Finnish birds of prey: status and population changes

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Information on the sizes and trends of the Finnish populations of raptors and owls is updated on the basis of an inquiry sent to specialists (54) on birds of prey in 22 different areas. Many of the estimates given for Finnish raptors and owls in the literature must be corrected; in some cases even the order of magnitude is wrong (e.g. the Sparrowhawk). The changes in the populations are poorly known for most of the Finnish birds of prey. Due to protection, the White-tailed Eagle, Sparrowhawk, Golden Eagle, Osprey, Peregrine and Eagle Owl have slowly recovered during the last few years. On the other hand, the Kestrel is decreasing dramatically throughout the country, the Goshawk is declining in southern Finland and the Merlin is probably decreasing in northern Finland. A country-wide monitoring study on raptors and owls is recommended.

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Introduction

Reliable information on the numbers and changes in raptor and owl populations is needed not only for scientific but also for conservational purposes. Censuses of raptor and owl populations are laborious, however (see Fuller & Mosher 1981, Forsman & Solonen 1984, Saurola 1985), and most of the population estimates for birds of prey lack a solid foundation. The only exceptions on a country-wide scale in Finland are four endangered or rare species which have been studied in detail: the White-tailed Eagle *Haliaetus albicilla* (Stjernberg 1983), Golden Eagle *Aquila chrysaetos* (Salminen & Sulkava 1976), Peregrine *Falco peregrinus* (Wikman 1983) and Osprey *Pandion haliaetus* (Saurola 1983b).

In spite of the scanty data, repeated estimates have been made of the sizes of the populations of birds of prey in most of the European countries (see e.g., Bijleveld 1974, Cramp et al. 1983, Gensbøl 1984). Inaccurate estimates, possibly even including errors in the orders of magnitude, may nevertheless encourage other scientists to collect more reliable data and to present improved figures.

Population estimates for Finnish raptors and owls have been given by Merikallio (1958), Bergman (1977) and several of the authors of the Finnish Bird Atlas (Hyytiä et al. 1983). As regards changes in the populations of Finnish birds of prey, Kuusela (1979b) and Saurola (1983a) have already pointed out that accurate information on this subject is also surprisingly scanty. In this paper I attempt to update the information available and to encourage Finnish ornithologists to renew their endeavours.

Material and methods

This study is based on an inquiry sent to ornithologists specializing on birds of prey in 22 (30) areas in Finland. These are, with one exception (Ylitornio in area 21 and not in 22), identical to the data collecting areas of the local ornithological societies in Finland (Fig. 1). The inquiry was sent after the field season of 1984, so that no field studies were carried out especially for this paper. Each local specialist was asked: 1) to give the best estimates (one or two figures) of the populations of all the birds of prey breeding in the area, 2) to report on long term trends, if known, and 3) to explain the data basis used for the estimates.

The areas and the 54 ornithologists were:

1) Åland: Lasse Laine and Torsten Stjernberg assisted by Göran Andersson and Göran Sjuls;
2) Varsinais-Suomi: Juhani Karhumäki assisted by Esko Gustafsson, Seppo Pekkala, Seppo Aspelund, Henry Laine, Pekka Siitonen and Unto Laine;
3) Länsi-Uusimaa: Dick Forsman (see also Solonen 1984);
4) Itä-Uusimaa: Lasse Härö;
5) Kymenlaakso: Seppo Grönlund assisted by Lauri Leikkonen;
6) Etelä-Karjala: Esa Sojamo;
7) Kanta-Häme: Juhani Koivu, Jouko Alhainen and Väinö Valkeila;
8) Päijät-Häme: Heikki Kolunen and Hannu Pietiäinen;
9) Satakunta: Jaakko Reponen assisted by Pertti Kalinainen, Kalevi Mattila and Tapio Niemi;
10) Pirkanmaa: Jyrki Savolainen (raptors) and Martti Lagerström (owls);
11) Mikkeli: Jouko Mättö assisted by Pekka Mättö and Ilkka Sten;
12) Suupohja: Pekka Peltoniemi;
13) Vaasa: Pertti Malinen and Juhani Koivusaari;
14) Suomenselkä: Pertti Sulkava (raptors) and Erkki Korpimäki (owls);
15) Keski-Suomi: Kari Oittinen;
16) Kuopio: Ari Lyytikäinen, Janne Taskinen and Juhani Toivanen;
17) Pohjois-Karjala: Juha Miettinen and Hannu Lehtoranta;

18) Keski-Pohjanmaa: Kauko Huhtala;
19) Pohjois-Pohjanmaa: Seppo Sulkava assisted by Kauko Huhtala;
20) Kainuu: Pekka Helo;
21) Kemi–Tornio: Pentti Rauhala;
22) Lappi: a) Ranua-Posio: Pertti Sulkava, b) Rovaniemi: Esko Nenola and Marcus Wikman, c) Kemijärvi–Salla: Seppo Saari, d) Pello–Kolari–Muonio: Jorma Halonen, e) Kittilä: Ahti Pasanen, f) Sodankylä: Raimo Virkkala, g) Pelkosenniemi–Savukoski: Heikki Karhu, h) Enontekiö: Martti Lagerström and i) Inari–Utsjoki: Lasse Isoivari.

Results

The estimates for the areas are presented in Tables 1 (raptors) and 2 (owls). The data used differ between the areas: some estimates are based on intensive long-term field studies, while many others are based more or less on intuition or on something between these extremes. Population estimates for the whole country are given in Table 3 along with the estimates presented by Merikallio (1958), Bergman (1977) and the Finnish Bird Atlas (Hyytiä et al. 1983).

