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The ranges of some marine birds and plants in an area of the archipelago of SW Finland

Mikael von Numers

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About 480 islets and small islands were censused in part of the archipelago of SW Finland. The study area consisted of three "zones" of different maritimity: the inner, middle and *fjärd* (fjärd = stretch of open water surrounded by the middle archipelago) zones. The distribution of a number of archipelago birds and plants was mapped and comments are made on possible factors influencing the landward boundaries and abundance of the species. This cross-disciplinary approach yields a more reliable picture of the maritimity of the different parts of the archipelago.

Strongly offshore birds species were: *Cepphus grylle, Stercorarius parasiticus, Anthus spinoletta littoralis, Sterna caspia*, with the most marine species, *Alca torda*, possibly breeding close to the seaward boundary of the area. Somewhat less maritime was *Arenaria interpres*. Plants with a similar distribution were *Isatis tinctoria* and *Cohlearia danica*. Among the bird species reaching the innermost part of the archipelago, but clearly more abundant in its offshore part were *Larus marinus, Somateria mollissima, Sterna paradisaea* and *Haematopus ostralegus*. Plants with a corresponding distribution were *Cardamine hirsuta* and *Vincetoxicum hirundinaria*. The recent immigration of *Aythya ferina* into the archipelago is discussed; this species has even bred in the *fjärd* zone.

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1. Introduction

In the summers of 1982 and 1983 I studied the ranges of the birds breeding in the NE part of the so-called archipelago sea of SW Finland. The area studied is situated W of the city of Turku (Fig. 1). In all, about 480 islands and islets were censused, nearly all the smaller islands and all the unwooded islets within the area. The main purpose of the study was to investigate whether one can discern clear-cut "zones", areas of different maritimity, in the large archipelago (for the question of zonation, see the recent discussion by von Haartman 1982). A statistical evaluation of the census data has not yet been carried out. The main method of censusing the archipelago birds was to count their nests.

Most islets were visited and censused twice in the summer, the second time mainly in order to count the nests of the Tufted Duck *Aythya fuligula*. The majority of the islands and islets were censused in only one of the two years.

In addition to birds, the distribution of some typical "archipelago plants" (Schärenpflantzen *sensu* Eklund 1931, 1934, 1937, 1958) was investigated. These plants are important indicators of the maritimity (soil and microclimate according to Eklund, and probably competition). In examining the question of zonation, it is wise not to restrict oneself to birds, but to collect as much evidence as possible from different groups of organisms. The species of archipelago birds are few in numbers. Further, the distribution of plants, exept that of anthropochores, seems to be more static than the distribution of birds. Of 9 offshore birds found earlier in the area, no less than 4 have recently enlarged their range in the direction of the mainland coast (von Haartman 1982), but only one of Eklund's numerous archipelago plants (*Hypericum hirsutum*) is supposed to be spreading "rapidly", though evidently not rapidly in the sense of ornithologists.

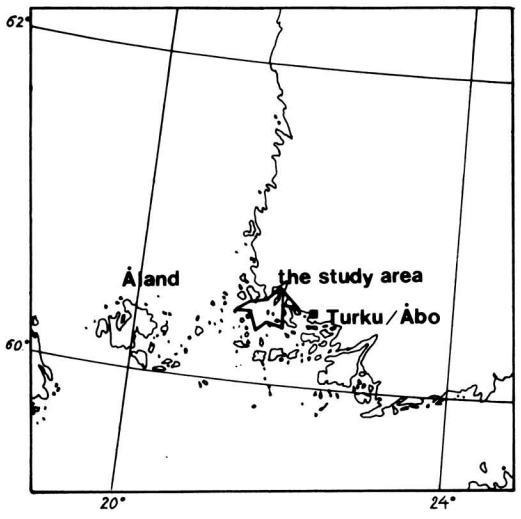


Fig. 1. The study area and its position in the archipelago of SW Finland.

The present study area does not extend into the marine zone bordering the open sea. The study area may be divided into three parts of increasing maritimity (Fig. 2): (1) the inner, (2) the middle, and (3) the *fjärd* zones or archipelagos, the third distinguished by von Haartman (1945); a fjärd is a stretch of open water penetrating into the inner parts of the archipelago. Apart from minor changes, the borders between the zones used here are those in the "Atlas of the archipelago of southwestern Finland" published by Nordenskiöld-Samfundet in 1960 (Jaatinen & Segerstråle 1960).

