regionálních atlasech (Flousek & Gramsz 1999, Hromádko *et al*. 2005), umožňuje lépe zachytit proměnlivost výskytu a početnosti ptáků, která je daná mozaikovitostí studovaného území. Kromě údajů o prokázanosti hnízdění v jednotlivých kvadrátech síťových map přináší také odhad početnosti v celém území CHKO, charakteristiku výskytu a prostředí využívaného druhem na daném území a údaje o hnízdních hustotách v různých typech prostředí. Kvantitativní mapy pro jednotlivé druhy nejsou bohužel dosud zpracovány.

SUMMARY OF THE THESIS

In the thesis, regional data on bird communities were studied in terms of species richness and occurrence of bird species in dependence on habitat and, in case of wintering birds, also on climatic conditions. The regional grid atlas of Prague (Fuchs *et al*. 2002), records from Wintering waterbird census in Central Bohemia, own data on the breeding population of the Mute Swan in the Třeboň region and data from individual marking of Mute Swans provided by the Bird Ringing Centre of the National Museum were used as the sources of data on the occurrence and abundance of bird species. The thesis also includes a part of the text of the prepared Atlas of breeding distribution of birds in the Třeboň region.

The first contribution (**Mourková J., Fuchs R., Sedláček O., Janovský Z., Exnerová A., Škopek J. & Formánek J. (in prep.): Bird species richness in urban environment: increased habitat diversity or natural refuges?**) is aimed at the analysis of factors affecting diversity of urban avifauna. The main issue was whether the species richness of birds is increased rather by the area of refuges of natural habitats or by habitat heterogeneity. Another question was whether the decline of species richness of the urban avifauna from the outskirts towards the city centre is caused by isolation from the surrounding landscape or whether this phenomenon is related to the composition and heterogeneity of the habitat. In the analysis of the effect of composition and diversity on bird communities, the Atlas of breeding distribution of birds of Prague (Fuchs *et al*. 2002), based on the data set gathered during mapping of breeding distribution of birds in Prague (1985-89), was used. A detailed description of the habitat was made using the additionally obtained aerial photos of the particular grid cells (from the 1990s). The habitat composition was described in a very complex way by three different methods: *habitat elements, rough habitat types* and *fine habitat types*; expressing relative proportion of each habitat category in particular grid cells. The overall diversity of habitats in grid cells was calculated using the Shannon-Wiener index (H') for each method of habitat description We found that the bird species richness is affected mainly by environment composition, with fragments of semi-natural environment (i.e. forest and wetland habitats) being the most important. However, habitat diversity is also of high importance, sugesting all habitat types contain some specific bird species and exceptional heterogeneity of habitats, even those supporting fewer bird species, enhances the overall bird species diversity in grid cells The only spatial gradient (the number of species increases from the northwest to southeast) suggests the effect of distribution of source populations in the surrounding landscape. No influence of cell position on the urban gradient was found. The decline in the number of species towards the city centre can thus be explained totally by habitat composition. Unlike the situation in some other cities (Clergeau *et al*. 2001, Fernández-Juricic & Jokimäki 2001, Garaffa *et al*. 2009), isolation of the centre of Prague from the surrounding

landscape does not play an important role, probably due to the abundant occurrence of trees and bushes not only in parks, but also scattered in the built-up areas. The study also brings an important methodological finding that using rough habitat types (settlements, woodlands, grasslands, wetlands) is the most suitable way how to describe the environment for the prediction of bird species diversity (in grad cells approximately 1x1 km). Rough habitat types can be easily obtained additionally from maps or orthophotomaps to the published atlases. Surprisingly, although a relatively high number of grid cell atlases for European cities have been published (Montier 1977, Witt 1984, Degen & Otto 1988, Dinetti & Ascarni 1990, Iankov 1992, Dinetti 1994, Luniak et al. 2001, Fuchs et al. 2002, Witt et al. 2005, Wichmann et al. 2009), none of them has been analysed in detail so far. In this respect, our contribution can be considered important for the understanding of patterns of distribution of urban avifauna diversity.

