

Organized persecution of birds of prey in Finland: historical and population biological perspectives

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In Finland, the persecution of birds of prey was already encouraged in the Swedish State Law of 1734, and was first included in bounty schemes in the Royal Decree on Avian Pests in 1741. All species of Finnish raptors and owls were persecuted during 1898–1923, the most intense period of active bounty-paying by municipalities and hunting societies. Elimination of avian predators was regarded as reasonable game management, and was also justified on moral grounds. Since the late 19th century, persecution of many species was questioned by professional biologists. We investigated the legal basis of persecution at different times, changes in attitudes towards birds of prey, and local and long-term impacts of persecution on population ranges and sizes in Finland. We found that in analysing the consequences of persecution, both the spatial and temporal scales of study are important. While populations of persecuted species may have dramatically declined at local scale, at the national level the ranges may have remained more or less stable. Active persecution had a severe short-term impact on many species: for example, the established breeding population of the Greater Spotted Eagle (*Aquila clanga*) was totally exterminated in the 1920s. Active conservation measures have in recent decades compensated for the losses caused by earlier persecution.



1. Introduction

The main cause of species extinction today is habitat change (Primack 2002), but historically, persecution (including hunting) has been the major cause of population declines of many vertebrate species (Fuller 2000, Paddle 2000, Yalden & Albarella 2009). This has been especially true for predaceous birds and mammals, whose persecution has been encouraged by legislation, specific

bounty schemes, and the predominantly hostile public attitude towards these competitors or even predators of man in many parts of the world (Newton 1979, Kruuk 2002). However, few long-term data exist on the magnitude and population-level effects of these activities.

In this paper we investigate the legal background and history of persecution of birds of prey in Finland, and the overall impact of organized persecution on the populations of Finnish birds of

prey based on contemporary ornithological studies and historical documents. With organized persecution we mean hunting or killing of pest species supported by legislation, systematic campaigns and/or specific bounty schemes. Our analysis of the legal basis of persecution covers the entire historical period from the Swedish rule over Finland (until 1809) to the period of Autonomy as part of the Russian Empire (1809–1917), and to the present Hunting Act of the Republic of Finland (1993).

Finland is a particularly suitable country for a historical survey of long-term population trends, because the history of published records on birds of prey extends back for more than two centuries. Hellenius and Idman (1802) published a pioneering review on the nesting habits of birds of prey in Tavastia, southern Finland. The first comprehensive handbook of Finnish birds was published in the latter half of the 19th century (von Wright 1859, von Wright & Palmén 1873). The first scientific population estimates for Finnish raptors and owls were given by Merikallio (1958). However, numerous more intuitive estimates and local analyses of population trends preceded this landmark publication.

2. Material and methods

For legal texts, our main source was the Finnish Statute Collection. Changes in attitudes towards raptors and owls were looked at on the basis of contemporary hunting handbooks (Aho 1902, Lindgren 1943, Yläne 1948) and of biological and animal welfare literature published in Finland in the late 19th and 20th century. For the history of hostile attitudes towards predatory birds, important sources were sportsmen's publications (e.g., *Metsästys ja kalastus* and *Tidskrift för Jägare och Fiskare*), as well as Turpeinen (1976), Teperi (1977) and Erkamo (1990).

We investigated changes in the population sizes and ranges of birds of prey belonging to the orders Falconiformes (raptors) and Strigiformes (owls). All species considered residents or regular visitors in Finland during the study period (from ca. 1860 to present) were included in our analysis. The list of resident species included frequent visitors that occasionally breed in the country, and was based on the reference books of von Wright (1859), von Wright and Palmén (1873), Mela

(1882), Mela and Kivirikko (1909), Kivirikko (1926–1927) and Kivirikko (1940). The nationwide data on overall population trends and impacts of persecution were collected from these sources and particularly from Merikallio (1958), which included the first nationwide bird census data. For more recent population sizes of raptors and owls, important sources were von Haartman *et al.* (1963–1972), Saurola (1985a), Väisänen *et al.* (1998) and Valkama *et al.* (2011).

We collected statistics on killed birds (1879–1942) and bounties paid by municipalities (1879–1930) from the Official Statistics of Finland. Bounty records of the Finnish Hunting Association are based on the association's annual reports published in the Finnish hunting magazines *Finska Kennelklubbens Tidskrift* (1896–1898) and *Suomen Metsästyslehti* (1893–1894, 1899–1912), and on Viljanen (1965). Bounties were standardized to 2009 value by using the factor of the value of money provided by the Statistics Finland. This transformation of money is essential because during the bounty-paying period vast changes took place in the Finnish infrastructure. That is, the Finnish Mark suffered inflation from 1916 onwards, and the value of bounties fell markedly by the time of Finnish independence and the Civil War in 1918.

Two major problems are associated with the national bounty statistics on predatory birds. First, they frequently did not distinguish between species and only provided the total number of killed birds of prey in a particular time period. Second, even if species data were provided, they appeared unreliable due to species identification problems of hunters (Suomalainen 1916). Thus, we included only three local studies with statistics on persecution of particular species: Suomalainen (1916), Putkonen (1935) and Sovinen (1948), all performed by professional biologists.

Due to local variation in hunting intensity, national data do not provide adequate data on local population trends of persecuted species. Local consequences of persecution are also ecologically of primary interest, because the processes possibly leading to population declines or extinctions can be studied in detail only at the local scale. However, very few local-scale historical data exist. Here, we used three carefully-performed local or regional studies, which were made in the regions

of Pori (Suomalainen 1927), Pieksämäki (Siivonen 1936) and Viipuri (Putkonen 1935, 1942).

As a result of the World Wars, Finland's national borders changed in the 20th century. With Finland we refer to the present territory of the country. The studies of Putkonen (1935, 1942) are in this respect an exception, as his material was partially collected from areas that have belonged to the Soviet Union, currently the Russian Federation, since the Second World War (e.g., the Isthmus of Karelia). Despite this, Putkonen's papers were included due to their high quality and lack of comparable data from other areas in the country.

3. Historical background

3.1. Attitudes towards birds of prey

Large raptors, such as the Golden Eagle (*Aquila chrysaetos*), have traditionally been admired for their beauty and audacity on the one hand, but on the other hand hated as competitors of man for preying upon domestic animals or game. In most ancient civilizations and tribal populations throughout the world the attitude towards raptors has been neutral or positive (Thiollay 1994). Possible negative attitudes probably have not resulted in remarkable persecution of birds of prey in Finland before the 1741 Royal Decree that encouraged persecution of birds of prey (see section 3.2.). According to Erkamo (1990), the 1741 Decree may have caused "considerable damage" to the Finnish raptor and owl populations, but there are no direct data to support this. Hellenius and Idman (1802), for instance, mentioned the "harmfulness" of the White-tailed Sea Eagle (*Haliaeetus albicilla*), Goshawk (*Accipiter gentilis*), Sparrowhawk (*Accipiter nisus*), Common Buzzard (*Buteo buteo*) and Marsh Harrier (*Circus aeruginosus*), but mentioned neither the 1741 Decree nor any persecution of these species.

Attitudes towards both avian and mammalian predators polarized in the late 19th century in Finland. We follow here Ilvesviita (2005), who divided the development of the Finnish national hunting policies into three eras, each representing a transition in the hunting policy. As shown below, also the attitudes towards birds of prey changed between the eras.

The first period (1865–1920) was an era of class society in which hunting was strongly regarded as a sport and hobby of the ruling elite (Ilvesviita 2005). Different animals belonged to different categories, as exemplified by the 1868 Hunting Decree (see section 3.2.). Game was regarded as useful to the human economy while predators were doomed to extermination. The main objective of game management was to kill all predators. According to Mykrä *et al.* (2005) the newly-established hunter associations strongly advocated persecution of birds of prey and other species considered harmful. Birds of prey were also considered "cruel" beings that deserved to be punished. The negative attitudes towards birds of prey were most clearly manifested in the 1898 Hunting Decree, which ornithologist and animal welfare activist Thorsten Renvall ironically called a "great triumph" and the "magna charta" for the country's sports hunters (Renvall 1902, 1912).