As the data on population changes are so scanty, the annual ringing totals from 1968 to 1984 are shown in Fig. 2. Of course, the graphs reflect not only real changes in populations, but also variation in annual nesting success and in the activity of the ringers. Ringing of all birds of prey has been encouraged by the Finnish Ringing Centre, especially during the last 10 years, which partly explains the increasing trends.

Many raptors and owls are affected by fluctuations in the populations of small rodents. Some of the rodent specialists are nomadic and change their breeding areas from year to year according to the abundance of their prey. What is the total breeding population of such species in a large area where the local populations of small rodents do not fluctuate in synchrony? In this paper, the estimates for the total Finnish population are intended to represent the maximum number of breeding pairs in a hypothetical year when small rodents reach their peak numbers as widely as can be considered realistic according to present knowledge.

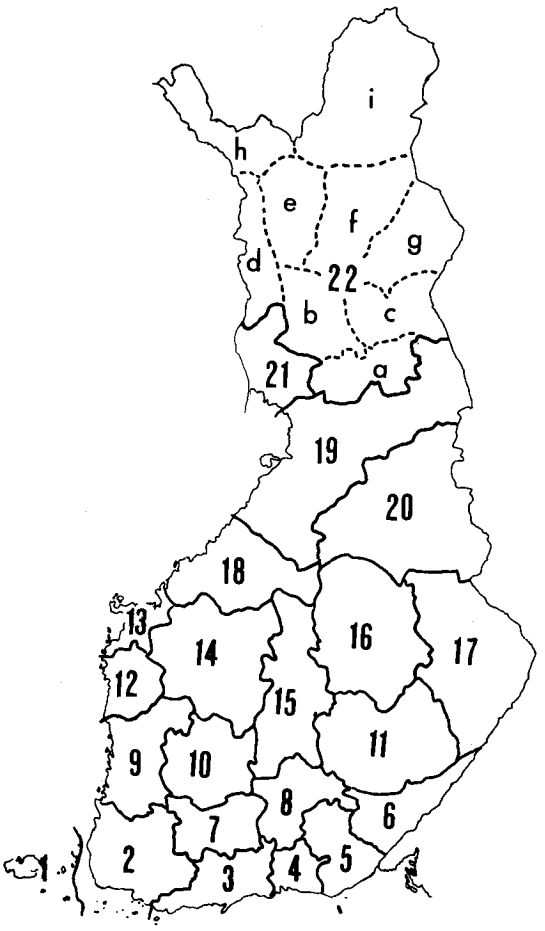

Fig. 1. Areas in which the data were collected (cf. Tables 1 and 2).

Status of different species and population trends

The Honey Buzzard *Pernis apivorus*

According to the present data, the mean density of the Honey Buzzard in southern Finland (areas 1–10) is 3 pairs / 100 km^2 land area, much lower than the 9–11 pairs suggested by Forsman & Solonen (1984) for the southern coast (area 3). In Finland, the Honey Buzzard is a particularly difficult species for the nest searcher and the real density can be higher than suspected now; the real numbers breeding in Finland could even be some thousands more than proposed in Table 3. However, the estimate by Nilsson (1981) for southern Sweden was not more than 3 pairs / 100 km^2 land area and the one for northern Sweden was lower than the figures for northern Finland in Table 1.

No information is available on recent population trends in Finland. The figures given by Merikallio (1958) and Bergman (1977) were no doubt much too small and cannot be compared with the present data. The population has presumably maintained itself at roughly the same level for decades.

The Marsh Harrier *Circus aeruginosus*

A specialist of sparse habitats, the Marsh Harrier is easily detected in its breeding sites and the population estimate is probably fairly accurate.

The Marsh Harrier joined the Finnish bird fauna in this century (see Hildén & Kalinainen 1966) and the population has increased steadily up to the present level. During the last 10 years the species has expanded its area inland, but for some reason disappeared from many breeding sites along the southern coast (areas 2, 3 and 4). No data are available on pesticide residues in Finnish Marsh Harriers (cf. Odsjö & Sondell 1977).

The Hen Harrier *Circus cyaneus*

The Hen Harrier is a northern species in Finland. As its prey animals (voles) may have a peak year simultaneously

Table 1. Estimated numbers in the different areas (see Fig. 1) of territories occupied annually by the Honey Buzzard (Per api), Marsh Harrier (Cir aer), Goshawk (Acc gen), Sparrowhawk (Acc nis), Common Buzzard (But but), Merlin (Fal col) and Hobby (Fal sub), and the estimated minimum (small rodent lows) and maximum (small rodent peaks) numbers of breeding pairs of the Hen Harrier (Cir cya), Rough-legged Buzzard (But lag) and Kestrel (Fal tin).