The water of the inner archipelago is typically shallow and muddy. The distances between the islands are small, and many of these are large and well forested. The wave action is restricted. All islands, including small rocky islets, are more or less surrounded by reeds.

In the *fjärd* archipelago the water is clear and much deeper than inshore (max. depths of c. 30 vs. 10 m). The total area of the islands is small in comparison with the water area. Reeds grow only on protected sites. With certain exeptions, the woods on the smaller islands consist of pine with large carpets of creeping junipers. On skerries the vegetation is still more sparse. The trees, if any, are crippled by the harsh environmental conditions. The wave action is strong even with moderate winds.

The middle archipelago is intermediate between the two extremes. Some relatively open waters are deep, but the wave action remains fairly restricted.

The landward boundary of the typical archipelago birds is determined by the extent to which the different zones fulfil their habitat requirements. Four species, *Sterna caspia, Stercorarius parasiticus, Cepphus grylle,* and *Anthus spinoletta,* are restricted to the most marine parts of the area studied, and a fifth, *Alca torda,* may nest just outside it. In the following text, examples will be given of the different distribution patterns of a number of marine birds and plants, commencing with the most marine ones. The maps show how differently different species react to the environmental gradients within the archipelago. The maps of the species can be compared with Fig. 3. where only the censused islands are shown.

2. Distribution of some bird and plant species

The Black Guillemot *Cepphus grylle* (Fig. 4) was represented in the study area by 80 pairs. These bred singly or in small colonies of up to 10 pairs on 26 treeless islets with abundant boulders and stones. The species obviously prefers deep, open, and clear waters. Other species restricted to the most marine western parts of the area are the Arctic Skua *Stercorarius parasiticus* (3 pairs), Rock Pipit *Anthus spinoletta · littoralis* (8 pairs), and Caspian Tern *Sterna caspia* (4 pairs).

The Turnstone *Arenaria interpres* (Fig. 5), had 66 pairs breeding in the area. It usually occurs together with terns and gulls, in single pairs on islets and treeless points of larger islands. The Turnstone becomes increasingly rare landwards, being absent within a distance of more than a nautical mile from the coast.

A perfect example of the archipelago plants with a clear-cut landward boundary is *Isatis tinctoria* (Fig. 6). It grows on sandy shores or on wrack and litter washed up on the shore. The largest clumps are found on sand or gravel islets by the largest open waters. *Isatis tinctoria* obviously needs bare soil, being incapable of competing with other large shore plants, such as *Phragmites communis, Scrophularia nodosa, Elymus arenaria, Rumex crispus,* and *Rubus idaeus.* On islets by open water the soil is exposed by wave action every year during the autumn storms and high water.

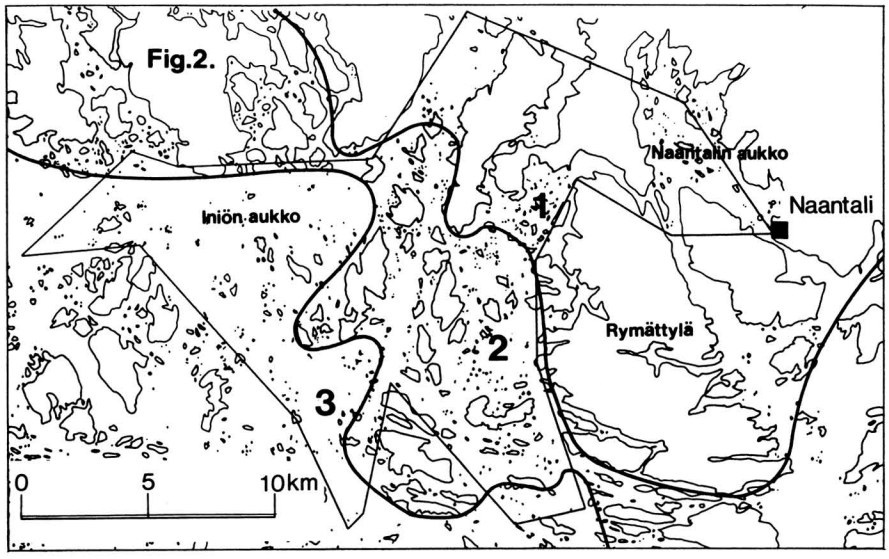


Fig. 2. The study area (thin border lines) and the different archipelago zones (thick lines): 1) the inner, 2) the middle, and 3) the fjärd zone.