The emergence of genuine conservationism in Finland also falls into this same time period (Vuorisalo & Laihonen 2000). With conservationism we refer to the view that nature has some value regardless of economic considerations, and therefore it deserves to be protected. In 1870 Zachris Topelius founded a "Spring Society" that aimed at "protection of little songbirds" (Topelius 1874). Approximately at the same time the Finnish animal welfare movement started to become organised, with first associations established in 1871 and 1874 (Nieminen 2001). Probably due to the introduction of conservation ideas and growth of ecological knowledge, some professional zoologists started to question the prejudiced species classifications in hunting legislation (Palmén 1896, Renvall 1896, 1912, Palmgren 1915, Palmén *et al.* 1916). By the late 1800s it was widely understood that many birds of prey were in fact useful to agriculture as predators of rodents. Renvall (1912) and Palmén *et al.* (1916) mentioned the ecological role of avian predators as "health officers" and gave them credit for eliminating weak and sick game animals. Renvall (1912) explicitly mentioned the possibility that predators, such as the Sparrowhawk, may prevent "worsening the race" of their prey animal populations by selective predation.

The second period (1921–1961) witnessed fundamental changes in both the structure of the

Table 1. History of legal protection of the Finnish raptor and owl species. The numbers in legal sources refer to index numbers in the Statute Collection of Finland (number of statute/year). Goshawk was protected from 1 May to 31 July since 1979, from 1 April to 31 July since 1983, and has been fully protected since 1989. Rough-legged Buzzard was not protected in Lapland province 1962–1979, although the Ministry of Agriculture could decide on its protection on state property there. Golden Eagle was protected outside the Oulu province (that included Lapland) 1926–1955, and outside the reindeer herding area 1955–1962. In 1962 full protection was granted to Golden Eagle, although the Ministry of Agriculture had authority to decide on its hunting in certain conditions (Hunting Act 290/62, §27). Eagle Owl was protected from 1 January to 31 August since 1966, and fully since 1983.

	Partial protection	Full protection	Legal sources
Falconiformes			
Honey Buzzard <i>Pernis apivorus</i>		1923	71/23
White-tailed Sea Eagle <i>Haliaeetus albicilla</i>		1926	60/26
Marsh Harrier <i>Circus aeruginosus</i>		1923	71/23
Hen Harrier <i>C. cyaneus</i>		1923	71/23
Goshawk <i>Accipiter gentilis</i>	1979	1989	455/79, 405/83, 493/89
Sparrowhawk <i>A. nisus</i>		1979	455/79
Black Kite <i>Milvus migrans</i>		1923	71/23
Common Buzzard <i>Buteo buteo</i>		1923	71/23
Rough-legged Buzzard <i>B. lagopus</i>	1962	1923, 1979	71/23, 292/62, 455/79
Golden Eagle <i>Aquila chrysaetos</i>	1926	1962	60/26, 109/55, 290/62
Great Spotted Eagle <i>A. clanga</i>		1955	109/55
Lesser Spotted Eagle <i>A. pomarina</i>		1955	109/55
Osprey <i>Pandion haliaetus</i>		1926	60/26
Kestrel <i>Falco tinnunculus</i>		1923	71/23
Merlin <i>F. columbarius</i>		1962	292/62
Hobby <i>F. subbuteo</i>		1923	71/23
Gyrfalcon <i>F. rusticolus</i>		1926	60/26, 109/55
Peregrine Falcon <i>F. peregrinus</i>		1959	210/59
Strigiformes			
Eagle Owl <i>Bubo bubo</i>	1966	1983	366/66, 405/83
Snowy Owl <i>B. scandiaca</i>		1962	292/62
Hawk Owl <i>Surnia ulula</i>		1962	292/62
Eurasian Pygmy Owl <i>Glaucidium passerinum</i>		1923	71/23
Tawny Owl <i>Strix aluco</i>		1962	292/62
Ural Owl <i>S. uralensis</i>		1962	292/62
Great Grey Owl <i>S. nebulosa</i>		1923	71/23
Long-eared Owl <i>Asio otus</i>		1923	71/23
Short-eared Owl <i>A. flammeus</i>		1923	71/23
Tengmalm's Owl <i>Aegolius funereus</i>		1923	71/23

society and the national hunting policy (Ilvesviita 2005). Lindgren (1943) wrote his game-management guide for all hunters and landowners, not only just for the “civilized elite”. Exploitation of nature was increasingly effective, and game was regarded as an important natural resource. The majority of Finland’s raptor and owl species were granted full protection (Table 1). The harmfulness of birds of prey was questioned increasingly often (Ilvesviita 2005), with the exception of the Goshawk and Sparrowhawk whose nests “could not be tolerated” in the hunting area (Lindgren 1943).

The difference to the first period was considerable, however. All birds of prey were no longer clumped together as harmful species that needed to be exterminated. The usefulness of some species was acknowledged even by hunters (Ylänné 1948). The list of rewarded species varied between game-management areas, but usually included at least the Goshawk and Sparrowhawk (Anon. 1947a, 1951). Legal protection of most raptor and owl species was difficult to digest for some ordinary hunters who had been used to shoot or capture all species of birds of prey (Ylänné 1948).

The third period (1962–1993) entailed radical changes in the cultural climate (Ilvesviita 2005). Nature conservation and environmental concern became widely acknowledged in society, which strongly influenced attitudes towards nature. The old division of species into useful and harmful ones was largely abandoned, at least by professional game managers and biologists. In the early 1960s the main targets of persecution were Goshawk, Sparrowhawk, Rough-legged Buzzard (in northern Finland) and Eagle Owl. Bounty paying for the Goshawk and Sparrowhawk by hunting organizations ended in 1963 (Suominen 1967). In the early 1970s the greatest discrepancy between hunters and conservationists was because of the Goshawk (Ilvesviita 2005). Conservationists called for full protection of the Goshawk, at least during the breeding season, while hunters would have preferred to continue its outlaw status and population management. Partially based on the obligations of the Convention on the Conservation of European Wildlife and Natural Habitats (or the Berne Convention, whose Appendix II defined all species of Falconiformes as strictly protected) the Goshawk was fully protected in Finland in 1989 (Ilvesviita 2005).

3.2. History of legislation

Changes in attitudes influence legislation, and *vice versa*. Already the 1734 State Law of Sweden listed some birds of prey as pests, namely the “eagle”, the “hawk”, Eagle Owl, Osprey (*Pandion haliaetus*) and “other predaceous birds” (State Law 1734). No bounties were, however, defined for birds. Bounties were first set on birds of prey in the Royal Decree on Avian Pests in 1741, created for the “extermination of raptors and pest birds”. All species of raptors and owls were outlawed by the 1741 Decree, and their persecution was encouraged.

In the Russian Era (1809–1917) two important hunting laws were passed. The Imperial Hunting Decree of 1868 has been regarded as the foundation of Finland’s present hunting legislation (Suomus & Mäki 1968). In the decree all wild mammals and birds in Finland were classified either as (1) useful species, the populations of which

were to be maintained or increased by protection, (2) harmful or pest species such as the “eagle”, the “hawk”, Eagle Owl and Osprey, which should be persecuted, and (3) other species, on whose protection or persecution there were no rules (Hunting Decree 1868). One of the objectives was to protect useful species and increase their abundance by eliminating their natural enemies listed in the pest category. Although the municipalities were obliged to pay bounties on all species in the second category, the exact sums for particular species were not specified in the decree. Some municipalities therefore chose to pay nothing (Teperi 1977), which apparently decreased the decree’s impact.

