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New archipelago birds in the era of water eutrophication

Lars von Haartman

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Since about 1960 the inshore archipelago of SW Finland has been colonized by the Pochard *Aythya ferina*, the Reed Bunting *Emberiza schoeniclus*, and the Reed Warbler *Acrocephalus scirpaceus*. The Pochard has also, to some extent, penetrated into the middle and *fjärd* archipelago.

In the two passerines, in particular, the invasion has coincided with the growth of dense reed vegetation around the shores, which is a consequence of eutrophication of the waters. The population increase started earlier in the shallow, eutrophic coastal bays than on the islands.

The immigration of the Pochard into the archipelago has probably also been preceded by an increase of the population in lakes and coastal bays, though evidence is lacking. Some of the archipelago Pochards breed, however, on treeless rocky islets or rocky NW points of wooded islands, and about half of the females have unusual nest sites resembling those used by the Tufted Duck *Aythya fuligula*, whose invasion of the archipelago took place much earlier.

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1. Introduction

Changes in the abundance and distribution of birds form a major biological problem for at least three reasons. First, it evokes more curiosity among laymen than most other biological phenomena. Second, bird populations have shown themselves to be perfect indicators of man-made changes in nature, many of which have a profound influence on our own well-being. And third, birds are in a key postion in the field of biogeography. Only this group, and to some extent the likewise intensely studied butterflies, show us *ad oculos* how and why populations and borders of distribution change. This is quite another thing than to reconstruct these changes from paleontological, climatological, and similar evidence. No wonder that these two groups often seem to dominate textbooks of animal geography, as those by Udvardy (1969) and de Lattin (1967).

2. Method and data

The birds on wooded islands and treeless islets around Lemsjöholm (60° 30′ N, 21° 47′ E) in the archipelago of SW Finland have been censused during the breeding season since 1937 and 1936, respectively. A map, showing the main part of the area was published in von Haartman (1980). It is essentially an inshore area, though a few islands may, perhaps, be considered to belong to the "middle" archipelago. For the present treatise, those islands were chosen which have been censused at least relatively continuously from the thirties on. In all, there were 36 such wooded and 26 treeless islands. On the former 845, on the latter 744 censuses were carried out, a "census" in this context consisting of one or more (usually not more than 4) census visits in a single breeding season. This gives an annual average of 19 censuses of wooded, and 16 of treeless islands. In other words, every island was, on an average, censused every second year. The intensity of the study fluctuated, however, being lowest in the 1940s.

Of the species treated here, the Pochard numbers are based on nests found and the Reed Warbler and Reed Bunting numbers on the average of pairs or males observed on the census visits forming a "census".

In the following text, the period 1936-82 will be divided into lustra (1936-39, 40-44, 45-49, etc.). If an island failed to be censused for a lustrum (or rarely several ones), the species treated in the text were considered to be absent. Considering their generally low numbers, this seemed to be preferable to the use of some complicated correction which would not have changed matters substantially because the censusing after 1960, when their immigration started, was fairly continuous.

3. Faunal changes

In a recent essay (von Haartman 1982) I have drawn attention to the fact that of nine off-

shore species studied in the 1930s, four have later extended their area in an inshore direction. One of them, the Turnstone *Arenaria interpres*, has done so only on a small scale, while the others, the Herring Gull *Larus argentatus*, the Great Black-backed Gull *L. marinus*, and the Arctic Tern *Sterna paradisaea*, have on a large scale. Of these three Larids, the Herring and Great Black-backed Gulls have been directly influenced by the human settlement with human waste products now forming a major source of food for them. The effect upon the Arctic Tern has been indirect; the eutrophication of the shore waters of the Baltic has enormously increased the numbers of Chironomid larvae living in the bottom mud, and the pupae and/or imagines serve the tern as food (von Haartman 1982).

Until well after World War II, the Arctic Tern was considered very representative of the offshore fauna, as was reflected in its vernacular names in a couple of European languages (*Havterne* in Danish, *Küstenseeschwalbe* in German, as compared to *Fjordterne* and *Flussseeschwalbe* for the Common Tern *Sterna hirundo*). Paradoxically, a considerable number of species of eutrophic lakes have entered the inshore archipelago so-to-say from the opposite direction. These species gained their first foothold on the Baltic coast at shallow, eutrophic bays on the mainland and large inshore islands. From lakes and coastal bays they have recently been able to penetrate into the archipelago itself. This process has been most striking in the Pochard, the Reed Bunting, and the Reed Warbler. Some population increase in the archipelago has also been evident in the Great Crested Grebe *Podiceps cristatus* and the Coot *Fulica atra*, but has not been as remarkable as in the three fore-mentioned species. Besides, severe winters also seem to influence the population size of the Grebe and the Coot (von Haartman 1945). In the present text, I will restrict myself to the Reed Bunting, the Reed Warbler, and the Pochard.

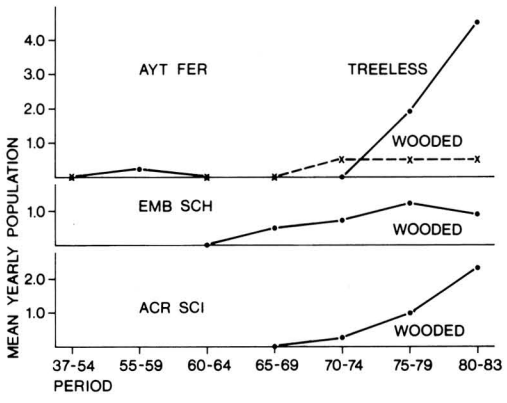

Fig. 1. Mean annual population (pairs) of Pochards, Reed Buntings, and Reed Warblers in an inshore archipelago in SW Finland.

