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Marked population increase in the Arctic Skua *Stercorarius parasiticus* in the Finnish Quark from 1957 to 1987

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The Arctic Skua *Stercorarius parasiticus* is a scarce breeder along the Finnish coast. The breeding population was estimated at 225 pairs around 1970 (Hildén 1971); since then the population has somewhat increased, especially in the late 1970s, and the Skuas have succeeded in recolonizing some archipelago areas from which they disappeared decades ago (Stjernberg 1983, see also Forstén & Tuominen 1984). Recently, the whole Finnish population was estimated at about 400 pairs (Hildén 1988).

Besides the Archipelago Sea in SW Finland, the densest Skua population is found in the archipelagoes of the Quark, the narrowest portion of the Gulf of Bothnia. The latter area was censused in detail by OH in 1957–60 and some parts of it again in 1974. In 1984–87, JU & HH thoroughly reexamined the same area (cf. Hästbacka 1985). In the following, we present data on the population increase and productivity of the Arctic Skua in the Finnish Quark.

Study area and methods

This study includes the archipelago from Sideby/Siipy to Oravais/Oravainen. The area censused by OH comprises the northern part of this area (mainly from Korsnäs to Valsörarna/Valassaaret; Table 1). The same area was also surveyed intensively by JU & HH; from other parts of the study area, we include data received from other ornithologists.

Table 1. Numbers of pairs of the Arctic Skua breeding in the Quark in 1957–60 and 1987. Place names refer to communes or distinct archipelago areas. Dashes indicate areas that were not censused by OH in 1957–60.

	1957–60	1987
Kristinestad/Kristiinankaupunki +		
Kaskö/Kaskinen	–	5
Närpes/Närpiö	–	5
Korsnäs	–	4
Molpegrunden	2	5
Bergö + Bergö Gaddarna	3	12
Malax/Maalahahti inshore archipelago	1	2
Rönnskären	9	14
Norrskär	1	5
Valsörarna/Valassaaret	1	4
Björkö + Replot/Raippaluoto	2	5
Vasa Glippet (Utgrynnan, Malaxkallan, Gåsgrund, Ensten, Skötgrund)	2	5
Replot Glippet	1	5
Mickelsörarna/Mikkelinsaaret	0	3
Oravais/Oravainen	1	2
Total (pairs)	23	76

As the Arctic Skua is conspicuous and therefore easy to census, the results obtained are probably very close to the actual numbers present. Breeding success was also investigated by searching carefully for the young in 1984–87 (the most thoroughly in 1987).

This was done in early or mid-July and, in several cases, the skerries were visited again a few weeks later in order to check the number of young fledged.

Results

The Arctic Skua population in the area studied by Hildén (1971) increased from 23 pairs in 1957–60 to 62 pairs in 1987; the total increase over the 30 years was thus 170%, the average increase per year being 3.5% (see Table 1).

The rate of population growth seems to have been stable throughout the whole period, as in 1974 there were 15 pairs compared with nine in 1957–60 on those islands which were censused both times; this corresponds to an increase of 67% and an annual increase of 3.4%. At Valsörarna, the history of the colonization is known exactly: the first Arctic Skua pair appeared in 1949, the second in 1963, the third in 1970 and the fourth in 1985 (Hildén et al. 1978, Hildén 1986). At Norrskär, there was only one pair in 1960, but three in 1970 and five in 1987.

The Arctic Skuas remain very faithful to the islets once selected as breeding places. There are skerries in the Quark where Skuas have nested continuously over more than 30 years, for example, Vörboashällan at Valsörarna from 1951 to 1986. The population thus grows, slowly colonizing new islets, which thereafter are inhabited each year. Of the breeding skerries recorded in 1957–60 and 1974, 73% (22 out of 30) were still inhabited by Skuas in 1987. In addition, there were several cases where Skuas in 1987 bred on skerries very close to the islet inhabited in 1957–60.

The breeding of the Skuas appears to fail only rarely; of the pairs observed in 1987, no more than 7.5% (=4 pairs out of 53) failed, although the summer was exceptionally cold and rainy. Two of the failures were due to addled eggs, in one case the young were killed by people, and for the other the reason was unknown (possibly flooding). Earlier, OH observed a couple of times that the newly hatched chicks were killed by *Myrmica* ants, and several times nests were destroyed by people.

The number of pulli is 1.43 and that of young fledged 1.65 per successful pair (pooled data from 1984–87; Table 2), indicating that small young may be easily overlooked. The difference is, however, not significant ($t=1.88$, $df=75$, 2-tailed $P=0.06$). There does not seem to be any significant variation between years (1985–87) in the production of young ($F=0.73$, $df_1=2$, $df_2=47$, $P=0.49$; this analysis includes only

Table 2. Productivity in the Arctic Skua in the Quark in 1984–87. Data from all areas in Table 1. Sample size = n . The difference between the number of pulli and fledglings is not statistically significant.