The Hunting Decree of 1898 encouraged persecution of more pest species than the 1868 decree, and identified nearly all persecuted species individually instead of using the earlier ambiguous groupings of “hawks” and “owls”. This may have resulted from the increased knowledge of the Finnish vertebrate fauna (von Wright 1859, von Wright & Palmén 1873, Mela 1882). The list of species to be persecuted included Golden Eagle, White-tailed Sea Eagle, Eagle Owl, Hawk Owl (*Surnia ulula*), Snowy Owl (*Bubo scandiaca*), all hawk species and the Osprey.

The Nature Conservation Act and the Amendment to Hunting Decree in 1923 were enacted soon after Finland became a sovereign state in 1917, which made a division of labour between the conservation and hunting legislations necessary. The legal status of most birds changed. The Nature Conservation Act (1923) gave a total year-round protection to many birds of prey (Table 1). Also the eggs and nests of all these species were protected by law. In the Amendment to Hunting Decree (1923) Golden Eagle, Eagle Owl, Goshawk and Sparrowhawk were still considered as pests, although no bounties were set upon them in law. However, the government supported hunting organizations, and for decades a part of this support was allocated to bounties paid for birds of prey.

During the 20th century all species of raptors and owls were gradually granted full protection. Table 1 summarizes the history of the legal protection of Finnish raptor and owl species. The all year round protection of Goshawk since 1989 finally terminated the law-based persecution of predatory bird species in Finland (Ilvesviita 2005).

Table 2. Raptors and owls in the bounty schemes between the enactment of the Royal Decree on Avian Pests of 1741 and the Amendment of Hunting Decree of 1923. Law-based bounties were paid by municipalities. In the case of voluntary bounties the most important organization was the Finnish Hunting Association (FHA). The bounty sums of 1741 and 1898 Decrees were converted to the 2009 currency (euros).

Species	Paying periods		Sums in euros	
	Municipalities	FHA	1741 Decree	1898 Decree
<i>Haliaeetus albicilla</i>	1742–1923	1879–1898	12	19
<i>Pandion haliaetus</i>	1869–1898	–		
<i>Aquila chrysaetos</i>	1742–1923	1879–1898	12	19
<i>Milvus migrans</i>	1742–1898	–	3.6	
<i>Buteo buteo</i>	1869–1898	1879–1912		
<i>Pernis apivorus</i>	1869–1898	1904–1905		
<i>Accipiter nisus</i>	1742–1898	1880s–1912	3.6	
<i>A. gentilis</i>	1742–1923	1871–1898	6	11
<i>Falco subbuteo</i>	1742–1898	–	3.6	
<i>F. peregrinus</i>	1869–1898	1886–1912		
<i>Bubo bubo</i>	1742–1923	1879–1898		19
<i>B. scandiaca</i>	1742–1868	–		
Other owls*	1742–1868	–	3.6	
Other hawks**	1869–1898	–	3.6	

* Includes eight species that bred within the borders of Finland.

** Includes 13 species that bred within the borders of Finland.

3.3. Types of persecution

The types of active persecution ranged from cutting of nest trees, egg removal and shooting (sometimes even through nests) to different types of traps. Trapping methods changed over time. Pole traps were widely used in Finland since 1902 due to active campaigns that promoted their use (Suominen 1967, Turpeinen 1976). A metal trap was mounted on the top of a pole. When a hawk or an owl landed on the pole the jaws snapped shut, damaging the bird's legs. The method was effective but criticized for its cruelty (Suominen 1967). It damaged and killed indiscriminately both pest species and harmless or even useful birds (Wight 1931). Due to the criticism, pole traps were forbidden in the 1923 Nature Conservation Act (15§), except for limited use in the vicinity of bird and hare farms and game-feeding sites (Lindgren 1943, Suominen 1967). The use of less harmful decoy traps was legal until the 1993 Hunting Act. Also decoy traps were criticized for sometimes painfully injuring the birds' legs (Lindgren 1943, Suominen 1967).

Cage traps were considered a lighter method of trapping birds of prey (Lindgren 1939, 1943). These gradually replaced the pole and decoy traps

as the most popular trapping method, and were apparently first presented as a suitable hawk-trapping method in a small Finnish-language hunting guide published in 1878 (Anon. 1878). The most widely-used cage traps were the Hamilton's cage trap, introduced from Sweden (Dieden 1924), and the Lindgren's cage trap (Lindgren 1939). Cage traps used mainly pigeons or corvids as decoy birds, and were less harmful for trapped harmless or useful birds, which could be released unharmed (Lindgren 1943).

The types of persecution varied between species. According to Kivirikko (1926–27), cutting of nest trees of the Golden Eagle, White-tailed Sea Eagle and Osprey was commonly applied and contributed to the local population declines of these species. Sandman (1900) stated that the Snowy Owl and the Great Grey Owl (*Strix nebulosa*) suffered heavily from commercial and scientific egg collecting. According to Suominen (1967), it was however the Gyrfalcon (*Falco rusticolus*) that ultimately suffered most from commercial egg collecting.

Law-based hunting and trapping regulations were ignored by some hunters. Shooting of White-tailed Sea Eagles and destroying their nests was still common in the 1960s, after four decades of le-

Table 3. Species identification problems with raptors and owls from September 1914 to November 1916 in the city of Pori (Suomalainen 1916).

Species (for which bounties were claimed)	Killed specimens, species confirmed	Killed specimens of other species	Other species identified	Total number of killed birds
<i>Haliaeetus albicilla</i>	0	2	Not known	2
<i>Aquila chrysaetos</i>	1	0	None	1
<i>Accipiter gentilis</i>	1	186	<i>Buteo buteo</i> <i>B. lagopus</i> <i>Pernis apivorus</i> <i>Accipiter nisus</i> <i>Falco subbuteo</i> <i>F. tinnunculus</i> <i>F. columbarius</i>	187
<i>Bubo bubo</i>	1	209	Hen <i>Gallus domesticus</i> <i>Asio otus</i> <i>A. flammeus</i> <i>Surnia ulula</i>	210

gal protection (Bergman 1964; Table 1). The same was true for the Golden Eagles in Northern Finland after one decade of legal protection (Saari 1976). Illegal pole traps as well as fox and muskrat traps were commonly used to trap birds of prey in the 1960s (Suominen 1967), and some hunters openly advocated for the reintroduction of pole traps that had been banned since 1923 (Halmesmäki 1946).

4. Bounty statistics

There were two principal bounty-paying organizations. Law-based bounties on avian pests were paid by the municipalities, whilst the Finnish Hunting Association was the most important voluntary bounty-paying organization (Table 2). The bounties were set for adults, chicks and eggs. The legislators apparently realized that an effective bounty scheme must also include control of juveniles. Bounty schemes included birds of prey, corvids and some smaller passerines. Between 1742 and 1923 bounties were paid for 33 raptor and owl species. Four legislative reforms were introduced during that period (see section 3.2.). Prior to the 1868 Hunting Decree the number of species in the bounty list was only 15. The 1868 Hunting Decree excluded all owls but the Eagle Owl, and included all eagles, hawks and falcons. This list of birds of prey then totalled 23 species. In spite of the extensive list of species rewarded by

municipalities, the persecution pressure on these species remained at a low level. This ineffective enforcement of law boosted the Finnish Hunting Association to voluntarily pay bounties of its own. Between the two Hunting Decrees 1868 and 1898 the Hunting Association rewarded persecution of White-tailed Sea Eagle, Golden Eagle, Buzzard, Eurasian Sparrowhawk, Goshawk, Peregrine Falcon (*Falco peregrinus*), Eagle Owl and Snowy Owl, as well as the Great Black-backed Gull (*Larus marinus*) and all corvids (Table 2; Pohja-Mykrä *et al.* 2005). The Government considered this action useful and consequently supported the association financially in 1889–1898 and again in 1903–1911 (Viljanen 1965).