Other two contributions are aimed at breeding biology of the Mute Swan, projecting over to population ecology of the species. In the second half of the 20th century, the Mute Swan experienced a significant range expansion throughout Europe, together with dramatic changes in numbers (see Wieloch 1991, Hora 1994, Fišerová 2002 for a review). The species is thus very interesting from the population biology point of view. In addition, the Mute Swan was studied in detail in the Czech Republic at the time of its population maximum (Hora 1984, 1985, 1987, 1990). Among others, Hora (1990) described in detail breeding parameters and nest losses, enabling comparison of reproduction parameters in the 1980s (at the time of dramatic growth of the population and reaching population maximum) with the data from the turn of the millennium, when the total abundance is fluctuating or even stable (Hora 1995, 1996, Svobodová & Rešl 2000, Fišerová 2002, Svobodová & Rešl 2002).

My study has resulted in two papers, one of them is aimed at habitat preference shown by the breeding (territorial) and non-breeding (non-territorial) components of the population (**Fišerová J., Musil P. & Šizling A.L. 2003: Labuť velká (*Cygnus olor*) - preference prostředí v hnízdním období na Třeboňsku, *Sylvia* 39: 107-118**.), and the other one compares reproduction parameters in the years 1999-2001 with the data from the 1980s and specifies a probable mechanism of stabilisation of the Mute Swan population (**Mourková J. (subm.) Breeding ecology of the Mute Swan (*Cygnus olor*) in southern Bohemia (Czech Republic) in 1999-2001 - breeding biology, hatching success and survival rate of the young. *Acta Biologica Universitatis Daugavpiliensis*.).**

Considering the wide range of habitats inhabited by the Mute Swan, the lack of breeding possibilities is unlikely to be the reason for population decline of the species (unlike the situation in the 1980s). Based on the analysis of habitat preferences in the Třeboň region in 1999-2001, I can conclude that breeding Mute Swans are nowadays more selective than in the period of population growth, inhabiting mostly sites with safe nesting possibilities and with the supposed high food availability at the time of brood rearing. Previous experience of the pair also plays an important role, as the species shows high breeding site fidelity. Non-breeding Mute Swans aggregated in large flocks during moulting were found mainly at large fishponds. The difference in site choice can be caused by lower energetic costs during territory defence at smaller fishponds, where display is often sufficient to discourage another pair from landing in the territory, while at large fishponds, used also by non-breeding Mute Swans, it is necessary to spend more time and energy defending the territory. Non-breeding Mute Swans are not territorial and usually stay in large flocks, probably to achieve higher safety during moulting when unable to fly.

Breeding parameters (clutch size and nest losses) did not change between the period of population growth in the 1980s and the period studied in this thesis. Considering the

intensification of fishpond management since the 1980s, which affected negatively the numbers of many waterbird species (Bejček *et al* 1990, Musil 2000), I expected lower survival of very small juveniles and/or higher nest losses. However, the proportion of unsuccessful nests did not differ from that recorded in the 1980s. According to my data, survival of the young was very high (87.3 % until the 6th week of life) and it does not seem to play an important role in population stabilisation. Markedly high mortality in other age categories is also unlikely, the species shows very high annual survival of adults (more than 92 %, Perrins 1991). The mechanism of population stabilisation seems to be lower proportion of adults engaged in breeding in particular years. This is also suggested by the data on higher proportion of non-breeding adults in the years 2000-2001 in comparison with the 1980s (Svobodová & Rešl 2002).

The latter two contributions are followed by the related analysis of **Mute Swan *Cygnus olor*** ringing data, published **in the Czech and Slovak Bird Migration Atlas.** Among others, the analysis documents low level of immigration and emigration in the Czech breeding population. Migration behaviour of the species (66 % of the individuals winter less than 50 km from their breeding site), strong breeding and natal site fidelity are also described in the contribution. Mortality causes and annual distribution of mortality of the species were also analysed. Large number of available recoveries in the Mute Swan enables to track some movements of individuals during their life, which is demonstrated on several examples.