	Area (100 km²) Total	Land	Per api	Cir aer	Cir cya	Acc gen	Acc nis	But but	But lag	Fal tin	Fal col	Fal sub
1 Ahvenanmaa	16	15	5–10	3–4	0–1	50	50	30	0	0–3	5	10
2 Varsinais-Suomi	102	100	150	20	0	350	600	250	0	10–50	10	150
3 Länsi-Uusimaa	72	67	300	5	0	200	500	350	0	5–30	5–10	150
4 Itä-Uusimaa	26	26	30–50	3	0	70–80	130–180	60–80	0	0–10	0	40–60
5 Kymenlaakso	56	51	150–200	25	0–1	250–300	150	350	0	10–100	20	100
6 Etelä-Karjala	72	57	200–300	7–15	0–5	100	400–500	200–350	0	20–50	20	150–250
7 Kanta-Häme	72	67	250–350	10–11	0	250–300	350–500	250–300	0	0–40	20–30	150–200
8 Päijät-Häme	76	64	100–200	25	0	150–300	300–600	300–600	0	0–50	10–25	50–150
9 Satakunta	97	92	300–500	43	10–30	350–450	700–900	400–600	0	0–100	10–20	80–100
10 Pirkanmaa	104	88	240	16	0	190	260	240	0	5–40	10	40
11 Etelä-Savo	175	130	150	1–3	0–6	250	150	300–550	0	0	5–15	75
12 Suupohja	53	52	300	5	40–100	150–200	200–300	100	0	10–100	20	10–20
13 Merenkurkku	33	32	40	0–2	10	80	40	90	0	20–40	0–1	15
14 Suomenselkä	184	173	150–200	2–3	50–300	300–500	200–400	200–400	0	50–200	20–30	100–150
15 Keski-Suomi	142	116	250	5–10	10–80	350	400	400–600	0	20–50	20	100
16 Pohjois-Savo	200	165	200–350	4–8	50–100	300–400	250–500	400–600	0	80–160	40–80	100–200
17 Pohjois-Karjala	216	178	350	10	100–250	400	600–900	800	0	50–350	100–150	200–250
18 Keski-Pohjanmaa	128	124	350	15	100–400	550	700	600	0	250	40	50
19 Pohjois-Pohjanmaa	301	285	150	10	250–500	600	1200	550–650	0–5	100–250	200–250	50
20 Kainuu	258	230	180–300	0	20–200	350–500	150–300	250–400	0–30	20–200	50–100	100–150
21 Kemi-Tornio	72	70	50	0	50–200	40–60	50–70	120–150	0–20	10–50	5–10	20–30
22 Lappi	917	860	100	0	100–1800	500–600	300–400	400–500	100–2500	0–250	1400	100
Total	3381	3046	3995–4890	209–233	890–3983	5830–6810	7680–9600	6640–8590	100–2555	460–2373	2010–2266	1840–2400

Table 2. Estimated numbers of territories occupied annually by the Eagle Owl (Bub bub), Pygmy Owl (Gla pas), Tawny Owl (Str alu) and Ural Owl (Str ura), and the estimated minimum (small rodent lows) and maximum (small rodent peaks) numbers of breeding pairs of the Hawk Owl (Sur ulu), Great Grey Owl (Str neb), Long-eared Owl (Asi otu), Short-eared Owl (Asi fla) and Tengmalm's Owl (Aeg fun) (see Fig. 1 and Table 1).

	Area (100 km²) Total	Land	Bub bub	Sur ulu	Gla pas	Str alu	Str ura	Str neb	Asi otu	Asi fla	Aeg fun
1 Ahvenanmaa	16	15	100	0–5	0	5	0	0	10–20	0–10	0–30
2 Varsinais-Suomi	102	100	300	0	50	250	50	0	50–500	0–10	300–900
3 Länsi-Uusimaa	72	67	140	0	80–120	400	60	0	50–500	0–10	100–800
4 Itä-Uusimaa	26	26	20–30	0	10–15	50–150	20–30	0	100–300	0	50–100
5 Kymenlaakso	56	51	50	0–1	50	350	50	0–2	100–500	0–25	50–600
6 Etelä-Karjala	72	57	30–50	0–5	100	200	30–50	0–5	100–500	0–30	50–800
7 Kanta-Häme	72	67	100–130	0–2	70–120	150–200	250	0	0–300	0–10	10–300
8 Päijät-Häme	76	64	20–40	0–1	50–100	100–150	150–300	0	10–300	0–10	10–300
9 Satakunta	97	92	140–150	0–3	200–400	80–150	250–350	0	30–300	0–100	100–900
10 Pirkanmaa	104	88	190	0–2	100	250	320	0	20–450	0–15	50–750
11 Etelä-Savo	175	130	50–60	0–10	100	40–60	150–200	0–8	0–250	0–20	10–550
12 Suupohja	53	52	90	0–2	20	15	30	0	20–200	5–200	20–200
13 Merenkurkku	33	32	50	0 .	20–40	0–2	0–5	0	0–10	0–20	40–80
14 Suomenselkä	184	173	350	0–10	350	0–10	600	0–5	50–2000	30–2500	100–3000
15 Keski-Suomi	142	116	100	0–10	100	100	600	0–10	30–100	0–20	30–1000
16 Pohjois-Savo	200	165	15–30	0–40	50–100	30–50	150–300	5–30	20–150	10–250	50–500
17 Pohjois-Karjala	216	178	50	5–200	150–200	20–80	50–200	5–70	50–800	20–400	80–800
18 Keski-Pohjanmaa	128	124	500	5–20	200	10	300	10–20	50–250	50–800	100–1000
19 Pohjois-Pohjanmaa	301	285	180	5–400	50–150	0	100	0–300	10–150	50–500	50–800
20 Kainuu	258	230	20–40	0–200	100–200	0	100–150	0–200	0–200	10–400	20–800
21 Kemi-Tornio	72	70	5–10	0–120	50	0	10	0–100	0–20	50–400	30–700
22 Lappi	917	860	100	100–3500	100–200	0	50	0–500	0–50	100–3000	50–1300
Total	3381	3046	2600–2740	125–4531	2000–2765	2050–2432	3320–4005	20–1250	700–7850	325–8730	1300–16210

Table 3. Estimated total numbers of territories occupied annually or maximum numbers of breeding pairs (of at least partly nomadic small rodent specialists, indicated by asterisks) and present trends of Finnish raptors and owls. Symbols: + = increasing, 0 = stable, – = decreasing, ? = no information, ( ) = trend only suspected. The numbers of *Haliaetus albicilla* has been estimated by T. Stjernberg, of *Circus pygargus* and *Falco rusticolus* by D. Forsman, of *Aquila chrysaetos* by P. Rassi, of *Pandion haliaetus* by P. Saurola, of *Falco peregrinus* by M. Wikman and of *Nyctea scandiaca* by A. Järvinen.