The list of bird species for which bounties were paid was radically shortened in the Hunting Decree of 1898; only four predatory bird species, that is, Golden Eagle, White-tailed Eagle, Eagle Owl and Goshawk, were rewarded (Table 2). However, persecution of these species increased after the enforcement of the 1898 Decree (Fig. 1; Erkamo 1990). The most intense killing pressure occurred in the Turku and Pori regions in south-western Finland, where altogether 312,993 recorded birds of prey were killed for bounties between 1899 and 1916. That was about 25% of all killed raptors in Finland at that time (see Statistical Yearbooks of Finland). From 1899 bounties ceased to be optional and for the first time municipalities were obliged to pay them. Contrary to the previous 1868

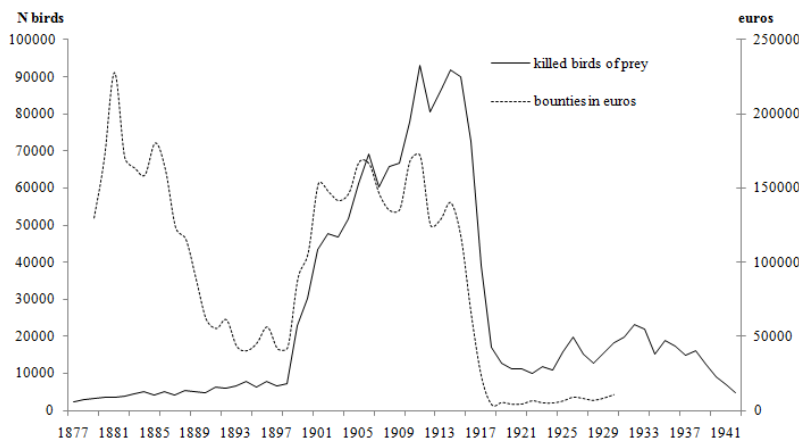


Fig. 1. Numbers of birds killed that were included in the bounty scheme during 1877–1942, and bounties paid for them during 1879–1930 (converted to 2009 value in euros; Statistical Yearbooks of Finland).

Decree, the 1898 Decree also defined the sums of money to be paid for each species.

Increased interest in bounties also brought along a huge species identification problem (Table 3). As the bounty sums were high enough to bring sufficient incomes for households, species misidentification may partly have been intentional. In the province of Satakunta, only 3.1% of birds killed in the hope of getting bounty payments had been correctly identified at this period (Table 3). For instance, 101 killed Kestrels (*Falco tinnunculus*) had been brought to the city officials as “young Goshawks” in the hope of receiving bounties (Suomalainen 1916). Both hunters and conservationists were concerned with the situation. As the bounties were paid to hunters on the presentation of cut-off legs, there was a growing need for a guidebook for the identification of bird legs, especially for the authorities responsible for paying bounties. Although there had been previous publications on the matter (e.g., Lindholm 1894), a comprehensive guide for identification on both rewarded and non-rewarded raptor legs was published in 1906 (Fig. 2; Hintze 1906). The pictures for identification of birds and their legs were published more or less regularly in the 1900s (e.g., Anon. 1941, 1947b).

The number of killed birds of prey fell remarkably after 1916, that is, a few years before the Nature Conservation Act and protection of many bird species in 1923 (see section 3.2). This decrease was due to inflation of Finnish Mark since 1916. The value of bounties fell markedly by the time of the Finnish independence and the Civil War of 1918. It is understandable that both the purchasing

power of the money and unstable conditions in society affected the killing of pests. The men who were either too young or too old for warfare directed their hunting effort towards edible game instead of pests whose bounties were practically worthless (Pohja-Mykrä & Mykrä 2007).

The Amendment of the Hunting Decree in 1923 ceased the law-based bounties on pest birds. However, municipalities and local hunting organizations continued to pay bounties privately. In the mid-1930s a few dozen municipalities paid bounties on Goshawks (Anon. 1935a). Since the mid-1930s bounty paying was carried on by game management associations. The associations actually got state subsidies for bounties (Anon. 1935b). In 1947 the Finnish Ministry of Agriculture earmarked funds for pest bird bounties and even set exact bounty-sums for Goshawk, Sparrowhawk and corvids (Anon. 1947a). As the misidentification of birds occurred to the same extent as in previous decades, the Ministry demanded that they should receive the cut-off legs of every killed specimen before the bounty paying (Anon. 1951). Bounty paying for the Goshawk and Sparrowhawk ended in 1963 (Suominen 1967).

5. Population biological consequences of persecution

5.1. National level

Four national sources (Kivirikko 1926–27, Merikallio 1958, Saurola 1985a, Väisänen *et al.* 1998) were used to summarize changes in the distribu-

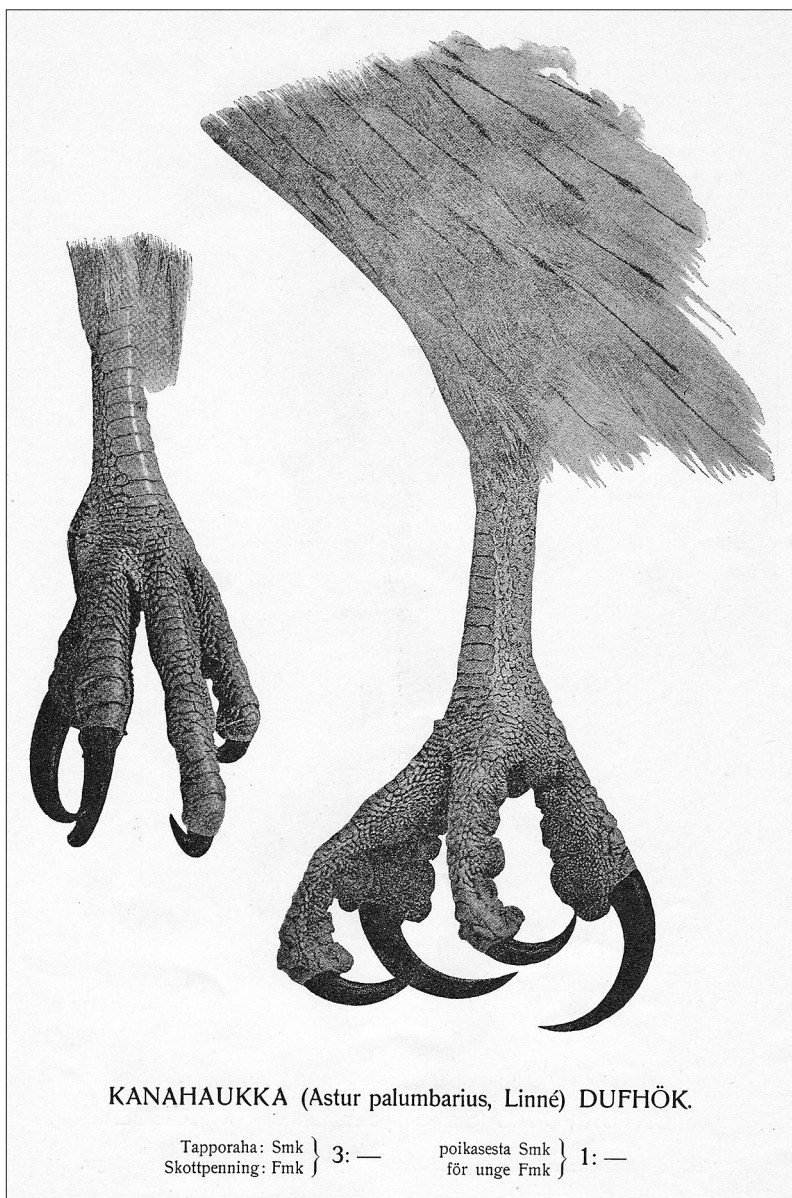


Fig. 2. Cut-off legs of a Goshawk (*Accipiter gentilis*), as illustrated in the guidebook for the identification of rewarded birds of prey (Hintze 1906).

tion and abundance of resident Finnish species of raptors and owls (Table 4). Nearly all species were reported to having been persecuted at least to some extent. Local extinctions due to persecution were explicitly reported for six species, i.e., the White-tailed Sea Eagle, Golden Eagle, Osprey, Gyrfalcon, Peregrine Falcon and the Eagle Owl. The smaller falcon species seem to have been less commonly persecuted than the larger species of raptors (Table 4). In addition, the Finnish population of the

Greater Spotted Eagle (*Aquila clanga*) is considered to have died out primarily due to persecution in the first half of the 20th century (Väisänen *et al.* 1998). At present, persecution is not considered a serious threat to Finnish birds of prey (Table 4).