Cochlearia danica (Fig. 7) grows as a relict on a handful of islets in the middle to inner archipelago, none of them however less than a nautical mile from the coast. Usually it is found only a little above sea level, but on islands with limestone (only a few in the area) it also grows on higher levels. In the marine part of the area it occurs on almost every treeless islet.

In the following text species are dealt with which, although their main distribution is offshore, occur in some numbers close to the coast.

The Great Black-backed Gull *Larus marinus* (Fig. 8) was considered a typical species of the open sea and largest *fjärds* until well after Word War II. Since then, its population has increased strongly and it has spread into the inner archipelago. Bergman (1982) suggests that the increase of the Great Black-back began because of the improved food supplies in the wintering area and because shooting of adult birds ceased in the 1940s and 1950s. In the study area 98 pairs were found, breeding not only on small rocky islets but also in colonies of other gulls on larger islands. Attempts at breeding have taken place on islets a stone's throw from the mainland shore, though, to the best of my knowledge, not in the fjärd of Naantali (Naantalin aukko)

The Eider Duck *Somateria mollissima* (Fig. 9) is numerous, as could be expected. In all, 1864 breeding pairs were counted in the area, the numbers being largest in its offshore parts. Where the water is shallow and the shores surrounded by reeds, the Eider Duck becomes rarer, though nowhere totally absent. Thus in the fjärd of Naantali, a single nest was found. The Eider Duck breeds on islands of all types but prefers those that are relatively low and sparsely wooded.

The Arctic Tern *Sterna paradisaea* has recently spread into the inner archipelago and now occurs quite close to the mainland (von Haartman 1982). It even breeds in the fjärd of Naantali (Naantalin aukko) where 13 breeding pairs were found in 1983.

Some plant species are completely or almost completely absent from the mainland but are found on the innermost islands. Their distribution thus resembles that of the Eider Duck, Great Black-backed Gull and Arctic Tern. *Vincetoxicum hirundinaria* (Fig. 10) is such an "archipelago plant". Usually it occurs in dense clumps on stony shores and among heaps of boulders. In the inner archipelago it is a relict, restricted to the higher levels of rocky hills and may exeptionally occur in such sites even on the mainland and on the very largest islands (Naantali; NW of the lake Meri-

järvi, Askainen; N of the lake Taattistenjärvi, island of Rymättylä). Eklund (1958) assumes that the occurence on high levels is conditoned by the microclimate; this does not exclude the possibility that the occurence is a relictic one, going back to the time when the mainland hills were islands.

Cardamine hirsuta (Fig. 11) was established on a considerable number of smaller wooded islands, but so far does not occur on the mainland and only rarely on the largest islands. It seems to have a poor competitive ability. Its niche may be characterized as sites where the lesser vegetation is sparse, as among junipers and raspberry canes, or hills where the soil borders on naked rocks or, in the most marine archipelago, also on gravel shores. Possible competitors include *Myosotis ramosissima*,

