CHANGES IN THE ABUNDANCE OF THE LESSER SPOTTED EAGLE (*AQUILA POMARINA*) BREEDING POPULATION IN LITHUANIA IN 1980–2006

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Abstract. In the mid-20 century, Lesser Spotted Eagle (*Aquila pomarina*) was considered to be one of the most abundant species among the birds of prey in the forests of Lithuania. The estimates of the national population changed from 300–500 to 1,500–1,800 pairs in 1994 and 2005, respectively. Changes in the population estimates did not reflect the actual population trend, but rather the level of investigation of the species in the country. In reality, the current status of the species' population is unknown due to the lack of regular, nationwide monitoring. The aim of this work was to estimate the status of the Lesser Spotted Eagle population in Lithuania. Field studies in 10 sample plots in various regions of Lithuania during the period 2003–2006 showed that the number of breeding pairs declined by 31% on average as compared to the period 1980–1998. We suggest that the population of Lesser Spotted Eagle decreased by 26% across the country during the period 1980–2006. Possible reasons of such decline are discussed in this study.

Key words: *Aquila pomarina*, population decline, breeding habitats, Lithuania

INTRODUCTION

In the mid-20 century, Lesser Spotted Eagle (*Aquila pomarina*) was considered to be the second most common raptor in Lithuania after Common Buzzard (*Buteo buteo*) (Ivanauskas 1959). At present, Lesser Spotted Eagle still remains one of the most abundant birds of prey distributed in all regions of the country (Drobelis 2004). The estimates of the population for 1994–2001 changed from 300–500 to 900–1,200 pairs (Treinys & Dementavičius 2004). Recent studies (2001–2005) suggest that 1,500–1,800 pairs breed in Lithuania (Treinys 2005). However, the increasing estimates of the population reflect the level of investigation of the species in the country rather than the actual population trend (Kurlavičius & Raudonikis 2001).

Transition to the market economy and restoration of private land property during the recent 15 years have brought about dramatic changes in the national forest and agriculture sector, which might have affected the population of Lesser Spotted Eagle. No changes in the species' productivity were recorded during the study

period, except those in nest-site selection and foraging habits (Treinys & Dementavičius 2004; Treinys & Mozgeris 2006). The lack of coordinated and nationwide monitoring did not allow to evaluate the actual population trend. The study for this reason aims to summarise the earliest and the most recent data on the trends of the Lesser Spotted Eagle population in Lithuania over the last few decades.

MATERIAL AND METHODS

Fieldwork data covered mainly two periods, 1980–1998 and 2003–2006. During the first period, data on the number of breeding pairs were obtained in 10 sample plots (Fig. 1). There are no precise records on the population trends in these territories for 1980–1998 due to irregular and fragmentary studies. Thus, the most detailed data of the earlier period were used. To estimate the current number of pairs, the mapping of the breeding territories and nesting sites of Lesser Spotted Eagle was repeatedly made in these sample plots for 2003–2006. Variations in the number of pairs in a

Figure 1. The distribution sample plots.

particular sample plot were evaluated based on three categories: decreased, increased or stable.

The loss of foraging and breeding habitats is known to be a crucial factor to Lesser Spotted Eagle (Meyburg *et al.* 2001). Larger birds of prey can expel smaller species from the territories suitable for breeding (Newton 2003). In order to discuss possible reasons for variations in the number of pairs, three factors were

taken into account in each sample plot: changes in breeding and foraging habitats, and interspecific competition. The factors were grouped into relative categories based on our observations in sample plots (Table 1).

The Chi-square method was used to determine whether at least one of the three factors correlated with changes in the number of pairs in a sample plot.

RESULTS

The number of pairs in seven sample plots declined, whereas in the other three it remained stable (the local population status in the Labūnava plot was considered as 'stable' despite the fact that the maximum number was lower). The number of breeding pairs in the investigated forests currently decreased by 27–33% (31% on average) as compared to the records of previous studies.

A lower number of Lesser Spotted Eagle pairs in all sample plots was significantly correlated only with the breeding of White-tailed Eagle (*Haliaeetus albicilla*) ($p = 0.038$), whereas no statistically significant correlation was found between the declining number of pairs, the intensity of cuttings and the status of foraging habitats.

Table 1. The evaluated factor, its category and substantiation.