5.2. Local level

Table 5 summarizes species persecution data based on three local studies (Suomalainen 1916,

Table 4. Population trends of Finnish birds of prey according to the major national surveys. Symbols: R± = range changes not reported; R- = range decreased; R+ = range increased; LE = local extinctions reported; P± = no changes in total population reported; P- = total population decreased; P+ = total population increased; ^p = contemporary shooting, systematic egg collecting or other forms of persecution reported.

Species	Kivirikko (1926–27)	Merikallio (1958)	Saurola (1985a)	Väisänen <i>et al.</i> (1998)
Falconiformes				
<i>Permis apivorus</i>	R±/P± ^p	R±/P±	P?	R±/P-
<i>Haliaeetus albicilla</i>	R-/P-,LE ^p	R-/P-,LE ^p	P+	R+/P+
<i>Circus aeruginosus</i>	R+/P+ ^p	R+/P+ ^p	P+	R+/P+
<i>C. cyaneus</i>	R±/P±	R-/P±	P+	R±/P±
<i>Accipiter gentilis</i>	R±/P- ^p	R±/P±	P-	R±/P-
<i>A. nisus</i>	R±/P± ^p	R±/P±	P+	R±/P+
<i>Milvus migrans</i>	rare visitor/P± ^p	R+/P+ ^p	P?	R±/P-
<i>Buteo buteo</i>	R±/P- ^p	R±/P± ^p	P±	R±/P±
<i>B. lagopus</i>	R±/P± ^p	R-/P±	P?	R-/P±
<i>Aquila chrysaetos</i>	R-/P-,LE ^p	R-/P-,LE ^p	P+	R±/P+
<i>A. clanga</i>	R±/P± ^p	R±/P- ^p	P?	R-/P- (possibly ext.)
<i>Pandion haliaetus</i>	R±/P-,LE ^p	R±/P±	P±	R±/P+
<i>Falco tinnunculus</i>	R+(in Lapland)/P±	R±/P±	P-	R+/P+
<i>F. columbarius</i>	R±/P±	R±/P- ^p	P-	R±/P-
<i>F. subbuteo</i>	R±/P±	R±/P±	P±	R±/P±
<i>F. rusticolus</i>	R-/P-,LE ^p	R-/P-,LE ^p	P±	R±/P±
<i>F. peregrinus</i>	R±/P± ^p	R-/P±,LE	P+	R±/P+
Strigiformes				
<i>Bubo bubo</i>	R±/P-,LE ^p	R±/P- ^p	P+	R+/P+
<i>B. scandiaca</i>	R±/P± ^p	R±/P± ^p	P?	R±/P±
<i>Surnia ulula</i>	R±/P± ^p	R-/P- ^p	P?	R+/P±
<i>Glaucidium passerinum</i>	R±/P± ^p	R±/P±	P?	R±/P+
<i>Strix aluco</i>	R+/P+ ^p	R+/P+	P-	R±/P-
<i>S. uralensis</i>	R±/P+ ^p	R±/P±	P±	R±/P±
<i>S. nebulosa</i>	R±/P±, ^p	R±/P±	P?	R+/P+
<i>Asio otus</i>	R+(in Lapland)/P± ^p	R±/P± ^p	P?	R+/P±
<i>A. flammeus</i>	R±/P±	R±/P± ^p	P?	R±/P±
<i>Aegolius funereus</i>	R±/P±	R±/P±	P?	R±/P±

Putkonen 1935, Sovinen 1948). On the basis of these data, all species encountered were occasionally persecuted irrespective of the fact that some of them were legally protected. For example, as late as 1928–1934, professional taxidermists in the Viipuri region received significant numbers of all owl species even though half of the species had been protected since 1923 (Putkonen 1935; cf. Table 1).

5.3. Population trends of species with reported local extinctions

All persecuted raptor and owl species considered were characterized by negative population trends

in the earlier half of the 1900s. Table 6 summarizes data on changes in population and range sizes in the areas of Pori (Suomalainen 1927), Pieksämäki (Siivonen 1936) and Viipuri (Putkonen 1942). These studies reported six cases of local extinctions in four species, that is, White-tailed Sea Eagle, Golden Eagle, Osprey and Eagle Owl. In addition, local extinctions of Greater Spotted Eagle, Gyrfalcon and Peregrine Falcon were mentioned elsewhere (Table 4).

5.3.1. White-tailed Sea Eagle

White-tailed Sea Eagles probably bred in all coastal areas and in some inland lakes from the

Southern Finland up to the Arctic Ocean in the 1800s, but disappeared subsequently from most of these areas (von Wright 1859, Mela 1882, Mela & Kivirikko 1909). The White-tailed Sea Eagle became locally extinct along the coasts of the Gulf of Finland and most parts of the Gulf of Bothnia by 1920 (Kivirikko 1926–1927, 1940). According to Jägerskiöld and Kolthoff (1926), the species was fairly common in the Åland Islands and in the Turku archipelago until the 1890s, but because of intense persecution supported by bounties on adults, chicks and even eggs, these populations decreased drastically by the 1910s. At that time the species was on the verge of extinction in Finland (Kivirikko 1926–1927). Still in the 1950s the species only bred in the Åland Islands, the Archipelago Sea and the central archipelago along the Gulf of Bothnia (Merikallio 1958).

The local extinctions in the late 1800s and the early 1900s were certainly caused by persecution. According to Suomalainen (1927), the White-tailed Sea Eagle no longer bred in the Pori region, and birds seen during migration were frequently shot. Neither did it breed in the Viipuri region (Putkonen 1942).

The Finnish White-tailed Sea Eagles, as conspecifics elsewhere, suffered later from bioaccumulation of polychlorinated hydrocarbons, which resulted in a collapse of the breeding population by the early 1970s (Koivusaari *et al.* 1972). Since then, the breeding population has recovered especially due to winter feeding and protection of nest sites, and was estimated to be about 350 breeding pairs in 2010 (Stjernberg *et al.* 2008, Valkama *et al.* 2011). The species is currently classified as vulnerable (Mikkola-Roos *et al.* 2010).

