

Population Trends and Breeding Success of the Golden Eagle *Aquila chrysaetos* in Estonia, 1935-1991

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The first data on nesting success and feeding habits of the Golden Eagle are from 1935 (Zastrov 1946) but systematic study started only in 1964 (Randla 1976).

The estimated number of breeding pairs in Estonia was 20 in 1960-1970 but a later census in 1980 gave 25 pairs, although the real number was probably much higher - 30-35 pairs. That is quite large considering the small size of Estonia (42,000km²) and the even smaller potential nesting habitat of 8,000-10,000km².

Golden Eagles breed in mainland Estonia only, preferring forested and marshy areas. In Pärnumaa, SW Estonia, for example, there breed eight pairs, 0.3 pairs per 100km² of suitable habitat (Lelov 1984). Several pairs usually nest in each of our biggest marshlands (200-500km²).

Between 8 and 19 nests per year have been under closer observation since 1975, i.e. those cases where either eggs have been laid or nests have been redecorated in spring (an average of 14 nests and 18 hatchings annually for 17 years) (Table 1).

Analysis of hatchings shows 60% breeding success during the period of 1970-1991. According to earlier (pre-1972) data, an average of 1.5 young fledged in cases of successful nesting. In the years 1975-1987 this number was 1.09 (N-89) and in 1988-1991 a slight increase was noted, to 1.29 (N-41). Corresponding data are practically the same in Finland, where the rate of successful nesting in 1970-1989 was 60% also (Virolainen & Rassi 1990). In both countries (N-118) the average number of eaglets that survived to leave the nest was 1.22 in 1975-1990. For every occupied nest there were 0.64 eaglets in Finland and 0.62 in Estonia (N-206). The corresponding data for Sweden are 1.2 and 0.64 (1975-1980). According to the 1964-1968 census in Scotland where 489 nests were under observation, successful hatchings averaged 1.2 eaglets, 0.7 per nest with eggs and 0.6 per territorial pair annually (Everett 1971; Newton 1979).

The populations of the Golden Eagle in Estonia, Finland, Sweden and Scotland are viable. As the data from 1980 show, there seems to be no decrease in numbers. On the contrary, the Golden Eagle population in these countries has increased by almost 50%. This bigger number could, of course, be the result of more intensive studies but it is a fact that not only has the re-occupation of former territories taken place but also in many suitable nesting areas the population density has reached the critical limit.

Mortality has dropped, so that there are sufficient strategic reserves in the present occupied areas.

General nesting characteristics and favourable conditions in the natural habitat of the Golden Eagle give reason to hope that prospects of maintaining their present numbers are rather good.

Table 1. Productivity of the Golden Eagle in Estonia in 1975-1991.

Year	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91
Decorated nests or nests with eggs	8	9	12	13	12	12	14	15	16	12	9	14	13	15	16	16	19
Successful nestings	5	6	3	8	4	4	6	11	7	7	4	11	8	11	9	9	12
No. of young capable of flying	6	7	3	8	5	4	6	12	8	8	4	11	9	14	12	13	15
No. of young capable of flying per successful nesting	1.2	1.17	1.0	1.0	1.25	1.0	1.0	1.09	1.14	1.14	1.0	1.0	1.13	1.27	1.33	1.44	1.25
No. of young capable of flying per established nesting	0.75	0.78	0.25	0.62	0.42	0.33	0.43	0.75	0.44	0.67	0.44	0.79	0.69	0.43	0.75	0.81	0.79

The maximum life span for the Golden Eagle averages 20 years (48 years in captivity) (Newton 1979). Mortality of young birds during the juvenile period, i.e. during the first four years, is 75%. If a pair raises even 0.5 young annually the continuity of the population in general should be guaranteed. At least in Scotland it is believed so (Love & Watson 1990). This calculation need not be absolutely reliable, especially if the life span or mortality should suddenly decrease. Stable living conditions are a necessary precondition for a stable population. Continuous nesting of 10-13 pairs was observed in NE Scotland over 26 years (1944-1969) without any great changes in breeding success. One long series (1935-1991) of nesting success of five pairs is recorded in Estonia as well.

Most Golden Eagles breed when prey is abundant. This is especially noticeable in the northernmost nesting areas.

The numbers of Mountain Hare and Black Grouse, the chief prey for the Golden Eagle in Estonia, are unstable but the abundance of Crane, Raccoon-dog, Mallard and carrion compensates for a possible shortage of the main prey. Therefore temporary

lapses in breeding success could not be due to scarcity of food. In Sweden, however, the geographical distribution and population density of the Golden Eagle are dependent on food availability (Tjernberg 1983).

