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The Mute Swan *Cygnus olor* in Ostrobothnia in 1970–1986

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The spread and distribution of the Mute Swan *Cygnus olor* in SW Finland is well documented. Since 1934, when the first breeding pair was found outside Mariehamn on Åland, the Mute Swan has colonized both inner and outer archipelagoes, and some lakes (Tenovuo 1983; see also Hëlminen 1977, Hëlminen & Eriksson 1978, Paasivirta & Mikkola 1971, Sarlund & Sundelin 1984, Tenovuo 1961, 1975). Recently, the whole breeding population in Finland was estimated at some 1000 pairs (Hildén 1984).

The expansion along the west coast of Finland has been similar to that on the east coast of Sweden (SOF 1978, cf. also Berglund et al. 1963, Grenmyr & Sundin 1981), although with a delay of about 10 years. Little has been known, however, about the northernmost Mute Swan population in Finland, breeding in Ostrobothnia since 1970. Tenovuo (1983) supposed that the nesting of Mute Swans between Kaskinen and Vaasa would be casual, due to the shortness of the ice-free period.

In the following, we present data on the expansion of the Mute Swan in Ostrobothnia during 1970–86 and discuss the limits of its range in Finland.

Study area and methods

The study area consists of the archipelago between Sideby and Vaasa (see Fig. 1). In the south, the archipelago is mainly very narrow, consisting of elongated rocky islands, with only swarms of smaller skerries further out. In Korsnäs and Bergö, the archipelago is dominated by low moraine islets, which radiate towards the north-west into the Quark. A typical inner archipelago with a mosaic of large forested islands is found only in Malax and around Vaasa.

The waters are mainly very shallow and eutrophication is heavy, due to discharges from the villages and mink and fox farms (cf. Sevola 1978).

The normal date for the ice-breakup is around 1 May (range c. 5 April to c. 25 May). In sounds, ice-free areas open up some weeks before the ice-breakup (about 1 April). Ice formation commences in the shallowest bays around 1 November. Thus, the ice-free period is 6–7 months near the mainland, and 7–8 months further out in the archipelago. The mean number of real ice days (Anon. 1971, 1978, 1982) was calculated by us on the basis of ice statistics

from the years 1965–80 (the latest published data are from 1979/80).

We censused the breeding pairs and non-breeders from 1970 to 1986, with an interruption of some years. The census, partly carried out by ourselves during boating and nest counts in the area from Närpes to Bergö, and partly based on interviews with ornithologists and fishermen, was especially thorough in 1984 and 1986.

The Mute Swan pairs arrive as soon as the first ice-free areas appear, normally around 1 April in the Korsnäs-Bergö area. Nest-building takes place in early May, the young hatch in mid-June and the departure of the swan families occurs from November to December.

Population increase and present distribution

The first known breeding of the Mute Swan in Ostrobothnia took place in Bergö in 1970 (Hästbacka 1987). For some years, this breeding site was the only one in the whole study area, being separated from the nearest breeding pairs farther south in northern Satakunta by almost 120 km.

During the 5–9 years after the first breeding, the population increased very slightly in absolute numbers; for instance, in 1978, we estimated the whole population in Ostrobothnia at only c. 5 pairs (data from an incomplete census).

After this initial period, the numbers increased more rapidly; in June 1986, there were 35 known breeding pairs, 21 subadult pairs, which had established territories but were not observed to breed, and about 30 young swans not yet paired. In 16 years, the Ostrobothnian population increased from 2 to about 140 birds (Table 1). Calculated over the 16-

Table 1. The growth of the Mute Swan population in Ostrobothnia. The censuses in 1971–78 were incomplete. Dashes indicate lack of data.

	Pairs		Individuals not yet paired
	breeders	subadults	
1970	1	–	–
1971–78	1–5	–	–
1983	17	–	–
1984	22	–	c. 100
1986	35	21	c. 30

year study period, the annual rate of increase of the total numbers of birds has averaged 11.5 % (the numbers of breeding pairs: 9.7 %).

Sarlund & Sundelin (1984) observed a similar pattern of increase in the archipelago off Rauma, about 200 km south of the northern part of our area.

At present, the Mute Swan is distributed fairly evenly along the coast in southern Ostrobothnia (Fig. 1). Minor concentrations are found in Närpnäs, Harrström, Korsnäs and Bergö, where the habitats seem to be especially favourable.