5.3.2. Golden Eagle

The Golden Eagle nested throughout the country in the early 1800s, but disappeared from southernmost Finland by 1850 (von Wright 1859, Mela 1882). By the early 1900s, Golden Eagle had disappeared also from south-eastern and south-western Finland due to persecution (Kivirikko 1926–1927). Although it had become rare in the south it was still fairly common in Lapland (Mela & Kivirikko 1909). Kivirikko (1926–1927) wrote that "if this kind of shooting is permitted to con-

Table 5. Species persecution data based on three local studies performed by professional biologists. Suomalainen's (1916) data include the numbers of killed birds that had been brought to the city officials of Pori (September 1914 – November 1916) in the hope of receiving hunting bounties. All these had been reported to be killed in the administrative area of the city of Pori; all identifications were confirmed by Suomalainen. Putkonen's (1935) data consist of owls killed in southeast Finland and subsequently stuffed by two professional taxidermists in the city of Viipuri 1928–1934. The data of Sovinen (1948) were based on the numbers of killed specimens that had been brought to the local hunting society of Satakunta-Lappi in 1945–1948 in order to obtain hunting bounties; species identifications were confirmed by Sovinen.

Species	Suomalainen (1916)	Putkonen (1935)	Sovinen (1948)
Falconiformes			
<i>Pernis apivorus</i>	6		11
<i>Haliaeetus albicilla</i>	0		0
<i>Circus aeruginosus</i>	0		0
<i>C. cyaneus</i>	1		0
<i>Accipiter gentilis</i>	1		52
<i>A. nisus</i>	35		11
<i>Milvus migrans</i>	0		0
<i>Buteo buteo</i>	32		18
<i>B. lagopus</i>	2		0
<i>Aquila chrysaetos</i>	1		0
<i>A. clanga</i>	0		0
<i>Pandion haliaetus</i>	2		0
<i>Falco tinnunculus</i>	101		7
<i>F. columbarius</i>	1		0
<i>F. subbuteo</i>	8		0
<i>F. rusticolus</i>	0		0
<i>F. peregrinus</i>	1		3
Strigiformes			
<i>Bubo bubo</i>	1	58	8
<i>B. scandiaca</i>	1	19	0
<i>Surnia ulula</i>	22	58	0
<i>Glaucidium passerinum</i>	0	27	0
<i>Strix aluco</i>	0	214	0
<i>S. uralensis</i>	0	72	1
<i>S. nebulosa</i>	0	18	0
<i>Asio otus</i>	141	40	0
<i>A. flammeus</i>	45	70	1
<i>Aegolius funereus</i>	0	44	4

tinue unhindered, soon only a memory will be left of our mightiest bird of prey", and Merikallio (1958) confirmed that the Golden Eagle is "a bird badly persecuted by culture".

Table 6. Population trends of Finnish raptors and owls in three long-term local studies. Species with negative trends only are shown in bold italics. Not resident = species did not breed regularly in the area (but could still be persecuted, e.g., on migration); * = individuals reported to be killed and/or nests destroyed; 1 = habitat change mentioned as a cause of population change. Putkonen (1942) did not include direct persecution data on most birds of prey; killed specimens were mentioned only for *Haliaeetus albicilla* and *Milvus migrans*. Persecution data on owls in the Viipuri region are from Putkonen (1935).

Species	Period 1913–17 (Suomalainen 1927)	Period 1926–35 (Siivonen 1936)	Period 1928–40 (Putkonen 1935, 1942)
Falconiformes			
<i>Pernis apivorus</i>	no trend	negative?*	negative
<i>Haliaeetus albicilla</i>	extinct	not resident*	negative*
<i>Circus aeruginosus</i>	no trend?*	not resident	negative
<i>C. cyaneus</i>	no trend*	not resident	not resident
<i>Accipiter gentilis</i>	negative	no trend	negative
<i>A. nisus</i>	no trend	no trend	negative
<i>Milvus migrans</i>	not resident	not resident*	not resident*
<i>Buteo buteo</i>	negative*	no trend	negative
<i>B. lagopus</i>	not resident*	not resident	not resident
<i>Aquila chrysaetos</i>	extinct*	extinct*¹	extinct
<i>A. clanga</i>	negative*	not resident	not resident
<i>Pandion haliaetus</i>	negative	extinct*	negative
<i>Falco tinnunculus</i>	no trend*	no trend	positive
<i>F. columbarius</i>	not resident*	not resident	not resident
<i>F. subbuteo</i>	no trend*	no trend	negative
<i>F. rusticolus</i>	not resident*	not resident	not resident
<i>F. peregrinus</i>	negative*	not resident	negative
Strigiformes			
<i>Bubo bubo</i>	negative*	extinct*	negative*
<i>B. scandiaca</i>	not resident*	not resident	not resident*
<i>Surnia ulula</i>	no trend*	no trend	no trend*
<i>Glaucidium passerinum</i>	no trend*	positive?*	negative*
<i>Strix aluco</i>	not resident*	not resident	negative*
<i>S. uralensis</i>	no trend*	no trend*	negative*
<i>S. nebulosa</i>	not resident*	not resident	not resident*
<i>Asio otus</i>	negative?*	no trend	positive*
<i>A. flammeus</i>	negative*	no trend*	not resident*
<i>Aegolius funereus</i>	no trend*	no trend	negative*

Intense persecution and habitat destruction have undoubtedly been the main causes of local extinctions of the Golden Eagle in Finland (Ollila & Koskimies 2007). The species had long been extinct as a breeding species in the Pori region (Suomalainen 1927). An indicator of the rarity of the species was that during a 10-year period, not a single specimen was shown to city officials in the hope of obtaining bounties (Suomalainen 1927). Moreover, the single specimen mentioned in Table 3, from an earlier period, was a stuffed bird. The species had long been extinct also from the Viipuri region (Putkonen 1942), and in the Pieksämäki region only 1–2 breeding observations existed from the 1920s. According to Siivonen (1936), exten-

sive logging had probably forced the species to abandon its old nest sites in this region.

The population of the Golden Eagle has slowly increased since the 1970s. In 2010 the estimated number of breeding pairs in Finland was 300–400 (Valkama *et al.* 2011). The species is currently classified as vulnerable (Mikkola-Roos *et al.* 2010).

5.3.3. Greater Spotted Eagle

According to Suomalainen (1927), the first known observation of the Greater Spotted Eagle in the Pori region was from 1881, when a bird was shot

in the vicinity of the city of Pori. The first nest was found in 1885, and repeated observations indicated that the species bred in the region in the late 1800s and the early 1900s. Suomalainen himself (1927) followed a nest in Riihijärvi from 1916 to 1919. In 1920–1927 this nest site was unoccupied, although birds were sometimes reported in the area. According to Kivirikko (1926–1927), many of the observed birds were shot, and eggs were taken to collections.

Valkama *et al.* (2011) noted that since 1919 breeding of the Greater Spotted Eagle has been documented only in 1943, 1975, and since 2005 (one breeding pair in central Finland). Väisänen *et al.* (1998) concluded that the main causes of local extinction of this species from Finland were shooting and trapping of breeding adult birds and egg collecting. The species is presently classified as critically endangered (Mikkola-Roos *et al.* 2010).

5.3.4. Osprey

The Osprey breeds in all regions of Finland, but has earlier suffered from intense persecution. According to Suomalainen (1927), the Osprey used to be rare in the whole Pori region, although it still bred in some localities. The main reasons for population declines were cutting of nest trees, trapping of birds with pole traps, egg collecting and disturbance during the nesting period. In addition, migrating birds were often shot. Putkonen (1942) considered Osprey as locally extinct in the Viipuri region, although birds were still often seen during the breeding season. The situation was similar in Pieksämäki region (Siivonen 1936), where successful nesting had not been recorded for many years. A nesting attempt in 1932 was interrupted as one of the adults was shot. The species has recovered well; in 2009 altogether 1,068 inhabited territories were recorded in Finland (Saurola 2010). It is currently classified as nearly threatened (Mikkola-Roos *et al.* 2010).