Reed Bunting and Reed Warbler

During the period spanned by my memory, and from additional old photographs, the most striking change in the appearance of the archipelago around Lemsjöholm has been the enormous luxuriation of the reeds. This change has taken place both along the mainland coast and around the islands, including the small, rocky, treeless islets. Where in earlier times there were just a few sparse stalks, the reeds now form dense green rings around the islands, open at the very most on their rocky NW side, which was the side facing the advance of the inland ice during the glaciations. It is quite natural that species for which reeds form the main habitat have profited by this development. The Pochard, the Reed Bunting, and the Reed Warbler are all species of reeds, though to a varying extent. The Reed Warbler prefers dense clumps of reeds growing in shallow water while the Reed Bunting extends its territories from the reeds well over the shore where this is covered by dense vegetation of willows, alder, and tall herbs. For the Pochard the reeds form a breeding and resting site rather than a feeding ground and, as we will see, today this species is not even completely dependent upon the reeds for breeding.

Comparing the population growth of the Reed Bunting and Reed Warbler in the archipelago (Fig. 1) and in the bays of the mainland coast (Fig. 2), we see that the increase commenced earlier in the bays. The Reed Warbler was first observed breeding in the bays in the early '40s, though the species may have been overlooked earlier both in my area and in S Finland generally. In my archipelago breeding Reed Warblers did not appear until 3 decades later, in the early 1970s.

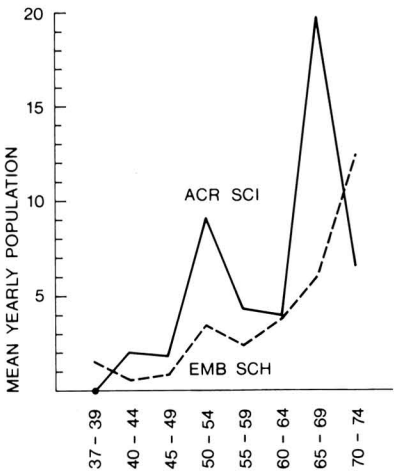

Fig. 2. Mean annual population of the Reed Bunting and Reed Warbler in coastal bays in an area in SW Finland (redrawn from von Haartman 1975).

In the coastal bays some increase in the Reed Bunting population commenced as early as the 1950s, gaining speed after 1960, when few cattle and horses were left to graze the shore meadows of S Finland. The first breeding of the Reed Bunting in the archipelago, excepting a few bays on larger islands of mainland nature, was not noted until the mid 60s. As an environment for the Reed Bunting, the islands are, and will remain, suboptimal. The reeds may be locally dense, but luxuriant shore vegetation is lacking as the forest on the small islands almost reaches the shore.

The Pochard

The immigration of the Pochard into the archipelago has been more dramatic. First of all, it has penetrated much deeper into the offshore archipelago than have the Reed Bunting and Reed Warbler, even having nested on a rocky islet in the midst of a large *fjärd* (von Numers 1984). This environment forms a strong contrast to the shallow and protected lakes and coastal bays, though, as pointed out already by Palmgren (1936), quite a few dabbling ducks typical of eutrophic habitats have begun breeding in the offshore archipelago, where they utilize the rich production of marine invertebrates on growing clumps of the seaweed *Fucus vesiculosus*.

Second, although the Pochard is no stranger in the inshore archipelago, where the water depths suit its diving ability (von Haartman 1945) and flocks of up to 500 males appear regularly in late May - early June, its invasion of the islands has in many cases demanded a radical change in its normal breeding habitat and nest site. Both shore reeds and small, rocky, treeless islets or rocky NW points on wooded islands are accepted as habitats in the archipelago, and the Pochard uses other, diverging nest sites almost as often as its nests in reeds (11 versus 15 observations). The category "diverging sites" includes: crevice with growing sedge; between stones among *Juncus* and reeds; in grass; in grass among high junipers; in grass and *Chrysanthemum (Tanacetum) vulgare*; in dense vegetation: grass, etc.; in moss with some *Matricaria maritima*; in sedge in a small pool. A fairly similar list, though with a smaller proportion of sedge and grass at the nest site, would be obtained if I enumerated the breeding sites of the Tufted Duck *Aythya fuligula* in the same archipelago. The proportion of nests in reeds is, of course, much higher in the Pochard than in the Tufted Duck. Not all the Pochard nests in reeds are located on the shore; reeds growing in small pools at higher levels on rocky islets or points seem to be accepted as well. A disadvantage of breeding on the shore in the archipelago is that the water level rises regularly from spring to summer in contrast to the situation in the lakes. I have not happened to find any flooded nests of the Pochard, but have seen several where the female had added considerable amounts of nest material as the water level rose.

In the archipelago the Pochard often breeds together with Larids, especially terns. Whether this is a coincidence or the outcome of active seeking, as in the Tufted Duck, is uncertain. Usually a single Pochard female nests on an island, but in a couple of cases there were two. Breeding starts no earlier in the archipelago and is perhaps even somewhat later than in the mainland lakes of S Finland. No clutch is known to have been commenced in the archipelago before 10 May.

The immigration of the Pochard is in a way a parallel case to the much earlier invasion of the Tufted Duck, about which we lack information. The further fate of the Pochard in our archipelago will, therefore, be of twofold interest. It may also give us the rare oppor-

tunity to follow new breeding habits *in statu nascendi*.

How far the invasion of the archipelago by the Pochard is the result of the eutrophication of the waters is not easy to say; male flocks were seen in the area as early as the thirties. It seems, at any rate, likely that the eutrophication has led to an increase of the population inhabiting the species's original habitats, lakes and eutrophic coastal bays, and this increase may well have stimulated the spread into the new habitat.

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