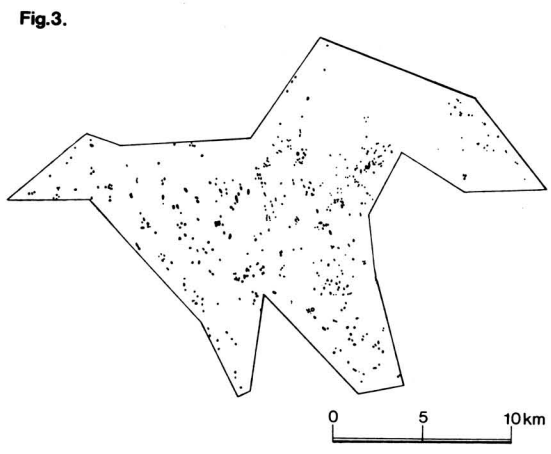
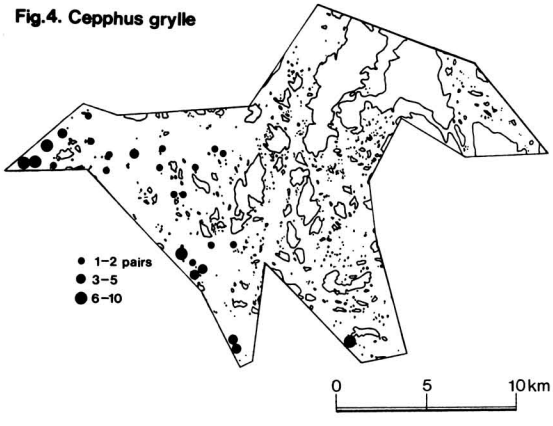
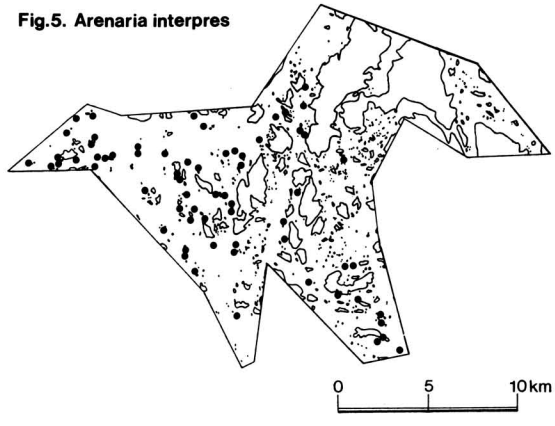
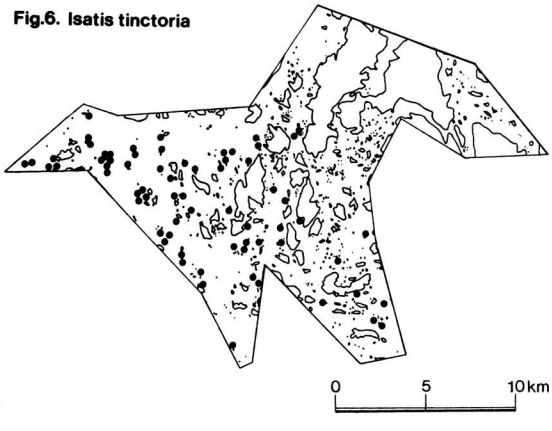


Fig. 3. The censused islands within the study area.







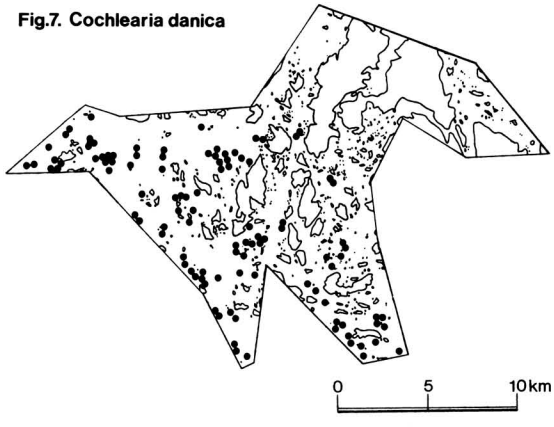


Fig. 4–13. The distribution of birds and plants within the study area.