5.3.5. Gyrfalcon

The Gyrfalcon used to breed at high fjelds over the entire Finnish Lapland, but was exterminated from the southern Lappish fjelds by the early 1920s

(Kivirikko 1926–1927). According to Merikallio (1958) "depredation of nests and other persecution by man has reduced the species to the verge of extinction". Even today the Gyrfalcon is a rare breeder in the northern Finnish Lapland (Väisänen *et al.* 1998). In other parts of Finland, migrating Gyrfalcons were also frequently killed. For instance, Suomalainen (1927) mentioned that one bird was shot as a Goshawk in 1917. Väisänen *et al.* (1998) considered egg collecting as the principal cause of the decline of the Gyrfalcon population of Finland. Gyrfalcons were also shot as predators of an important game bird, namely the Willow Grouse (*Lagopus lagopus*; Koskimies & Ollila 2008). The species is presently classified as endangered (Mikkola-Roos *et al.* 2010) with less than 40 breeding pairs (Valkama *et al.* 2011). The poor recovery of this species may be connected with its nest-site selection; optimal nesting sites are scarce and easily spotted by potential egg collectors.

5.3.6. Peregrine Falcon

The Peregrine Falcon suffered greatly from bioaccumulation of organochlorides in the mid-1900s, and the reproductive rate subsequently declined. However, in the earlier decades the main anthropogenic threats were active persecution and habitat change. According to Suomalainen (1927), the species used to breed in large mire areas in the Pori region until 1920s, but was persecuted. In the Viipuri region it bred in three mire areas during early 1900s (Putkonen 1942). Siivonen (1936) was not aware of breeding attempts in the Pieksämäki region. Merikallio (1958) noted that the species had been exterminated in the archipelago of the Gulf of Finland, at least between Hanko and Loviisa. In addition to shooting, the species suffered from egg collecting. According to Sandman (1900) the price of a Peregrine Falcon egg was as high as ca. 5 Finnish Marks; in the 2009 currency, the sum equals 20 euros. However, persecution cannot have been the main cause of the population decline in the 1950s (Linkola 1964). At its lowest, in the early 1970s, the Finnish breeding population was only ca. 30 pairs, while the current estimate is 250–290 pairs (Valkama *et al.* 2011). The species has thus recovered well, although the population is

still lower than the 600–700 breeding pairs of the 1950s (Ollila & Koskimies 2007). The species is presently classified as vulnerable (Mikkola-Roos *et al.* 2010).

5.3.7. Eagle owl

According to Merikallio (1958), the numbers of Eagle Owls had decreased considerably by mid-1900s due to severe persecution by man in all parts of the country. As a consequence, Siivonen (1936) considered the species to be extinct from the Pieksämäki region. According to Suomalainen (1927), the Eagle Owl probably still bred in the Pori area, although recent nest findings were lacking. Putkonen (1942) noted that the Eagle Owl was rare in Viipuri region during breeding season, and that no recent nests had been found. Based on such observations Kivirikko (1926–1927) concluded that the species had been exterminated from many parishes in Finland.

Since the 1960s, the population of Eagle Owl has increased rapidly due to the decrease in persecution (Table 1), more abundant food sources provided by refuse dumps (particularly rats), and increased openness of forested areas caused by forestry (Väisänen *et al.* 1998; Valkama & Saurola 2005). In the inland south-western Finland, the breeding population increased by about 40% during 1978–1995 (Lehikoinen *et al.* 2003). In recent years, however, the population has somewhat declined as a result of the strict waste-management policy enforced by the European Union. The species is currently classified as near threatened (Mikkola-Roos *et al.* 2010), with a total population of 1,200 breeding pairs (Valkama *et al.* 2011).

5.4. The case of Goshawk: was persecution useless?

Goshawk has probably been the most hated and persecuted raptor in Europe (Suominen 1967). In Finland, Goshawk was given a pest status already in 1647 (Royal Decree on Hunting 1647) and bounties were paid for it during 1741–1963 (Anon. 1947a, Saurola 1976). Although law-based bounties on Goshawks were ceased in 1923, the Ministry of Agriculture allocated money to game-management associations to pay bounties

up to 1963 (Anon. 1947a, Anon. 1951, Saurola 1976). Hellenius and Idman (1802) noted the poultry predation habits of young Goshawks. During most of the 20th century, hunting guidebooks emphasized the harmfulness of the Goshawk and strongly advocated for its persecution. However, due to species identification problems (Table 3) there are no reliable statistics on the numbers of Goshawks killed. Saurola (1976) estimated the number of birds killed annually to be at least 5,000–6,000. Trapping and hunting of Goshawks were most intensive from September to October. Since partial protection in 1979, persecution in Fennoscandia has decreased remarkably, although about 7 per cent of ringed nestlings were reported in bird ringing statistics as having been killed during their first year as recently as 1976–1980 (Saurola 1985b).

The Goshawk seems to have been particularly tolerant to persecution, however. Considering the intensive persecution efforts, Sulkava (1963) regarded the success of long-term persecution as "surprisingly poor" and explained this persecution tolerance with Goshawks' high reproductive rate, lack of natural enemies, fondness to large forest areas in which some pairs can always reproduce successfully, and the fact that in Finland an unknown proportion of the Goshawk persecution effort was actually targeted at more visible raptors, such as the Common and Honey Buzzard (*Pernis apivorus*). This is also seen in Table 3, which indicates species-identification problems in the Pori region; 186 birds had been shot as Goshawks, but only one of these was really a Goshawk.

According to von Haartman *et al.* (1963–1972), active persecution has not been able to permanently decrease Finnish Goshawk populations. Local extinctions were avoided due to rapid colonization of vacant areas by young birds. Severe winters, fluctuations in prey populations and forestry have influenced Goshawk populations more than human persecution (Kenward *et al.* 2000). According to Väisänen *et al.* (1998), Goshawk population and its range had remained fairly constant from the 1950s to the early 1970s, despite intensive persecution. However, in some areas especially in southern Finland the populations have declined since the 1970s, probably due to the declines of grouse populations caused by modern forestry.

Haukioja & Haukioja (1971) argued that persecution may actually have had a positive effect on the Goshawk population. Based on these authors' ringing data, about 20% of the autumn Goshawk population had been killed by man. About 70% of the killed birds were young, which naturally have a high mortality rate. Thus, because persecution seems to have concentrated on the "weakest" part of the population, the effect of man on the Goshawk population dynamics has not exclusively been negative.

6. Discussion

Our results show that persecution used to be most intense and directed at the highest number of species of birds of prey from 1898 to 1923. Persecution was justified primarily as a means to increase game stocks that were supposed to have declined due to predation. The possible role of habitat change was not well understood during that period (but see Vuorisalo & Laihonon 2000). Persecution was to a varying extent targeted at all species of birds of prey, irrespective of their legal status. The main reasons for this were probably the widespread attitude that all birds of prey were to some extent "harmful" to man, non-targeted killing of all raptors in the hope of bounties and the poor species-identification skills of many hunters. It is also possible that some hunters were simply unaware of changes in the legal status of some birds of prey especially after 1923. After the 1923 legislative reforms, systematic persecution concentrated on a handful of species, most notably the Goshawk, Sparrowhawk, Rough-legged Buzzard (in Lapland), Golden Eagle (in Lapland), White-tailed Sea Eagle (in the Archipelago areas) and the Eagle Owl.