	Merikallio 1958	Bergman 1977	Atlas 1983	This study	Present trend
Pernis apivorus	1000	800–900	6500	5000	?
Milvus migrans	50		3–10	(10)	?
Haliaetus albicilla	34	30	50	60	+
Circus aeruginosus	100	100	150	230	+
Circus cyaneus	600		>1500	3000*	(+)
Circus pygargus			<10	0–3	?
Accipiter gentilis	500	1500–2500	3500	6000	–
Accipiter nisus	1200	(300–800)	5000	10000	+
Buteo buteo	2300		10000	8000	(0)
Buteo lagopus	<3000			2500*	?
Aquila clanga		0–2	a few	(2)	?
Aquila chrysaetos	82	100	150–200	200	+
Pandion haliaetus	500	800–900	1000	1000	0
Falco tinnunculus	3400	(1500)	4000	1500*	–
Falco columbarius	1600		2000	2000	(–)
Falco subbuteo	<2700		2500–5000	2000	(0)
Falco rusticolus		2–5	20–25	30	(0)
Falco peregrinus	500	20	60	70	(+)
Bubo bubo	200		1000–1500	2500	+
Nyctea scandiaca			some tens	50*	?
Surnia ulula	3600		thousands	4000*	?
Glaucidium passerinum	200–300		2000	2500	?
Strix aluco	2000		2000–5000	2000	–
Strix uralensis	700		3000–6000	3000	(0)
Strix nebulosa	2000		hundreds	1000*	?
Asio otus	2500		>10000	5000*	?
Asio flammeus	<9000		10000	5000*	?
Aegolius funereus	1500		>10000	15000*	?

all over the northern half of Finland (A. Kaikusalo pers. comm.), the sum of the maximum numbers of breeding pairs from the different areas may be a realistic maximum estimate for the whole country. The local estimates cannot be very accurate, because none of the few ornithologists in northern Finland has shown particular interest in the Hen Harrier. The estimates may be too high rather than too low, because hunting Hen Harriers are conspicuous. With few exceptions, the average maximum density varies from 2 to 3 pairs / 100 km^2 of land throughout the main breeding area.

According to line transect results from northern Finland (Väisänen 1983), the population increased significantly from the 1940s to the 1970s. In the southern part of its breeding area (area 14; Sulkava 1984), the 1950s and the 1970s were favourable, while the 1960s and the first years of the 1980s were unfavourable decades for the Hen Harrier. Decreased persecution and deforestation of large areas in northern Finland have surely had a positive effect on the numbers. Modern agricultural techniques may be responsible for the recent decrease in the vast areas of arable land in Ostrobothnia (Sulkava 1984).

The Goshawk *Accipiter gentilis*

The Goshawk territories are distributed evenly over large areas: when Lapland (areas 21 and 22) and two other areas (5 and 18) are excluded, the average densities reported varied from 2 to 4 pairs / 100 km^2 of land. Further, Goshawk nests are relatively easily found, and it has been one of the favourite species of raptor ringers. For these reasons the estimate given in Table 3 should be one of the most reliable in this paper. On the basis of Swedish trapping data and coefficients derived, with many assumptions, from Finnish ringing statistics, Marcström and Kenward (1981) proposed an estimate of 10 300 breeding pairs for Finland. This figure seems to be much too high, whereas Sulkava's estimate in the Finnish Bird Atlas (Table 3) is too cautious. The first estimate based on the Finnish monitoring project for birds of prey (Saurola 1985) was 6000 pairs (Haapala & Saurola 1983).

According to the general opinion of Goshawk ringers who have worked with this species for two or even three decades, heavy persecution did not cause a notable decrease in the population from the 1950s to the early 1970s. In 1979 the Goshawk became protected for a short period during the breeding season; from 1983 it has been protected during April–July. No increase has been evident since the protection measures. The increase in ringing totals for 1982–1984 (Fig. 2) can be attributed to the beginning of the project for monitoring birds of prey or to three favourable breeding seasons, or to both. During the last 10 years a decreasing trend has been observed in southernmost Finland (area 3), presumably because of the decrease of forest tetraonids caused by clear-cutting (Wikman & Lindén 1981, Forsman & Ehrnstén 1985).

