps cristatus	4.9	6.3	0.9	0.9
Podiceps nigricollis	1.5	0.2	0.5	0.1
Fulica atra	24.0	23.5	1.0	1.0

The little grebe *Tachybaptus ruficollis*, great crested grebe *Podiceps cristatus* and mute swan *Cygnus olor* in both periods, and the red-necked grebe *Podiceps grisegena* in the first period, inhabited 81-94% of the complexes. The average percentage share of the mentioned species was low, diversified, and amounted to 1.1-6.3% depending on the studied period. The average percentage share of the other seven bird species did not exceed 3% in either period. They were the least frequently observed species (frequency ≤ 50%): goldeneye *Bucephala clangula* (observed only on two complexes) teal *Anas crecca*, greylag goose *Anser anser*, northern shoveler *Spatula clypeata*, black-necked grebe *Podiceps nigricollis* and gadwall *Mareca strepera*. Garganey *Spatula querquedula* also was not numerous but it appeared on over half of the complexes (56-63%).

Declining trends were observed in nine species but there were significant differences in abundant breeding pairs between the two periods only in the case of the red-necked grebe (Wilcoxon test, $z = 3.41$, $p < 0.001$), coot ($z = 3.01$, $p = 0.003$), black-necked grebe ($z = 2.52$, $p = 0.01$), pochard and tufted duck ($z = 2.53$, $p = 0.01$) (Fig. 2., Tab. 2.).

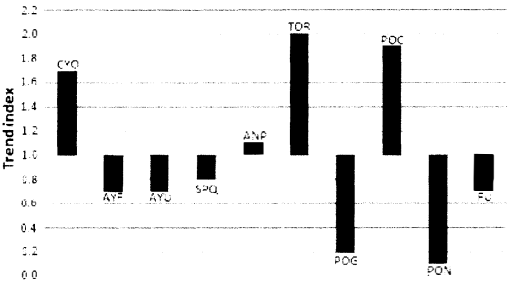

Figure 2. Waterbird species trends which occurred on the most fishpond complexes (frequency >50% in the first studied period). Quantitative changes in the breeding population were expressed in relation to the numbers from the first monitoring period as a means of trend indexes from particular complexes. Species abbreviations: *Cygnus olor* (CYO), *Aythya ferina* (AYF), *A. fuligula* (AYU), *Spatula querquedula* (SPQ), *Anas platyrhynchos* (ANP), *Tachybaptus ruficollis* (TOR), *Podiceps grisegena* (POG), *P. cristatus* (POC), *P. nigricollis* (PON), *Fulica atra* (FU).

The highest declining trend concerned the black-necked grebe (reduction of the number of breeding pairs by average 94% and widespread from 50% to 13%) and red-necked grebe (82% and from 94% to 44% respectively). Six species showed increasing trends; however, the comparison of results was not statistically significant. They were the common species of great crested grebe, little grebe, mute swan with a high increase, mallard with a slight increase, and a rare species of greylag goose and gadwall.

Discussion

The observed abundance trends of some described species of birds in the Lublin region were of a supra-regional nature (BirdLife International 2017, Chodkiewicz et al. 2018, BirdLife International 2019, see tab. 2.). Among the analysed species, only the pochard is threatened globally and its population is decreasing in Europe and in the world. In turn, the European and global population of the other common diving duck species on fishponds – that is, the tufted duck – has achieved a stable status. In Poland, a significant decrease in both pochard and tufted duck was in 2007-2009, and is currently rather regressing with slight fluctuations in numbers. In neighbouring countries, also in Belarus, a declining trend of both species of diving ducks was found, while in Ukraine their fluctuations were noted. However, the tufted duck has a growing trend in Lithuania. Coot was declining in 2007-2010 in Poland but now is an increasing trend like in Lithuania. The coot population is stable in Belarus but fluctuations are in Ukraine, while the European population is declining. The red-necked grebe shows decline across the country, as opposed to the European population. The situation of the black-necked grebe is uncertain in Europe. The

black-necked grebe recorded a significant decline in 2013-2017 in Poland. Species with growing trends in the region such as greylag goose, mallard, gadwall and great crested grebe are continually increasing in Poland. In the case of mute swan, greylag goose and gadwall, their European and global population shows an upward trend.

Table 2. Comparison of regional, national, European and global population trends of studied waterbirds breeding species based on this paper, Chodkiewicz et al. (2015, 2018) and BirdLife International (2019). Explanation of symbols: (+) increase, (-) decrease, (0) stable, (?) unknown or uncertain.