The persecution trends in Finland have global roots. In some parts of Europe the negative attitudes and bounty paying for large raptors spread already in the 16th century, and persecution of raptors and owls became globally widespread in the 1800s and early 1900s (Newton 1979). According to Thiollay (1994), the traditional reverence towards raptors was replaced in the late 18th century by an "obsession" to destroy these same "vermin" birds. The ultimate cause seems to have been the rapidly-increased hunting pressure and livestock

farming, which both are activities that consider birds of prey as harmful competitors (Valkama et al. 2005 and references therein). Systematic persecution of raptors was mainly undertaken by hunters, gamekeepers and sometimes by farmers, who considered persecution the only way to prevent predation of raptors and owls on sheep, poultry and game species. Globally, the destruction peaked between 1860 and 1960 (Thiollay 1994). In Norway alone, 88,476 Golden Eagles and White-tailed Sea Eagles, and 135,000 other raptors had been killed during the second half of the 19th century. In Alaska, 128,273 Bald Eagles had been killed during 1917–1952, and in Austria about 15,000 to 22,000 raptors had officially been killed each year between 1948 and 1968. In Europe, the numbers must have been millions from 1950 to 1970. From this perspective, the strict protection of all species of Falconiformes in Appendix II of the Convention on the Conservation of European Wildlife and Natural Habitats (1979) appears a major historical step.

Likewise, the rise of bird protection in the late 1800s was an international phenomenon. Britain had legislated protection for seabirds already in 1869, and for all wild birds by 1880. In Germany, laws on bird protection appeared in Bavaria in 1866, Saxony in 1876, and Prussia in 1880 (Bonhomme 2007). Bird conservation organizations have existed since 1869 in Sweden and since 1870 in Finland (the Spring Society of Zachris Topelius). The German Bird Conservation Society was founded in 1875, and the Royal Society for the Protection of Birds was founded in Britain in 1889 (Vuorisalo & Laihonon 2000). Clearly, the rising criticism against persecution of raptors and owls in Finland since the late 1800s was not a separate phenomenon, but rather paralleled developments in other European countries, and was influenced by them.

From the hunters' perspective, the high investment in anti-predator propaganda gradually lost its importance in the 20th century, and the last fight for continuing the management (i.e., harvesting) of the Finnish Goshawk population can hardly be called a dramatic one (Ilvesviita 2005). The main reasons were probably (i) assumed minor role of predators as population regulators, (ii) the increased standard of living of the Finnish (human) population that made the claimed economic losses

caused by predators to look negligible, and (iii) the increased environmental awareness since the early 1960s.

The lows of raptor populations reflect the importance of persecution as an ecological factor. Nearly all species actively persecuted since 1800s have, however, recovered and occur currently in viable populations in Finland. The gradual ending of persecution after the Second World War was good news for all birds of prey in Finland. However, some species, most notably the White-tailed Sea Eagle and the Peregrine Falcon, suffered from hindered reproduction caused by synthetic organochlorines for decades. The breeding populations of the White-tailed Sea Eagle, Osprey and Eagle Owl are presently thriving, that of Golden Eagle is slowly increasing, and the Peregrine Falcon has recovered from its population bottleneck. Unfortunately, the Greater Spotted Eagle has not yet recovered, and the population of the Gyrfalcon is still less than 40 pairs (Valkama *et al.* 2011).

The unexpectedly high tolerance of persecution by the Goshawk, undoubtedly the most persecuted species in Finland, calls for an explanation. This is especially so, as the species disappeared from large areas of Britain, Denmark and the Netherlands (Thiollay 1994). Typically Goshawk populations contain a non-breeding segment that has a secretive lifestyle (Kenward *et al.* 2000). These non-breeders or “floaters” are adult birds and physiologically capable of breeding, but they will for some reason not do so until a territory becomes available (Newton 1998, Tornberg 2000, Tornberg *et al.* 2005). Plausible explanations for the Goshawk’s persecution tolerance in Finland include landscape structure, the species’ life-history, the intensity of game management, and the human population density as such. In sparsely-populated areas, such as Finland, where the landscape is predominantly forested, young and non-territorial Goshawks are migratory whereas the territorial pairs usually do not migrate. The Goshawk persecution in Finland has traditionally taken place during spring and autumn migration, which suggests that particularly these non-breeding and non-territorial individuals are targeted (see also Haukioja & Haukioja 1971). The breeding segment of the population may not have been severely affected by the persecution and, if a territory has become available, there have always been floaters around

to rapidly occupy it. In United Kingdom and in continental Europe, on the other hand, Goshawks are more sedentary, the landscape is more open and there have simply been more people to carry out the intense persecution. In these areas, both the non-breeding and breeding segments of the population may have suffered from persecution equally.

Our results also suggest that in analysing consequences of persecution, the scale of the study is important. While census data at the national level indicate that the ranges and populations of many persecuted species have remained relatively stable, their local-scale population trends could still have been negative.

We conclude that (1) birds of prey used to be actively persecuted relatively recently, irrespective of legal protection granted for many of them; (2) this persecution had a great impact on the abundance and range of many species; and (3) persecution has earlier been actively encouraged by legislation. The vast increase in the numbers of killed “pest birds” after the 1898 Hunting Decree serves as a good example of this. We also conclude that (4) from the conservationist viewpoint, bounty schemes appeared problematic for several reasons. One is that the species-identification skills of hunters were often poor, which regularly resulted in persecution of non-target species, some of which may have been endangered. Finally, we state that (5) perhaps even more problematic was the basic attitude behind all bounty schemes, that is, classification of species into “pest” and “useful” ones. Experience shows that in the course of time such valuations may change considerably, and therefore great caution should be used in the application of such classifications in legislation or in practice.

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Petolintujen vainon historia ja biologiset seuraukset Suomessa

Petolintujen vainolla Suomessa on pitkät perinteet. Useat lajit ja asetukset aina 1700-luvulta alkaen pyrkivät määrittelemään eri petolintujen vahin-

gollisuuden ihmisen toimille ja riistalle. Pahimmiksi syntipukeiksi kotkien lisäksi on katsottu kanahaukka (*Accipiter gentilis*), varpushaukka (*A. nisus*) ja huuhkaja (*Bubo bubo*). Petolintujen vahingollisuutta ja sen myötä vainon tarpeellisuutta arvotettiin myös laissa määrätyn ja vapaaehtoisesti maksetuin tapporahoin.

Tapporahojen maksun kiivain aika asettuu vuoden 1898 metsästysasetuksen ja vuoden 1923 metsästyslain muutoksen väliin. Petolintujen vainon katsottiin olevan riistanhoidollisesti järkevää, ja tavoitteena oli petolintukantojen hävittäminen sukupuuttoon. Tämän tavoitteen eettinen perusta ja biologiset vaikutukset kyseenalaistettiin tutkijoiden ja luonnonsuojelijoiden tahoilta jo 1900-luvun alkupuolella, mutta tapporahat säilyttivät paikkansa suomalaisessa riistanhoidossa viime vuosikymmenille.

Tapporahojen maksun tavoite onnistui kiljukotkan (*Aquila clanga*) kohdalla, jonka paikallinen populaatio tapettiin sukupuuttoon Suomesta 1920-luvulla. Vainon aiheuttamista alueellisista sukupuutoista kärsivät ainakin merikotka (*Haliaeetus albicilla*), maakotka (*A. chrysaetos*), kalasääski (*Pandion haliaetus*), tunturihaukka (*Falco rusticolus*), muuttohaukka (*F. peregrinus*) ja huuhkaja. Näiden lajien kantojen toipuminen on ollut hidasta, mutta nyttemmin suojelutyön voidaan katsoa onnistuneen.

Vainon tehokkuus on vaihdellut lajeittain. Esimerkiksi kanahaukkakanta on selvinnyt vuosisatojen aktiivisesta vainosta vähin vaurioin. Tätä selettävät lajityypilliset tekijät, kuten piilotteleva pesintä metsässä ja tehokas lisääntyminen, sekä vainon pääasiallinen kohdistuminen kiertäviin nuoriin yksilöihin. Lisäksi kanahaukkaan kohdistetut vainotoimet johtivat usein väärin lintulajien tappamiseen; tapporaha maksettiin todisteeksi näytesyistä irtileikatuista jaloista, ja metsästäjät tarjosivat kanahaukkoina varsin kirjavaa joukkoa eri lintulajeja.

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