Factor	Category	Substantiation
Breeding habitats	Intensive cuttings	Sample plots with dominating commercial forests. The intensity of cuttings has increased twice since 1993 annually covering >200 000 hectares of forests (DFPA 2001)
	Non-intensive cuttings	Sample plots located in protected areas, where the cutting is less intensive than in commercial forests
	Cuttings are minor or absent	Sample plots with minor or no clear cutting (strict nature reserves and management reserves)
Foraging habitats	Reduced	Sample plots with overgrown or transformed meadows (meadows are important foraging habitats for Lesser Spotted Eagle in all distribution range, Vali <i>et al.</i> 2004)
	Improved or no changes recorded	Sample plots with no visible changes in foraging habitats or with an improved state of open foraging areas (the increased cover of fallows and meadows)
Breeding of an interspecific competitor	Breeds	Lesser Spotted Eagle actively responds to White-tailed Eagle (<i>Haliaeetus albicilla</i>) (personal observations). This species is known to prey on the nestlings of bird of prey species (Dementavičius 2004)
	Does not breed	Sample plots have no breeding White-tailed Eagles

Table 2. The sample plot, number of Lesser Spotted Eagle pairs in 1980–1998 and 2003–2006, local population status, breeding cases of White-tailed Eagle, status of nesting and foraging habitats.

Sample plot, area	The number of Lesser Spotted Eagle pairs in 1980–1998	The number of Lesser Spotted Eagle pairs in 2003–2006	Population status	The beginning of the White-tailed Eagle breeding attempts	Nesting habitats	Foraging habitats
1. Žalgiriai, 800 ha	3–4	2	Decreased	1993	Cuttings are minor or absent	Remained stable or improved
2. Lančiūnava, 1,500 ha	10	5–6	Decreased	1994	Intensive cuttings	Reduced
3. Labūnava, 800 ha	5–7	5–6	Stable	No	Intensive cuttings	Remained stable or improved
4. Puzaičiai, 300 ha	2–3	2–3	Stable	No	Intensive cuttings	Remained stable or improved
5. Čepkeliai, 10,000 ha	2–3	1	Decreased	1985	Cuttings are minor or absent	Reduced
6. Barauka, 200 ha	1	0	Decreased	1995	Intensive cuttings	Remained stable or improved
7. Dusetos, 800 ha	1	0	Decreased	1994	Non-intensive cuttings	Remained stable or improved
8. Lūžai, 200 ha	3–4	2	Decreased	No	Non-intensive cuttings	Remained stable or improved
9. Burbiškis, 200 ha	3–4	4	Stable	No	Intensive cuttings	Remained stable or improved
10. Ažvinčiai, 5,000 ha	5	4	Decreased	No	Non-intensive cuttings	Remained stable or improved
Total	35–42	25–28				

DISCUSSION

Data quality

The investigated areas were comparatively small with compact and mostly isolated forests. This enabled to do relatively accurate estimates of the number of pairs, which would be complicated to do in the area of several hundred square kilometres. Moreover, field studies also involved the period of 2005–2006 characterised by the largest number of successful breeding pairs. This facilitated the mapping of eagle individual territories and nests.

During the earlier period, mostly the method of nest mapping in winter and nest checking in summer was employed. This method excluded registration of single territorial eagles, non-breeding pairs or pairs that experienced unsuccessful breeding early in the season (only 60% of pairs breed successfully each year: Treinys & Dementavičius 2004; Bergmanis *et al.* 2006). This explains why this method fails each year to detect all occupied breeding territories. For methodical consistency, only nesting pairs were counted in each of the territory for the period 2003–2006. Single territorial birds and territorial non-breeding pairs were not

involved in this analysis. For the above-mentioned reasons, we assume that our data are not biased by natural factors or methodical differences and reflect the actual population trend. However, we can't exclude the possibility that the decline was overestimated because of the previously used method. This could be the case if during this period the proportion between breeding and non-breeding pairs had changed. Since only the number of breeding pairs was counted during both periods, the share of non-breeders increased and, consequently, this was considered a decline.

Population trend

Our study revealed a decline in the Lesser Spotted Eagle population, but the essential question how the number of Lesser Spotted Eagle pairs has changed in Lithuania still remains open. In the Lančiūnava sample plot, the number of pairs (decreasing since 1997–1998, the authors' observation) markedly decreased (Table 2). Intensive clear cuttings have been taking place in this area and the meadows have been transformed into cultivated fields since 1996–1997. White-tailed Eagle that preys on the fledglings of birds of prey (Dementavičius 2004) was observed to breed in the above site in about 1994 (D. Dementavičius, pers. comm.). The coincidence of all negative factors could account for such a sharp decline in the Lesser Spotted Eagle population in this sample plot. Consequently, we made the assumption that the Lančiūnava sample plot was not representative and excluded it from analysis. The remaining nine sample plots revealed a decline of 20–31% (26% on average) in the number of Lesser Spotted Eagle pairs. The nine sample plots are located in different regions of Lithuania, therefore they are not impacted by specific natural conditions or landscape use peculiarities. Thus, we suggest that a similar decline (about 26%) in the Lesser Spotted Eagle population has occurred in throughout Lithuania.