The Sparrowhawk *Accipiter nisus*

Together with the Common Buzzard, the Sparrowhawk is the most numerous raptor species in Finland. The average density in 10 out of 18 southern areas (1–18) varied from 4 to 8 pairs / 100 km^2 land. The lowest estimates (2 pairs) from the south are probably due to restricted field work on the Sparrowhawk rather than to actual low densities (cf. Frankenberg 1982). For this reason the population estimate

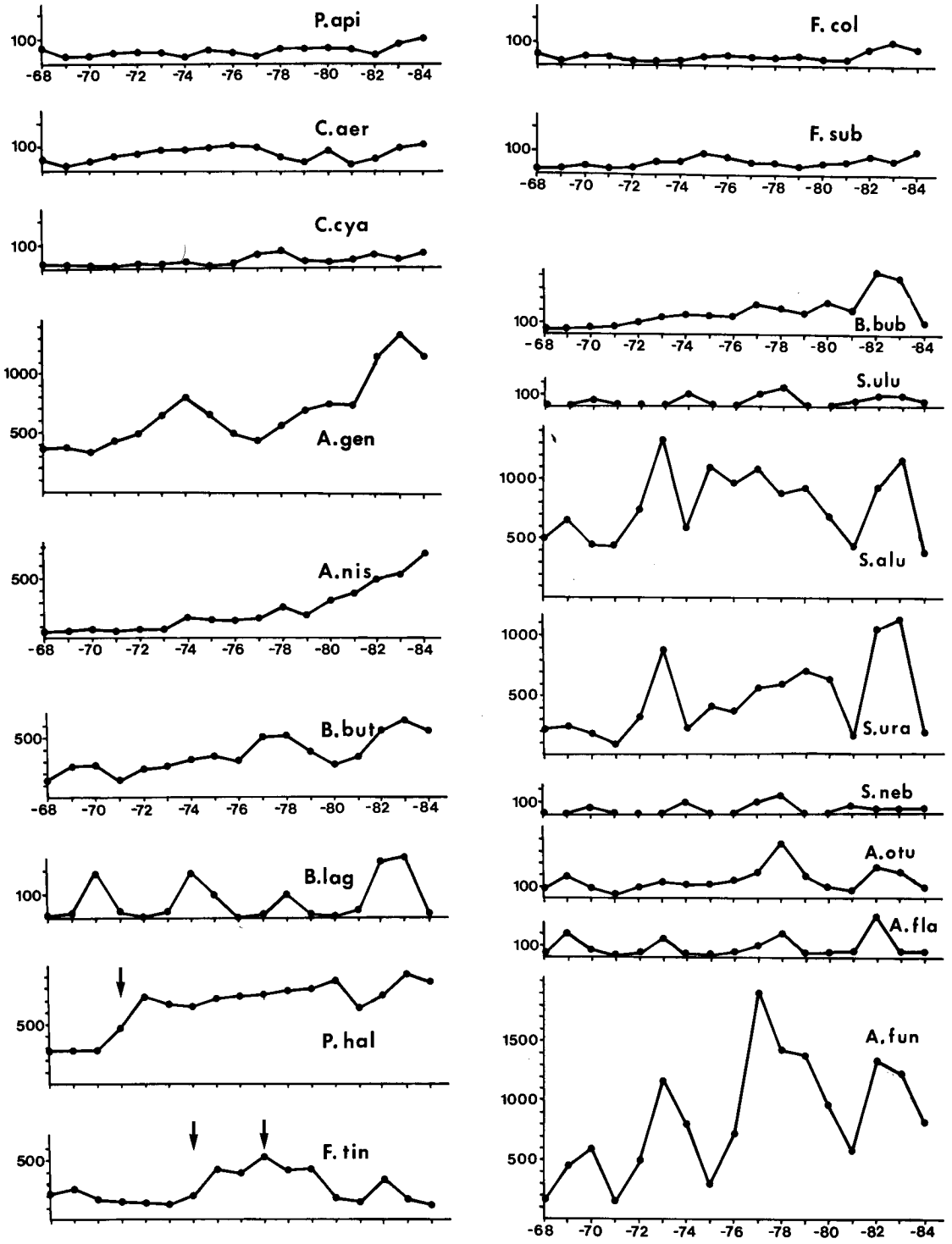

Fig. 2. Numbers of nestlings of some Finnish raptors and owls ringed in 1968–1984. The beginning (Osprey and Kestrel) and the end (Kestrel) of special projects indicated by arrows.

given in Table 3 is somewhat higher than the maximum from Table 1, but it could probably be even higher.

Unfortunately the decline of the Finnish Sparrowhawk population in the 1960s was not documented accurately (Solonen 1984), although a decrease in the number of occupied territories and in the nesting success was detected in many areas (e.g. Sulkava 1970). Correspondingly, the only evidence of a population recovery is a tenfold increase in ringing totals (Fig. 2), which also reflects the activity of the ringers, and "general opinion". Insufficient data on the numbers and population changes have resulted in strikingly low estimates in the recent literature, e.g. 300–750 pairs for the whole of Finland as derived by Cramp et al. (1980) and Gensbøl (1984) from Bergman (1977). The Finnish Sparrowhawk population certainly never decreased to such a low level.

The Common Buzzard *Buteo buteo*

The Common Buzzard breeds in all parts of Finland, excluding northern Lapland, but there are remarkable differences in the densities, even locally (e.g. Forsman & Solonen 1984). Because of this uneven distribution pattern, an estimate for the whole country derived by generalizing data from relatively small study areas is much less accurate than e.g. the one given for the Goshawk. The average density for the whole country is 2.6 pairs / 100 km^2 of land area, which is lower than the estimate of Svensson (1979) for the corresponding latitudes in Sweden, but higher than the figure (2.0) used by Nilsson (1981). I suspect that the present estimate for the Finnish population (Table 3) is more likely to be too low than too high.

According to Bergman (1977), the Common Buzzard population has decreased by half from the 1930s to the 1970s. On the other hand, no significant change was found between the 1940s and the 1970s on line transects in northern Finland (Väisänen 1983). Both increasing and decreasing local trends were reported from different areas in this study, which suggests that the population has remained at roughly the same level during the last two decades.

