Breeding raptors and owls at Halinga, SW Estonia, in 1978–1989

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Received 27 September 1990, accepted 14 December 1991

Introduction

The numbers of raptors and owls were studied at Halinga, Pärnu region, SW Estonia in 1978–1989. The study area (about 220 km^2) is surrounded on three sides by large mire complexes, one of these partly (45 km^2) extending into the study area. Forests cover 45 km^2 (mainly in the western part) and cultivated land 130 km^2.

During the study years, the size and borders of the area have been the same. The environment has also remained more or less unchanged (no large clear-cut areas, no large-scale reclamations, etc.). Thus no substantial changes in the environmental conditions can be expected to have occurred for breeding birds . In 1980, about 30 km^2 in the western part of the study area became depopulated.

Methods

Birds were censused by the same method throughout the study period. Assisted by two to three observers, I dedicated about 250 hours per year to the field work. This amount of work was less than in similar projects in Finland (Saurola 1986).

In spring, hooting owls and displaying diurnal raptors were recorded. We used these data and the observations of the feeding flights in trying to locate the nests. We checked artificial nests (N = 6) and nest-boxes (N = up to 25). We also checked old *Corvus corone* or *C. corax* nests because *Falco* species depend on them. As, for example, *Accipiter gentilis* and *Aquila* species repeatedly use old nests or nests nearby, these were checked regularly.

A territory was considered to be occupied if a nest was found, recently fledged juveniles were observed or at least three observations were made in a presumed nesting site (for Strigidae, at least two records of territorial hooting in a presumed nesting site). These criteria were often supported by observations of aerial display.

If single birds held a nest, the territory was not considered to be occupied and they were excluded from Table 1.

These criteria have enabled me to present the minimum numbers of raptors and owls, except for the *Aquila* species whose numbers are absolute. Due to too few hours of field work, the numbers of *Pernis apivorus* and *Accipiter nisus,* in particular, are underestimates. The numbers of *Buteo buteo* and *Asio otus* may have been underestimated in the four first seasons and in 1978 some other species may also have been underestimated.

Species composition

The number of breeding species varied from year to year between 8 and 14 (Table 1). Altogether 18 breeding species were recorded in 1978–1989. Of these, *Aquila pomarina*, *Circus cyaneus*, *Circus aeruginosus*, *Falco columbarius*, *Asio flammeus* and *Aegolius funereus* bred in the study area only irregularly. The number of breeding species increased significantly during the study (Spearman's rank correlation coefficient $r_s = 0.74$, $P < 0.005$).

Breeding density

The densities of raptors and owls in various study areas are compared in Table 2. Though studies similar to that at Halinga have been carried out in two other areas in Estonia, these unpublished data cannot be used. The data for Strigidae come from Kõrvemaa Landscape Reserve, North Estonia, from 1976–1982 (Randla 1985).

The Kuldiga study area (103 km^2, 43 km^2 forests) lies in Western Latvia (Ķemlers & Ķemlers 1990). For better comparability, only data from 1980–1987 from that area have been used. The Finnish data express the average densities of raptors and owls (Koskimies 1989). Depending on the suitability of habitats and the abundance of rodents, the densities may be considerably higher.

Population fluctuations

The variation in the population size was characterized by the coefficient of variation (CV).

The largest fluctuations were noted for the vole specialists (*A. otus* CV = 106%; *Falco tinnunculus* 95%). The variation in *Strix uralensis* numbers appeared to be particularly great (96%), but this was mainly due to the increasing trend.

The numbers of the most characteristic species of the study area proved to be the most stable: *A. nisus* (CV = 52%), *Falco subbuteo*

Table 1. Number of territories of raptors and owls at Halinga study area (220 km^2).

Species	Years											
	78	79	80	81	82	83	84	85	86	87	88	89
Pernis apivorus	1	1	1	–	1	1	1	–	–	1	1	1
Circus aeruginosus	–	–	–	–	–	–	–	–	1	–	–	1
Circus cyaneus	–	–	–	–	–	–	–	2	–	2	–	1
Circus pygargus	3	4	3	3	2	2	1	1	2	1	3	2
Accipiter gentilis	3	3	3	–	3	2	1	1	1	1	2	2
Accipiter nisus	1	3	1	2	1	3	2	4	1	3	2	1
Buteo buteo	7	12	12	8	16	18	16	19	20	17	15	16
Aquila pomarina	1	–	–	–	1	–	–	–	–	–	1	1
Aquila chrysaetos	–	–	–	–	1	1	1	1	1	1	1	1
Falco tinnunculus	–	1	–	2	3	1	–	1	2	1	–	1
Falco columbarius	–	1	1	–	–	1	–	1	1	–	–	–
Falco subbuteo	1	3	1	1	2	2	4	3	3	2	1	3
Bubo bubo	–	1	1	2	3	2	2	1	1	1	2	1
Strix aluco	4	4	3	3	5	7	3	5	4	2	5	4
Strix uralensis	–	–	–	1	2	1	4	3	5	6	7	9
Asio otus	–	1	–	–	2	3	1	7	6	3	1	2
Asio flammeus	–	–	–	–	–	–	–	–	–	–	–	1
Aegolius funerus	–	–	1	–	–	–	–	1	–	–	–	–
Total	21	34	27	22	42	44	36	50	48	41	41	47

(48%), *Circus pygargus* (47%), *B. buteo* (45%) and *Strix aluco* (32%).