Data of our previous studies include records of different years, therefore it remains unknown when exactly the population decline started. Lesser Spotted Eagle is very attached to individual breeding territories (Vali 2003; Drobėlis 2004), therefore territory abandonment is a long-lasting process (Sheller *et al.* 2001; U. Bergmanis, pers. comm.). Birds abandon their territory in the following succession: rare breeding pairs, non-breeding pairs and lastly single territorial birds. Thus, the species responds to natural or anthropogenic changes in habitats with a lag of several years. During the period 2001–2006, we found territories occupied by single birds and pairs that failed to produce offspring for several years. We also found territories that had been abandoned for a number of years. As a re-

sult, we make the assumption that our results reflect an accomplished or continuing population decline since 1980–2006.

A population decline was also recorded in Latvia (19%, Bergmanis *et al.* 2006) and Germany (Meyburg *et al.* 2004). Although in some countries the population remains stable, the European status of the species is evaluated as declining (for the situation in different countries see Burfield & van Bommel 2004).

Possible reasons

The breeding density of raptors in the breeding areas are largely affected by two resources: food and nesting sites. In particular cases, the breeding density is limited by a minor resource (Newton 2003). The decline of the Lesser Spotted Eagle population in Latvia is associated with the loss of nesting sites due to intensive clear cutting in private forests, another important reason is the overgrowth of meadows after they are abandoned (Bergmanis *et al.* 2006). Over a 2003–2006 period, 18% ($n = 99$) of Lesser Spotted Eagle nesting sites or their protection zones were affected by forestry activities in Lithuania. A decline in the number of pairs in each of the investigated sites is likely to be related to different factors – intensive cuttings in some places and overgrown or cultivated meadows in others. The breeding density of raptors can be limited by interspecific competition for food, predation factor (larger animals hunt smaller animals) or because smaller species avoid larger species (Newton 2003). Larger species can settle in the territories of smaller species (Hakkarainen *et al.* 2004) or smaller species breed at a specific distance from larger species' nests (Sergio *et al.* 2003). White-tailed Eagles in Lithuania have restarted breeding since 1987 and nowadays a total of 80–90 pairs breed in the country (D. Dementavičius, pers. comm.). The number of Lesser Spotted Eagle pairs have declined in all sample plots ($n = 5$) that contain breeding White-tailed Eagle. The smallest observed distance between successful nests of White-tailed and Lesser Spotted Eagles was 500 m. In the other location, where the distance between the nests of both species was 370 m, breeding attempts were unsuccessful for both eagles during the same year of the five-year period. Aggressive behaviour of Lesser Spotted Eagle was also often observed when White-tailed Eagle intruded into its territory. We presume that the neighbourhood of White-tailed Eagle, along with the loss of meadows and intensive forest cutting, has impact on the spatial distribution of the individual breeding territories of Lesser Spotted Eagle and diminishes the number of sites suitable for breeding. Lesser Spotted Eagle, however, has also abandoned territories with

remaining nesting sites and apparently unchanged foraging conditions, including those vacant from larger birds of prey. The size of a migratory bird population can be affected by the factors on breeding or wintering grounds, or both (Newton 2004). Lesser Spotted Eagle is a long-distance migrant and spends half of the year outside breeding habitats (Meyburg *et al.* 2001). The species constantly faces the risk of being shot during migration (Meyburg *et al.* 2001) or perish due to unfavourable natural conditions (Meyburg *et al.* 2002), whereas the future population trend of long-living individuals is mostly related to adult survival rate (Baltontin *et al.* 2003). Lesser Spotted Eagle, as other territorial birds of prey, occupy habitats of different quality (Baltontin *et al.* 2003; Ferrer & Bisson 2003), but population decline results in increased selectivity for habitats (Lohmus 2001). This may lead to the abandonment of low-quality territories (poor foraging and breeding conditions, interspecies competition, proximity of anthropogenic elements, etc.), because predatory bird species tend to occupy habitats of higher quality as soon as they become free (Ferrer & Bisson 2003).

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ERELIO RĖKSNIO (*AQUILA POMARINA*) POPULIACIJOS KAITA LIETUVOJE 1980–2006

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SANTRAUKA

20 amžiaus viduryje buvo manoma, kad erelis rėksnys yra viena gausiausių plėšriųjų paukščių rūšių Lietuvoje. Populiacijos įvertinimas kito nuo 300–500 porų 1994, iki 1500–1800 porų 2005. Tačiau didėjantis populiacijos įvertinimas atspindėjo ne realų populiacijos pokytį, bet ištirtumą šalyje. Tikrasis populiacijos statusas iki šiol buvo nežinomas, nes šalyje nebuvo vykdytas nuolatinis rūšies gausumo monitoringas. Šio darbo tikslas buvo nustatyti erelio rėksnio populiacijos statusą Lietuvoje. Lauko darbų metu 2003–2006 dešimtyje tyrimo plotų, esančių įvairiose šalies vietose, perėjo vidutiniškai 31% porų mažiau nei 1980–1998. Manome, kad visoje šalyje perinčių erelių rėksnių porų skaičius galėjo sumažėti 26% per 1980–2006 metų laikotarpį. Straipsnyje aptartos galimos sumažėjimo priežastys.

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