Fig.8. Larus marinus

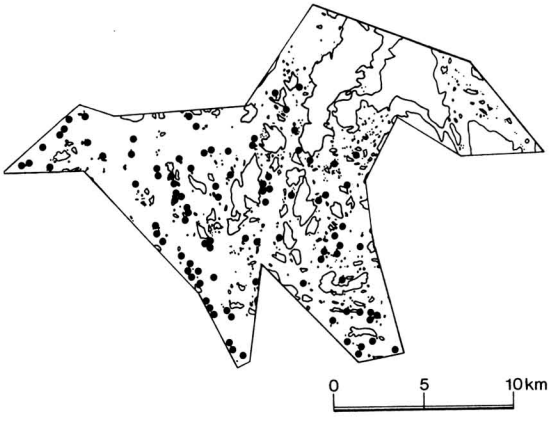


Fig.9. Somateria mollissima

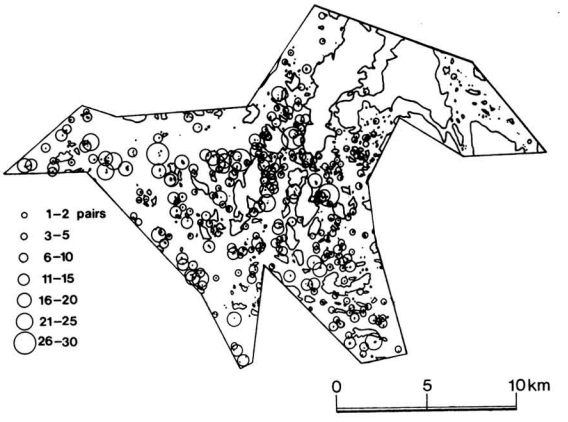


Fig.10. Vincetoxicum hirundinaria

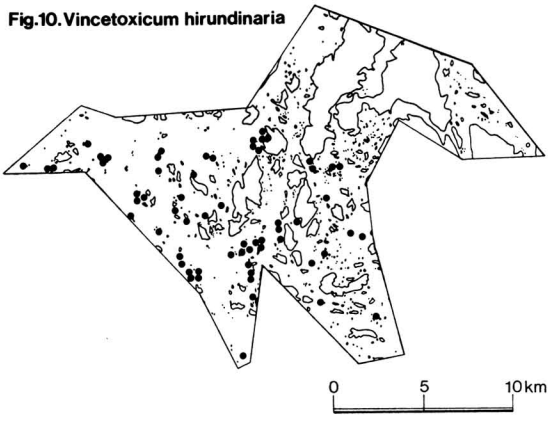


Fig.11. Cardamine hirsuta

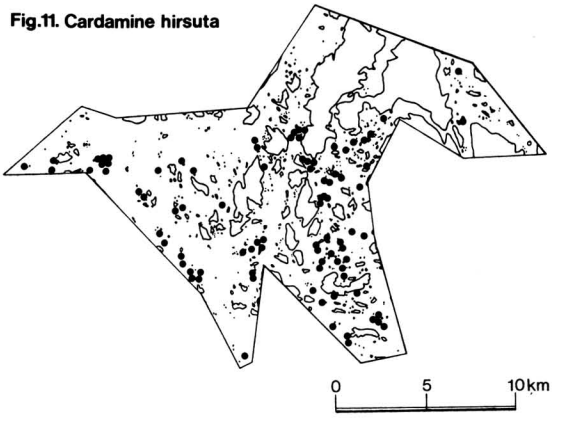


Fig.12. Haematopus ostralegus

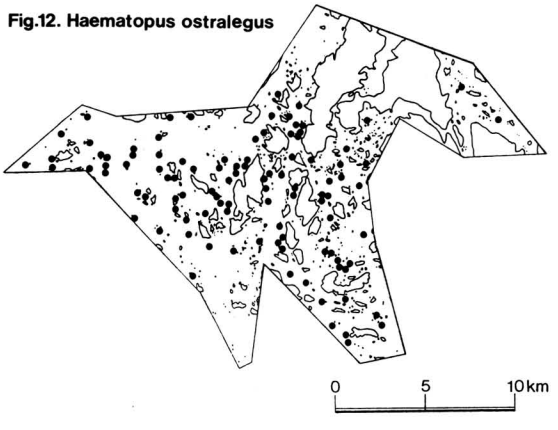
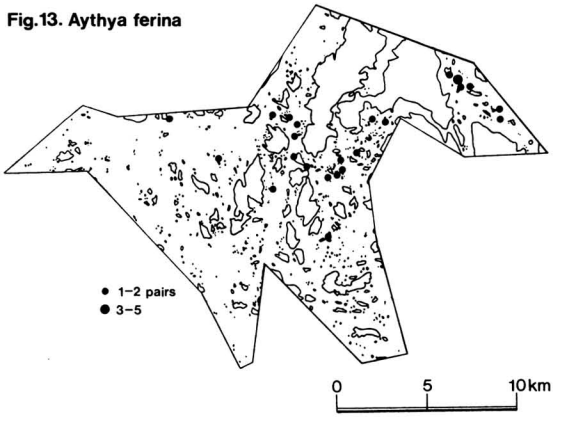