The Rough-legged Buzzard *Buteo lagopus*

The number of breeding pairs fluctuates markedly, depending on lemming and vole cycles. The estimate in Table 3 is the sum of the maximum numbers of territories in a peak year for small rodents all over Lapland (22). The maximum densities for subareas 22c, 22e, 22g and 22i varied uniformly from 2 to 3 pairs / 100 km^2 land; higher densities were given only for subareas 22f (8 pairs) and 22h (5 pairs). Even during small rodent lows, most of the territories are occupied early in the spring, but very few birds lay eggs or stay for long in the territory (M. Lagerström pers. comm.).

According to line transect data, the population decreased significantly from the 1950s to the 1970s (Väisänen 1983). However, this result probably only indicates that the main census years of the 1970s were not good vole years; the other data do not suggest significant trends.

The Kestrel *Falco tinnunculus*

In the 1980s the Kestrel has been so sparse in most parts of Finland that ornithologists have certainly paid attention to its occurrence. In addition, a hovering Kestrel is easily noticed and many of the nests are located near fields. The approximate number of local Kestrel territories should therefore be well known to ornithologists interested in birds of prey and the estimates (Table 1) must be fairly accurate. In contrast, the estimate for the total maximum population (Table 3) is not accurate at all, because nowadays the Kestrel seems to be more or less nomadic in most of Finland and it is very difficult to combine the data from different areas in an estimate for the whole country.

During the last two decades the Finnish Kestrel population has decreased in almost the whole country, most dramatically in the south. A special "Project Kestrel" was started in 1974. After five years of work, the total population was estimated at 4000 pairs (Kuusela 1979a), which was a higher figure than had been expected, and the future of the Kestrel in Finland was not considered alarming. However, the Kestrel had largely disappeared from many previous breeding sites (e.g. in area 7) and in areas where the numbers still reached the normal level in peak years of small rodents, the amplitude of the annual fluctuations seemed to be wider than before, probably at least partly owing to the change to a more nomadic way of life. Now, only five years later, less than 500 pairs are estimated for the whole of southern Finland (areas 1–11) during a theoretical year of simultaneous small rodent peaks. Two decades ago some of the larger southern areas alone could have supported 500 Kestrel territories. No clear connections between the population decrease and changes in agriculture have yet been shown (Kuusela 1983).

The Merlin *Falco columbarius*

More than two-thirds of the Finnish Merlin population breed in Lapland (area 22), where the density of ornithologists is low. Further, an occupied Merlin territory is not easily detected before the young are almost fledged, nor has there been a detailed study on the Merlin in Finland (cf. Olsson 1979). Thus, the population estimate cannot be accurate. Even the maximum densities of 2–3 pairs / 100 km^2 of land (subareas 22c, 22f, 22h and 22i) are lower than those used by Nilsson (1981) for Sweden, and the average density reported for other parts of Lapland is only 0.5 pairs. However, no other data suggest that the estimate in Table 3 is too low.

Line transect data (total 12 observations) from North Finland suggested a significant decrease of the Merlin population from the 1940s to the 1970s (Väisänen 1983). This is in agreement with the results of a questionnaire sent to local ornithological societies (Hildén & Koskimies 1983) and with the Falsterbo migration statistics (Roos 1978). However, very few of the raptor specialists (areas 21 and 22e) consulted in this study could confirm the negative trend with their own field observations.

The Hobby *Falco subbuteo*

The population estimate for the Hobby is presumably more accurate than that for the Merlin: the Hobby is a southern species and conspicuous during the breeding season. Its density is highest in the south-eastern part of the country (area 6: 3.5 pairs) and averages 1.7 pairs / 100 km^2 of land area in southernmost Finland (areas 2–10).

The population trends are obscure. Some reports suggest a slight decrease, others a slight increase during the 1980s.

The Eagle Owl *Bubo bubo*

In view of the great amount of field work done by ringers during the last years (e.g. about 500 nestlings ringed in both 1982 and 1983, Fig. 2), the total estimate of the Eagle Owl population is probably realistic. In western Finland (areas 1–3, 7, 9, 10, 12–14, 18) the density averages more than 2 territories / 100 km^2 of land.

Two decades ago the Eagle Owl was generally considered an endangered species. Since 1966 it has been protected during the breeding season and since 1983 all the year round. Protection, clear-cutting of forests and the growth of large open rubbish dumps with dense rat populations have

been the main reasons for the rapid recovery of the population. Unfortunately this recovery has been documented exactly in very few areas. In area 9 the increase was from 81 territories in 1968 to 120 territories in 1983, i.e. 50 per cent in 15 years (Helppi & Kalinainen 1984). In this and some other areas (1, 2 and 14) the population did not reach such low a level as in the rest of the country. Merikallio's (1958) estimate, 200 pairs, was probably excessively pessimistic, for only some years later v. Haartman et al. (1963–1972) proposed 500–1000 pairs.

The Hawk Owl *Surnia ulula*

The Hawk Owl belongs to the difficult group "northern vole specialist, no detailed studies". Its annual fluctuations have a wide amplitude, most probably due to its nomadic way of life. The density estimates for Forest Lapland (subareas 22a–g, Table 2) in maximum years vary from 2 to 10 pairs / 100 km^2 of land. This variation probably reflects differences in the reliability of the data rather than real geographical differences. The total population estimate (Table 3) for a hypothetical maximum year is speculative. I believe that the maximum number of pairs breeding in a peak year cannot be much lower but could perhaps be much higher than the estimate given.