Species	Regional population trends	National population trends	European population trends	Global population trends
Cygnus olor	+	0	+	+
Anser anser	+	+	+	+
Bucephala clangula	–	+	0	0
Aythya ferina	–	–	–	–
Aythya fuligula	–	–	0	0
Spatula querquedula	–	–	–	–
Spatula clypeata	–	–	0	–
Mareca strepera	+	+	+	+
Anas platyrhynchos	+	+	0	+
Anas crecca	–	?	?	?
Tachybaptus ruficollis	+	?	0/?	–
Podiceps grisegena	–	–	+	–
Podiceps cristatus	+	+	–	?
Podiceps nigricollis	–	–	?	?
Fulica atra	–	+	–	+

Global drops in bird populations are related to threats such as hunting, intensification of agriculture and aquaculture, climate change, pollution, invasive species, diseases, natural system modifications and other human activities (BirdLife International 2015). There are a few significant problems, which have determined the trends of birds in the Lublin region. A significant reason for the drop in the number of birds was the change in the management of the ponds as a result of ownership transformations in the 1990s, in Poland and other post-communist countries. The intensification of fishing production could have led to negative pond habitat modifications (Houdková, Musil 2003, Fox et al. 2016). As a result, the production area of the ponds was increased which caused a decreasing diversity of habitats, reduction of reed beds surface, increasing the depth of ponds and size of fish stocks and removal of islands. Furthermore the

large surface share of ponds with one- and two-year old fish and late term filling of fry ponds impacted food and nesting conditions and consequently the distribution and breeding success of waterbirds (Kloskowski, Nieoczym 2015, Nieoczym, Kloskowski, 2018). It is also worth mentioning that from the 1970s, fishponds surface area was increasing, but now there is also a disturbing gradual decline in their surface area in the Lublin region (Uziak, Turski 2008, GUS 2014, 2017). This is a result of abandoning fish farming, which usually leads to the ecological succession of these ponds or their transformation into farmlands and fruit plantations.

Afterwards, nestling predation of birds (mainly corvids, gulls and different diurnal birds of prey) and mammals (mainly mustelids, canids and domestic cats) is an important factor determining the breeding success of ducks, grebes and coots (Chylarecki et al. 2018). An invasion of American mink could have been harmful to birds in wetlands in the north and north-east of the region (Zalewski, Brzeziński 2014). The American minks have been regularly observed and captured on the ponds in Polesie Lubelskie and in the Valley of the Lower Wieprz (personal observations, unpublished data). The disappearance of gull colonies as a protective shield in some ponds was the main cause of the decline in the number of black-necked grebes and diving ducks (Wójciak et al. 2005, Fox et al. 2016, Chylarecki et al. 2018).

In the case of sparsely observed duck species the obtained trends are not certain because fishponds may not be optimal nesting habitats for them. Garganey and the northern shoveler prefer meadows in river valleys and teal inhabit often eutrophic, small, forest lakes, so they are uncommon in Lublin region (Wójciak et al. 2005, Sikora et al. 2007). In turn, goldeneye is not common in south-eastern Poland, occurring only on forest ponds of Polesie Lubelskie (Wójciak et al. 2005, Sikora et al. 2007). Little grebe prefers small, shallow, eutrophiced ponds with developed submerged and emerged vegetation (Sikora et al., 2007, Kloskowski et al. 2010). It is a hidden species, so the increasing number could be affected by the growing effectiveness of their detection (Chylarecki et al. 2018). In turn, great crested grebe prefers different types of larger water reservoirs and also inhabits ponds but, compared to other smaller grebes, with larger fish (Sikora et al. 2007, Kloskowski et al. 2010). Effective protection and increased European population could have a positive effect on greylag goose and mute swan in Poland (Chylarecki et al. 2018). However, the increase in the number and spread of these species can be negatively perceived by agricultural or fish farmers due to feeding on crops in the vicinity of ponds and grains destined for fish. Greylag goose has been observed mainly on large complexes of fish ponds with rich rush vegetation and grasslands near the breeding sites, in typical nesting and feeding habitat for this species (del Hoyo et al. 1992). Mute swan until the mid-twentieth century nested mainly on large lakes, then it began to prefer artificial reservoirs in Poland (Sikora et al. 2007). In the Lublin region, 23% of breeding sites of mute swan were recorded on lakes, and 59% on fish ponds (Wójciak et al. 2005).

Conclusions

The shown abundance trends of some described bird species breeding in south-eastern Poland coincide with the observed avifauna changes in Poland and Europe. Despite the decline in numbers, pochard, tufted duck and coot are still the dominant breeding species on fishponds. The drastic decrease in red-necked grebe and black-necked grebe is alarming. Unfavorable global quantitative changes should encourage international action to protect birds in their breeding habitats, resting and feeding areas during migration, and wintering. Consequently, it is recommended to continue the monitoring of waterbirds and to extend it to further waterbodies in the Lublin region and to undertake transboundary research and protection initiatives in cooperation with ornithological societies and research institutions from Belarus and Ukraine.

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