Productivity measure	Mean \pm SD (n)
Pulli/successful pair	1.43 0.50 (51)
Fledglings/successful pair	1.65 0.49 (26)
Young observed/breeding pair	1.36 0.61 (74)

prefledged young, as our data on fledglings are mainly from one year only).

The number of young (irrespective of their age) per breeding pair and year is 1.36 (pooled data from 1984–87; Table 2). The figure does not differ statistically when our most thorough study season (1987) is compared with the other summers ($t=0.62$, $df=72$, 2-tailed $P=0.54$). Nor is there any significant difference when comparing only the pairs with an ascertained breeding outcome in 1987 with the pooled data for all categories of young in 1984–86 ($t=0.02$, $df=47$, 2-tailed $P=0.98$).

Most likely the above figure, 1.36 young per breeding pair and year, is a slight overestimate, as some of the pairs that failed may have been overlooked (these pairs may have abandoned their breeding skerries before our census of young, or they may belong to those pairs whose breeding outcome could not be ascertained). Thus, about 1.3 young per pair and year is probably more realistic as a measure of the present fledgling productivity of the Arctic Skuas in the Quark.

Discussion

Data on fledgling productivity in Finnish Arctic Skuas are scarce. Forstén & Tuominen (1984) reported a fledgling productivity of 0.75 and 1.3 young per pair and year in two well-studied pairs in the Bothnian Sea (data from 14 and 17 years, respectively). In an earlier paper (1968) they reported that 52–62% of the eggs produce fledglings, which would account for a productivity of 0.94–1.12 fledglings per pair and year when the mean clutch size is 1.8, namely, a somewhat lower figure than ours. On the other hand, higher survival rates of the young and higher net productivity than compared with our data have also been published (see Williamson 1965, Cramp & Simmons 1983, O'Donald 1983, Furness 1987).

As the Skuas in Finland were earlier persecuted heavily (Merikallio 1958, Hildén 1971, Leikola et al. 1986), we have reason to expect that both the juvenile and adult summer mortality have decreased in recent decades. This is most likely to be the main reason for the recent population increase. Another evident reason is the huge increase in Finnish gull populations, which offers improved feeding conditions for the Skuas (cf. Hildén 1971, Stjernberg 1983, Forstén & Tuominen 1984).

We can tentatively calculate the present rates of mortality, if we assume that we have a Skua population reproducing at the above rate but remaining fairly stable for some years. Then the probability of the young surviving to reach recruitment age is $(1-c)(1-d)^2$, where c =mortality in the first year and d =adult annual mortality (O'Donald 1983). For a population on Fair Isle, O'Donald (1983) calculated $c=0.32$, which, however, might be too low for Skuas from the northern Baltic as they are probably subjected to more dangers during migration (see Furness 1987).

As an estimate of the first year mortality we use $c=0.40$, or 40%, which is the figure reported by Furness (1987). Assuming this, an adult mortality rate of 18 % would account for the present rate of increase in the Skuas in the Quark. Both figures are conceivable, as they fall within the range of these population parameters, reported mostly for Atlantic Skua populations (Furness 1987:238). However, the population parameters so far reported for the Arctic Skua are insufficient to allow an assessment of any change in mortality.

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Sammanfattning: Markerad populationstillväxt hos labben i Kvarken

Den väl undersökta labbpopulationen i södra Kvarken ökade från 23 par år 1957-60 till 62 par år 1987 (tabell 1). Den totala ökningen är 170% och den genomsnittliga årliga ökningen 3,5 %. Populationstillväxten har sannolikt varit jämn under hela perioden (en partiell taxering utfördes även år 1974).

Antalet boungar per par med lyckad häckning uppmättes till 1,43 under åren 1984-87; motsvarande siffra för antal flygga ungar per par var 1,65 (tabell 2). Nettoresultatet för det häckande beståndet antas vara ca 1,3 ungar per par och år. Denna siffra är något lägre än vad som rapporterats från atlantiska labbpopu-

lationer, men troligen något högre än den ungpåproduktion som uppmättes i Bottenhavet i slutet av 1960-talet.

Mot den bakgrunden anser vi att en faktor som med säkerhet förorsakat beståndsökningen hos labben i Kvarken är förbättrad ungpåproduktion till följd av avtagande förföljelse från människans sida. Man kan grovt beräkna att dödligheten under labbungarnas första år borde vara ca 40% och den årliga dödligheten bland de vuxna fåglarna ca 18% för att motsvara den uppmätta nettoproduktionen och beståndsökningen.

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