No data on population trends are available.

The Pygmy Owl *Glaucidium passerinum*

The data from all areas are highly tentative, due to the lack of systematic field work on the Pygmy Owl, except in the case of its feeding biology (Kellomäki 1977). However, with two exceptions (areas 9 and 14), the estimated densities vary within a narrow range, from 0.5 to 1.5 pairs / 100 km^2 of land.

No reliable information is available on long-term trends. The continuous decrease of the optimal habitat, old spruce forest, will probably reduce the numbers of the Pygmy Owl.

The Tawny Owl *Strix aluco*

During the last two decades, large areas in southern Finland have been saturated with nest-boxes for Tawny, Ural and Tengmalm's Owls (e.g. Saurola 1982), and more than 8000 nest-boxes for owls are checked annually (Forsman et al. 1980). Nest-box data combined with data from excursions for listening to hooting owls have been used as a basis for the estimates in Table 2 and these should therefore be good. The average density for southernmost Finland (areas 1–10) is 3.1 pairs / 100 km^2 of land. The highest densities were reported from areas 5 (6.9 pairs) and 3 (5.9 pairs).

The occurrence of the Tawny Owl in Finland goes back no more than a century, and the population was still increasing in the 1950s and 1960s. During the last decade, however, a decreasing trend has been evident in the annual total of ringed nestlings (Saurola 1982, Fig. 2) and this may be a sign of a real population decrease.

The Ural Owl *Strix uralensis*

The Ural Owl is one of the three target species of the "nest-boxes for owls" project (see the Tawny Owl), which has yielded much information on these species. Compared with that of the Tawny Owl the breeding area of the Ural Owl extends farther north and to more sparsely inhabited areas, where the number of ornithologists is low. Thus the data basis for a population estimate is perhaps not as reliable as for the Tawny Owl, but more reliable than for the other owls (except the Eagle Owl).

Up to the early 1960s, before the large scale nest-box project began, the Ural Owl was considered rare. The average density in well-studied optimal areas (7–10, 14) is now estimated uniformly at 3.5 pairs / 100 km^2 of land. Presumably the population has actually recovered due to the increased availability of optimal nest sites (nest-boxes as substitutes for stumps removed by modern forestry) and to the end of persecution. However, the increase in the nest-box population may be partly attributed to Ural Owls that have moved from hidden suboptimal nest sites (e.g. previous twig nests of raptors) to nest-boxes. The data from my long-term study area (area 7) suggest a slight population decrease during the last 10 years, which might be an effect of the simultaneous recovery of the Eagle Owl population.

The Great Grey Owl *Strix nebulosa*

The Great Grey Owl is a northern vole specialist, but not the most difficult one for a population estimate. The average density estimates for the optimal areas (19, 20, 21, 22a–d) in peak years varied within a narrow range, from 1 to 1.5 pairs / 100 km^2 of land, although local densities can be much higher (Mikkola 1981). For this reason I incline to believe that the estimate for the total population in a peak year is of the correct order of magnitude. During the first half of this century, the intervals between maximum breeding years were very long, even decades (Merikallio 1958). At present the Great Grey Owl seems to breed in high numbers at intervals of 3–5 years, depending on the fluctuations of small rodents (see e.g. Saurola 1982).

No information on long-term trends is available.

The Long-eared Owl *Asio otus*

Relatively little field work has been done on the Long-eared Owl in Finland, and partly for this reason the estimated average maximum densities differ rather widely between the areas. In addition, at least a part of the population seems to be nomadic (Saurola 1983c); the breeding area extends from the southern coast up to southern Lapland and within this large area small rodents fluctuate asynchronously. The present estimate is thus only tentative and should be treated accordingly.

No information on population trends is available. The population has possibly remained at the same general level during the last three decades.

The Short-eared Owl *Asio flammeus*

It is questionable whether we should even attempt to estimate the Finnish numbers of such a nomadic species as the Short-eared Owl, because the Finnish population is difficult to define at all: in consecutive years the same individuals may breed at sites thousands of kilometres apart (see Saurola 1983c). In this data set, 64 % of the Short-eared Owls were from Ostrobothnia (area 14) and Lapland (area 22). In Lapland, the estimated average densities for a maximum year varied between the subareas (22a–i) from 0.5 to 10 pairs / 100 km^2 of land. As the peak years of small rodents seldom coincide in Bothnia and Lapland, the best total estimate for the whole country in a maximum year is probably some thousands of pairs less than the sum total of the 22 areas (Table 3).

It is almost impossible to determine the national population trends for the Short-eared Owl, but the maximum number of breeding pairs in southern Finland was probably higher in the beginning of this century than now (Korpimäki in Hyytiä et al. 1983).

Tengmalm's Owl *Aegolius funereus*

Some of the local estimates for Tengmalm's Owl are fairly

reliable, being based on the nest-box projects and field studies. However, most of them were arrived at more by intuition than by using hard data: the estimated average densities in maximum years vary from 3 to 17 pairs / 100 km^2 of land. Tengmalm's Owl is highly dependent on small rodents and partly nomadic: the females change their breeding site according to the food supply, but the males tend to keep their territories even during rodent lows in southern Finland (Lagerström 1980), though not in northern Finland (Ylimaunu et al. 1985). The definition of the Finnish breeding population is thus unclear. The estimate in Table 3 is the sum of the theoretically simultaneous maximum numbers of territories occupied by at least a male.