Population trends

Statistically significant increasing trends were obtained for both owls ($r_s = 0.85$; $P < 0.01$) and diurnal raptors ($r_s = 0.54$; $P < 0.05$). The number of *B. buteo* ($r_s = 0.63$; $P < 0.05$) and *S. uralensis* ($r_s = -0.97$; $P < 0.001$) increased significantly. The continuing increase of the latter species began in 1981, when the first pair settled in the study area. The increasing trends of *B. buteo* and *A. otus* may be unreliable, as their detectability in the firs study years was probably lower than later on.

Discussion

The results cannot be generalized for the whole of Estonia,but, although local, they can be considered typical of Western (Lowland) Estonia.

The relatively low percentage of forests (ca 20%; similar to that in the whole region) causes absence or irregular breeding and low densities of many species typical of large expanses of forest (*A. gentilis, A. pomarina, Glaucidium passerinum, A. funereus* etc.). Such agricultural landscapes seem chiefly to favour *B. buteo*, which had the highest frequency (33–44% of all breeding pairs). At the same time, the density of *B. buteo* was not even in the study area: 12–15 pairs per 100 km² bred in the eastern part (intensively farmed ground with patches of woodland), while only single pairs inhabited the brush (former pastures) and uniform pine-woods of the western part.

The numbers of *S. uralensis* have evidently increased both in the study area and in Estonia as a whole. In the 1940s and 1950s the density of this species in the present Kõrvemaa Landscape Reserve was estimated at 1.9 pairs per 100 km² (Mank 1962), by 1976–82 it was already 2.0–5.3 pairs per 100 km² (Randla 1985). No clear reason is known for the population increase of *S. uralensis* .The numbers have not been influenced by the nest-boxes set up in the study area (3 since 1978, 11 more since 1980 and an additional 11 since 1983), as only one nest-box has been occupied permanently by this species and another has been used occasionally.

One possible explanation of the increase of *S. uralensis* may lie in the relationships of *Aquila chrysaetos, Bubo bubo* and *Strix uralensis*. In 1982, *A. chrysaetos* occupied a territory in the western part of the study area where *B. bubo* used to breed, and since 1984 *B. bubo* has not been recorded there any more. At the same time the number of breeding *S. uralensis* pairs increased from

Table 2. Comparison of densities (pairs/100 km²) of raptors and owls between Halinga, Kõrvemaa (Estonia), Kuldiga (Latvia) and Finland. Sources: Halinga = this study, Kõrvemaa = Randla 1985, Kuldiga = Ķemlers & Ķemlers 1990 and Finland = Koskimies 1989.

Species	Halinga	Kõrvemaa	Kuldiga	Finland
Pernis apivorus	0.0–0.5		1.9–2.9	2–5
Circus pygargus	0.5–1.8		–	–
Accipiter gentilis	0.0–1.4		2.9–3.8	2–4
Accipiter nisus	0.5–1.8		2.9–3.8	4–8
Buteo buteo	3.2–9.1		22.3–26.2	3–6
Falco tinnunculus	0.0–1.4		–	1–2
Falco subbuteo	0.5–1.8		1.9–2.9	1–3
Bubo bubo	0.0–1.4	0.7		2–4
Strix aluco	0.9–3.2	–		3–7
Strix uralensis	0.0–4.1	2.0–5.3		2–5
Asio otus	0.0–3.2	–		2

1 to 2–4. Suggestions that *B. bubo* prevents the increase of *S. uralensis* have been made in Finland (Saurola 1985, Koskimies 1989).

Competition for both nesting and feeding sites was observed between *C. cyaneus* and *C. pygargus* (cf. Table 1), and competition for nesting sites between *F. subbuteo* and *F. columbarius* (the two latter species breed mainly in old *C. corone* nests).

A. gentilis has suffered heavy persecution by humans, who destroyed 25% of the nests. However, persecution is not thought to have caused a notable decrease in the population of this species (Saurola 1985).

Acknowledgements. Many thanks are due to Agu Leivits for the great help in preparing this manuscript and Eerik Leibak for translation of the text. For valuable comments on earlier drafts I am indebted to Olli Järvinen, Hannu Pietiäinen and Tapio Solonen.

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