The Mute Swan is still absent from most of the inner archipelago off Malax and Vaasa. It first bred in this area in 1986, but on the outer fringe. This may be due to the late breakup of the ice in the area or to a possible scarcity of suitable breeding skerries.

Clutch size and production of young

The clutch size of different Mute Swan populations in Europe is 4.9–6.2 (Bauer & Glutz von Blotzheim 1968, Cramp & Simmons 1977, Hilprecht 1956). Tenovuo (1975) reported a mean clutch size of 5.85 from the Archipelago Sea. The numbers of fledged young per pair and year in Europe are 3.1–6.2 (Bauer & Glutz von Blotzheim 1968, Hilprecht 1956).

The clutch size and number of young per pair in Ostrobothnia (Table 2) do not seem to differ significantly from the above values.

In the Archipelago Sea, Tenovuo (1975, 1976) observed a lower breeding success among pairs that bred on small exposed skerries than among pairs in coastal bays (1.4–2.8 young per pair vs. 4.1). In the offshore areas in Ostrobothnia, we have recorded some pairs with only 1 or 2 big chicks, but in general the dichotomy in habitat choice and productivity (Tenovuo 1975) does not seem to exist in our study area, with its lower relief and consequently shallower shores. Most of the breeding sites are intermediate between the inner bays and exposed skerries in the Finnish SW archipelago; the nests are mostly situated in areas with rich and shallow bays in the neighbourhood.

The productivity of the Ostrobothnian Mute Swans seems to be good. Nesting failures are relatively rare; we recorded 5 total failures among 22 breeding pairs in 1984 and 3–4 failures among 35

Table 2. Mean productivity (\pm SD) of the Mute Swan in Ostrobothnia, calculated by pooling broods from August–October. Dashes indicate lack of data. Sample sizes in parenthesis.

	Clutch size	Number of young per successful pair
1984	–	5.15 \pm 1.63 (13) range 3–7
1986	5.36 \pm 1.39 (14) range 3–7	4.44 \pm 1.85 (25) range 1–9

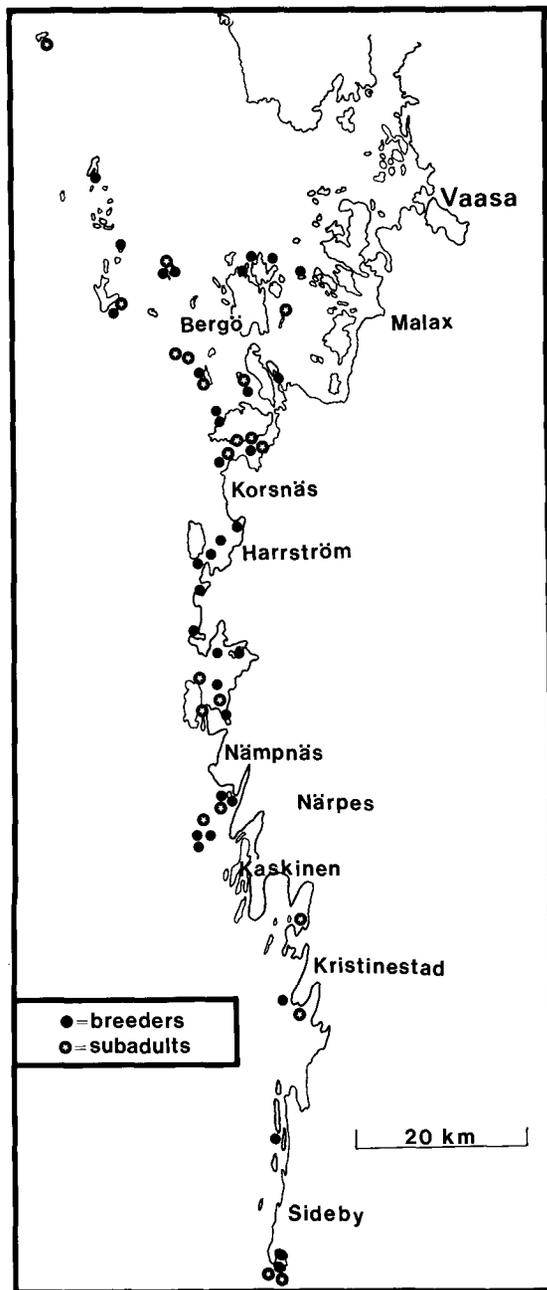


Fig. 1. The distribution of the Mute Swan in Ostrobothnia in 1986. The map includes breeding pairs and subadult pairs which had established territories.

pairs in 1986. According to information from local fishermen, mortality among chicks is caused by Minks *Mustela vison* and Herring or Great Black-backed Gulls *Larus argentatus* and *L. marinus*.