During the last 20 years, the population has decreased in the well-studied areas 7 and 10 (P. Linkola, J. Koivu and M. Lagerström pers. comm.), but no exact information is available from other parts of the country.

Concluding remarks

a) Raptors and owls are important for general environmental monitoring. One of the most important indications of the dangers of DDT was the worldwide population crash of the Peregrine and similar trends in the populations of the Osprey, Sea Eagles and other birds of prey.

b) The data available on the population size and recent trends vary in reliability and completeness between the different species. The estimates presented above may be ranked for accuracy as follows.

1)The best population estimates are those based on country-wide monitoring projects: the figures for the White-tailed Eagle, Golden Eagle, Osprey and Peregrine.

2) The population estimates for the rest of the raptors and owls (excluding some rare species) are based on the "total intuition" of the local bird of prey specialists from the different parts of the country. They are probably fairly accurate for the Marsh Harrier, Goshawk, Eagle Owl, Tawny Owl and Ural Owl.

3) They are probably less accurate for the Sparrowhawk, Common Buzzard and Hobby.

4) They are probably inaccurate for the Honey Buzzard, Hen Harrier, Rough-legged Buzzard, Kestrel and Merlin.

5) The estimates are little more than educated guesses for the Hawk Owl, Pygmy Owl, Great Grey Owl, Long-eared Owl, Short-eared Owl and Tengmalm's Owl.

c) The population changes, even during the last decade, are poorly known for most of the Finnish raptors and owls. Some species (the White-tailed Eagle, Sparrowhawk, Golden Eagle, Osprey, Peregrine and Eagle Owl) have been recovering slowly during the last few years, in most cases, due to protection measures. On the other hand: the dramatic decrease of the Finnish Kestrel population is still continuing and the breeding season of 1985 will show how alarming the situation really is. The Goshawk is decreasing in southern Finland and the Merlin is probably declining in northern Finland.

d) The project for monitoring all Finnish raptors and owls, started recently by the Zoological Museum of the University of Helsinki in collaboration with the Ministry of Environment, seems to be greatly needed not only to improve the understanding and conservation of Finnish raptor and owl populations but also for the general monitoring of our environment. In this project, more than one hundred permanent study areas (10-km squares, based on the National Grid) have been established. The aim is to detect all occupied territories and nests of birds of prey in these study areas every year. The project relies entirely on the voluntary field work of amateur ornithologists.

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Selostus: **Suomen petolintukantojen nykytila**

Tutkimuksen tavoitteena on arvioida Suomen päiväpetolintu- ja pöllökantojen suuruudet ja kannanmuutosten tämänhetkiset suuntaukset maan eri osien petolintuasiantuntijoilta kerätyn aineiston perusteella. Taulukoissa 1 ja 2 on esitetty osa-alueittain arviot mehiläishaukan (Per api), ruskosuohaukan (Cir aer), kanahaukan (Acc gen), varpushaukan (Acc nis), hiirihaukan (But but), ampuhaukan (Fal col), nuolihaukan (Fal sub), huuhkajan (Bub bub), varpuspöllön (Gla pas), lehtopöllön (Str alu) ja viirupöllön (Str ura) vuosittain asuttujen reviirien määristä sekä sinisuohaukan (Cir cya), piekanan (But lag), tuulihaukan (Fal tin), hiiripöllön (Sur ulu), lapinpöllön (Str neb), sarvipöllön (Asi otu), suopöllön (Asi fla) ja helmipöllön (Aeg fun) pesivien parien minimi- ja maksimimääristä pikkujyrsijäkantojen pohja- ja huippuvuosina. Koska Suomen petolintukantojen muutoksista on niukasti tietoa, kuvassa 2 on esitetty runsaimpien lajien pesäpoikasten rengastusmäärät vuosina 1968–1984. Käyrät kuvaavat paitsi kantojen muutoksia myös pesimistuloksen ja rengastajien aktiivisuuden vuosittaista vaihtelua.

Taulukossa 3 on esitetty taulukkojen 1 ja 2 sisältämän tiedon ja tiettyjen harvinaisten lajien asiantuntijoilta saadun ilmoituksen perusteella tehdyt kokonaisarviot Suomen petolintukantojen suuruuksista (sarake 4), aikaisemmat julkaistut arviot (sarakkeet 1–3) sekä kirjoittajan näkemys kantojen pitkäaikaismuutoksen tämänhetkisestä suunnasta. Kirjoittaja jakaa arviot viiteen tarkkuusluokkaan: 1) tarkat (merikotka, kotka, sääksi ja muuttohaukka), 2) melko tarkat (ruskosuohaukka, kanahaukka, huuhkaja, lehtopöllö ja viirupöllö), 3) vähemmän tarkat (varpushaukka, hiirihaukka ja nuolihaukka), 4) epätarkat (mehiläishaukka, sinisuohaukka, piekana, tuulihaukka ja ampuhaukka) ja 5) arvaukset (hiiripöllö, varpuspöllö, lapinpöllö, sarvipöllö, suopöllö ja helmipöllö).

Tiedot kantojen muutoksista ovat useimpien lajien osalta epämääräiset. Merikotka-, varpushaukka-, kotka-, sääksi-, muuttohaukka- ja huuhkajakannat ovat suojelutoimien ansiosta jonkin verran elpyneet. Tuulihaukkakannan romahdus jatkuu edelleen koko maassa, joten laji olisi otettava erityisseurannan kohteeksi. Etelä-Suomen kanahaukkakanta ja Pohjois-Suomen ampuhaukkakanta ovat myös selvässä laskusuunnassa.

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