The following three contributions are based on the data from Wintering waterbird census at the Vltava river in Prague and Central Bohemia. In contrast to the International Waterbird Census (Gillisen *et al*. 2002), this programme is carried out in regular intervals several times during the winter season, enabling to monitor interseasonal changes in abundance as well as intraseasonal course of wintering.

The contribution **Bílý M., Mourková J., Bergmann P. 2008: Spatial distribution and habitat preferences of wintering waterfowl in central Bohemia. *Acta zoologica Academiae Scientarium Hungaricae* 54 (Suppl 1), 95-109.** describes seasonal dynamics, habitat and site choice by particular species in two winters differing significantly by weather conditions (2003/04 and 2004/05). Data from central-Bohemian sections of the Vltava, Labe, Berounka and Litavka rivers (altogether 270 km of the river course) and selected standing-water sites (31 localities) were analysed. The sites were characterised by the composition of the surrounding landscape, flow rate, slope of the river and chemical composition of water in the case of river sections; and by composition of the surrounding landscape and altitude in the case of standing water, respectively.

Data on two selected species are summarised in the contribution **Mourková J., Bergmann P. & Bílý M. 2009: Zimování slípky zelenonohé (*Gallinula chloropus*) a lysky černé (*Fulica atra*) ve středních Čechách (1995 - 2007) a v Praze (1970-2007), *Sylvia* 45: 121-136.** In the paper, interseasonal changes in abundance at an urban wintering site at the Vltava river in Prague are compared with other data from Central Bohemia, and the effect of air temperature on interseasonal changes in abundance is assessed. Intraseasonal dynamics of the study species are discussed marginally.

Many current studies are focussed on the effect of climate changes (NAO, or air temperature - Ridgill & Fox 1990, Musilová *et al*. 2009b), food availability (Suter & Van Eerden 1992, Werner *et al*. 2005, Schmieder *et al*. 2006) or other factors on interseasonal changes in abundance and distribution of particular species, however, mechanisms affecting intraseasonal dynamics are mostly neglected. The following paper **Mourková J., Bílý M., Bell C., Bergmann P., & Šizling A.L. (subm.): Factors affecting wintering abundance patterns of**

central European water birds in Prague, ***Bird Study***. is an extensive analysis of a complete time line (9 checks per winter for the period of 16 years) of data from a wintering site at the Vltava river in Prague. The main issue was whether the intraseasonal dynamics of wintering species are rather species stable and locally specific or whether they are determined by weather conditions of the particular winter, and whether they are affected rather by local or distant conditions (e.g. at breeding sites and on migration routes). The effect of air temperature in central Europe (Prague), in regions with oceanic climate (Gdansk) and regions with continental climate (Moscow) and the effect of river flow at the Prague wintering site on intraseasonal dynamics of particular species at the Vltava river in Prague was analysed.
The stable component of seasonal dynamics was recorded in all common species. Seasonal dynamics of particular species was most often affected by the course of air temperature during the winter in Gdansk and Prague, other factors played a less important role. The species reacting to weather conditions in a similar way shared similar foraging behaviour and, to a smaller extent, areas of origin of populations wintering in the Czech Republic.

The thesis includes a part of the manuscript of the **Cepák J., Mourková J., Storch D., Zárybnický J. (in prep.): Atlas of breeding distribution of birds in the Třeboň region.** an original monograph (so far an incomplete manuscript), bringing detailed data on the distribution and abundance of particular bird species in the Třeboňsko Protected Landscape Area in 2001-2004. In contrast to most regional atlases in the Czech Republic, it is based on original data collected in a finer grid (ca 2.9x2.8 km). The used scale, the same as in some other regional atlases (Flousek & Gramsz 1999, Hromádko *et al*. 2005), enables to record better the variability of occurrence and abundance of birds, which is a result of patchiness of the study area. Besides the data on confirmed breeding in particular cells of the grid maps, the atlas also provides estimates of abundance in the whole PLA, characteristics of occurrence and of the habitat used by the particular species in the study area, and data on breeding densities in different habitat types. We also plan to prepare quantitative maps for particular species.

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