We know of only two cases of young swans freezing in the ice in late autumn.

Discussion

According to Hildén and Sharrock (1982), the Mute Swan has recently "largely increased" its populations in almost the whole of Europe.

The success of the species is attributed to several favourable circumstances: the ban on hunting (in contrast to earlier centuries), intensified winter feeding, low mortality due to mild winters, lack of natural enemies (Tenovuo 1976, Berglund et al. 1963), eutrophication, which causes an increased supply of food and nesting places, high productivity and increasing access to ice-free wintering areas in cities and near power stations (Sarlund & Sundelin 1984).

On the other hand, the population increase may be retarded by early ice formation, nest losses (Tenovuo 1975), an increased number of addled eggs in cold springs (Tenovuo 1961) and high mortality, especially among young swans during cold winters (Mathiasson 1973). As we do not expect radical changes in the climate, in the human attitude towards swans or in the wintering conditions, the Mute Swan can now be regarded as a well-established species in Ostrobothnia.

There is reason to believe that the Mute Swan will continue its spread northwards, at least to the archipelago of Replot-Björköby, possibly to the area between Vaasa and Jakobstad; birds have been observed as far north as Jakobstad and Kokkola (Andersson & Taxell 1975, Hästbacka 1987). The good productivity (cf. above) and the generally high survival rate of young swans (cf. Table 2; however, see also Andersen-Harlig 1978) support such a prediction; immigration from more southern populations may also occur.

The northern limit of the Mute Swan distribution in Finland was earlier expected to lie in the archipelago off Pori, as the whole breeding season requires about 180 days with ice-free waters (von Haartman et al. 1963–72, Tenovuo 1961). However, statistics on the number of real ice days along the coast of the Bothnian Bay (Anon. 1971, 1978, 1982) show that the 180 day-limit should lie in the area between Raahel and Oulu, where the ice-free period is about 185 days. In our study area, the number of real ice days ranges from 129 (Kaskinen, harbour) to 151 (Vaasa, inner harbour), and is even less in the outermost archipelagoes (e.g. 112 at Sälgrund off Kaskinen, 124 at Rönnskär and 94 at Norrskär off Vaasa). It is thus possible that the species could breed even slightly north of Jakobstad.

It should also be taken into account that northern populations of southern species can shorten their breeding season to some extent (e.g. the Great Crested Grebe *Podiceps cristatus*, Lammi 1985). In fact, the fledging period of the Mute Swan is known to vary (Cramp & Simmons 1977), which indicates that a shortening might occur in this species, as well. It is also possible that pairs will be discouraged from breeding by very late springs (cf. Ogilvie 1978).

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Sammanfattning: Knölsvanen som häckfågel i Österbotten 1970–1986

Det första fyndet av häckande knölsvanar i Österbotten gjordes år 1970 i skärgården i Bergö. År 1986 hade beståndet ökat till 35 häckande par, 21 par som ännu inte häckade, men hade etablerat revir, och c. 30 ungfåglar, som inte hade bildat par (tabell 1).

Ungproduktionen per par och år (tabell 2) sammanfaller i stort sett med de data som föreligger från populationsstudier i Mellaneuropa. Utbredningen av i dag är någorlunda jämn, med mindre koncentrationer i områden med gott biotoputbud (figur 1).

Hittills har det undersökta beståndet i Sydösterbotten utgjort knölsvanens nordligaste förekomst i Finland. På basen av enstaka observationer ända upp till höjd av Karleby, flera tillväxtgynnande faktorer (såsom jaktförbud, vinterutfodring, avsaknad av naturliga fiender och eutrofiering) och isstatistik, som visar att en tillräckligt lång isfri period föreligger ända till området mellan Brahestad och Uleåborg, föreslår författarna att en fortsatt expansion norrut är att vänta hos knölsvanen.

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