Fig.13. Aythya ferina



Viola tricolor, Allium schoenoprasum, Fragaria vesca, and especially *Arabidopsis thaliana,* another Brassicaceae species, in many respects resembling *Cardamine hirsuta.*

Among the archipelago birds, the Oystercatcher *Haematopus ostralegus* (Fig. 12) is still more evenly distributed in the different parts of the study area, though it becomes rarer in the vicinity of the coast, due to the scarcity of shores with bare gravel and smaller stones, on which it mainly breeds. Relatively few nests are placed in rock crevices with more or less bare soil. The scarcity of gravel shores is due to the more rapid development of a litoral plant cover in the inner archipelago, where wave action does not clear the shore and kill the vegatation up to some height above the water level. Thus the factors favouring the existence of the Oystercatcher and *Isatis tinctoria* in the offshore archipelago are partly the same. In all, 103 pairs of the Oystercatcher were noted in the Study area, usually singly, but once with only 10 m between the nests.

The reciprocal question, the seaward range limit in the archipelago of some birds of lakes and eutrophic coastal bays, will not be treated here, except for the following surprising case.

The Pochard *Aythya ferina* (Fig. 13) is known as a typical species of eutrophic waters rich in vegetation. The Pochard now also occurs on small islands and islets, and the pairs breeding on such in the area amounted to 27 pairs. The highest density, 10 pairs, was not unexpectedly found in the most inshore part, the narrow fjärd of Naantali. On smaller islands the Pochard usually breeds together with terns and gulls, e.g. in colonies of Black-headed Gulls *Larus ridibundus.* The nest is usually placed in semiaquatically growing reeds close to the shore, but may also be found in vegetation cover in a crevice on the bare point of a wooded island or on a treeless rocky islet. This type of nest site is characteristic of the Tufted Duck *Aythya fuligula.* The spread of the Tufted Duck from its original lake-like environment took place long ago, but the immigration of the Pochard into the archipelago is obsiously going on right now (von Haartman 1984). A Pochard nest was found on a treeless islet almost in the centre of the large, open Iniö fjärd (Iniön aukko), which also harboured a colony of gulls.

3. Concluding remarks

A number of archipelago plants and birds were treated with respect to their distribution in the inshore parts of the archipelago. Attention was restricted to qualitative differences (presence-absence of species) with the evaluation of quantative differences (bird numbers, constancy of plant occurence) being postponed.

Four bird species do not penetrate into the parts of the archipelago inshore of the larger fjärds: *Cepphus grylle, Anthus spinoletta, Stercorarius parasiticus,* and *Sterna caspia,* and one species, *Arenaria interpres,* is represented there by only a few pairs. The marine habitat of the fjärds is obviously, at least at present, an ecological prerequisite for their occurrence in the area.

Other mainly offshore bird species advance farther towards the coast, some of them reaching the mainland. It was not possible to find areas where their inshore borders coincide in a noticeable manner. This is partly due to the different habitat requirements of the species and partly to the mosaic-like structure of the archipelago, where sub-archipelagoes of a more in- or offshore nature alternate irregularly.

The floristic parts of the study showed chiefly that a number of archipelago plants (sensu Eklund) penetrate farther inshore and are more widespread than was earlier believed. This applies to *Isatis tinctoria, Cochlearia danica,* and *Cardamine hirsuta* (cf. Eklund 1934 and Atlas över Skärgårds-Finland, 1960).

The most decidedly offshore species, *Isatis* and *Cochlearia,* have an essentially similar distribution, though they occur in quite different habitats. Their distribution strongly resembles that of the archipelago bird *Arenaria interpres.*

The part of the archipelago studied is in a state of rapid change, chiefly due to the ever-increasing construction of summer houses and the growing traffic.

The eutrophication of the water together with the increased food supply have caused a swift rise in the population of large predatory gulls (*Larus marinus* and *argentatus*). The present maps are therefore a document of a state, still at least semi-natural, and as such an end in themselves. The future will not ask for our theories, but for our facts (Eklund 1948).

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