Table 2. Nesting success of the Golden Eagle at five sites in Estonia, 1935-1991.

Nest site and period of observation	No. of fledged young for each successful nesting	No. of decorated nests or hatchings	No. for period under observation
NW-Eesti (1964-1982)	1.2 (9)	1.0 (11)	0.6 (18)
W-Alutaguse (1969-1982)	1.4 (8)	1.1 (10)	0.9 (16)
E-Alutaguse (1969-1982)	1.0 (10)	1.0 (10)	0.7 (14)
Kõrvemaa (1977-1991)	1.0 (15)	0.4 (15)	1.4 (15)
Aegviidu (1935-1952)	1.4 (5)	0.5 (12)	0.4 (15)

According to Table 2, data on the pairs differ greatly, even in conditions of comparatively satisfactory prey availability. There are pairs that as a rule raise for short periods two eaglets a year and one pair in Kõrvemaa for 13 consecutive years raised at least one eaglet annually. This could easily be an inherited tendency (minimal difference in ages of eaglets). One pair in NW Estonia had altogether five nesting omissions over the 18 years their nest was under observation. Four of these lasted for a year and one for four years. During the latter, however, the female laid infertile eggs and met a fertile male only in the fifth year.

Long-term statistics show that nesting omissions lasting 2-4 years are quite common. Often one of the pair is not fully mature. The proper plumage does not form until the bird is five years old. This is an indicator of the small size of the reserve population and, despite comparatively successful breeding, the Golden Eagle mortality is not always compensated. The abovementioned pair from NW Estonia nested there last in 1981 and subsequently, in 1982-89, a single eagle was observed in the vicinity of this nest. That example points to the fact that 0.6 eaglets per year is either the

critical limit or an indicator of too low a productivity to create an adequate population reserve in our conditions. This is further proved by an Aegviidu nest site that perished in 1952. For 15 consecutive years it had produced 0.4 young annually. Serial observations show that nesting is usually successful for 3-4 consecutive years with 1.5-1.7 fledglings leaving the nest annually. That points to the possible replacement of nesting pairs and to a maximum life span of 4 juvenile plus 3-4 mature years.

Supposing that 30 pairs of Golden Eagles nest in Estonia and each raise 0.6 eaglets in a year, making an annual total of 18 young of which a quarter survive to maturity, the total number of Golden Eagles in Estonia should then be 100 individuals, about 40 of them being juveniles. This seems to be too small a number to secure a sufficient reserve unless the population receives replenishment from neighbouring areas. If such replenishment takes place, the problem of suitable nest sites and nest-trees surfaces. That is extremely important. The best nesting areas for the Golden Eagle in Estonia are marshlands that cover more than 10,000km² altogether and comprise 22% of the republic. Assuming that only 50% of these, the biggest peat-bogs and marshlands of at least 100km² each, could be potential nesting areas, the best possible nest sites should be already occupied. The presence of suitable old trees for building nests is an important precondition as well. Such trees grow on the "bog-islands" or higher ridges at the edges of marshlands only. Tens of man-made platforms have been built recently to improve conditions in potential nesting areas. Four of these were occupied in 1991.

As most of our larger marshlands are protected territories where all economic activities are strictly forbidden, the future of the Golden Eagle in Estonia seems to be fairly secure. Any kind of disturbance in a 200m area round the nest is prohibited. Sparse human habitation, abundance of prey, a large number of ungulates (dead individuals provide carrion) have favoured the stability of the eagle population.

Half a century ago hunting and egg-collecting endangered the Golden Eagle population most. In the years 1970-1982 other reasons gained priority. In 22 confirmed cases the birds were either shot, found dead for unknown reasons, found with damaged wings or trapped. Five of the 10 trapped birds were set free but lacking either a toe or a talon. Use of dangerous traps for hunting was prohibited in 1991.

Present conditions are favourable for the Golden Eagle in Estonia but the delicate balance may be easily upset should the factors influencing mortality gain importance, e.g. tourism, decrease of the game population, large-scale timber felling and restoration of farms.

The Estonian Golden Eagle population is unique in all Europe but especially significant in the plains of the forest zone. In the other, more densely populated regions, marshlands have usually been drained and, as a result, become unsuitable. The Golden Eagles of Estonia deserve international attention and all possible measures to preserve their natural habitat should be taken.

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