Numbers and distribution of wintering waterfowl in Norway

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Introduction

Due to lack of census data, few serious attempts to estimate Norway's wintering waterfowl populations have been made. The reasons are mainly severe difficulties connected with fieldwork during winter, such as rough seas, low temperatures, lack of daylight, and problems of transportation. Regular mid-winter counts started in the mid-1960s in connection with the work coordinated through the International Waterfowl and Wetlands Research Bureau (IWRB) and reported by Atkinson-Willes (1976), Ruger *et al.* (1986) and Pirot *et al.* (in press). Acknowledging the increasing threat to seabirds and coastal waterfowl posed by the escalating oil activity on the Norwegian continental shelf, a surveillance of these birds was given high priority within the Norwegian National Seabird Project 1979–1984 (Røv 1984), and was carried out in nine (now eleven) selected areas along the coast. Annual mid-winter counts have been conducted mainly by volunteer observers from the Norwegian Ornithological Society. In addition to this, extensive one-off surveys have been carried out in connection with oil prospecting on specific fields on the Norwegian continental shelf. Responsible for these investigations have been the Research Division of the Directorate for Nature Management in Trondheim, Tromsø Museum and local conservation authorities. Some of the base material on which this paper relies has already been summarised (Nygård and Røv 1984; Follestad *et al.* 1986), other data are unpublished reports. The data are entered into the Norwegian Seabird Registry (Follestad and Nygård 1984). General information about movements and distributions will be found in Haftorn (1971) and Cramp and Simmons (1977). It is hoped that this paper will give an up to date and as good an account as possible of the waterfowl populations wintering on the Norwegian coast.

Field Methods

Most of the observations were made from the mainland or islands, by means of a telescope. In the outer archipelago, medium sized boats supplied with inflatables were required, in order to enter small skerries and islets. Good viewpoints were selected, and the sea scanned for seabirds and waterfowl. The area covered was marked on the map, and a new viewpoint then taken, until complete coverage of the area was accomplished. Recently helicopters have also been used for transportation and counts in areas where other methods were inadequate (Follestad *et al.* 1987). The bulk of the surveys has been done in January and February, but north of 65°N some March counts have been included. The weather at this time is often stormy, with rough seas obstructing fieldwork. Some counts have therefore been made under less than ideal conditions.

Extent of Surveys

Significant gaps still exist in the Skagerrak area (Aust-Agder), in the south-west (Hordaland), and in many of the deep fjords. More effort has been spent on the part of the coast between 62°–68°N than on any other parts. The areas covered by censuses at least once are shown in Figure 1. An estimated 70–80% of the potential wintering areas for coastal seabirds have been surveyed. The Norwegian coastline is divided into 5 different regions, here named the South, West, Central, Low North and High North regions. These are of fairly comparable length, the northernmost being the longest, and they follow district (county) boundaries.

Data Handling

After coding of data on to standard forms, they were entered into the database. A basis for making sound estimates was obtained running a data program especially tailored for this. The program goes through the database in the following steps:

1. Groups the observations for each locality into months and years.
2. Selects the set of observations for each locality stemming from the most recent

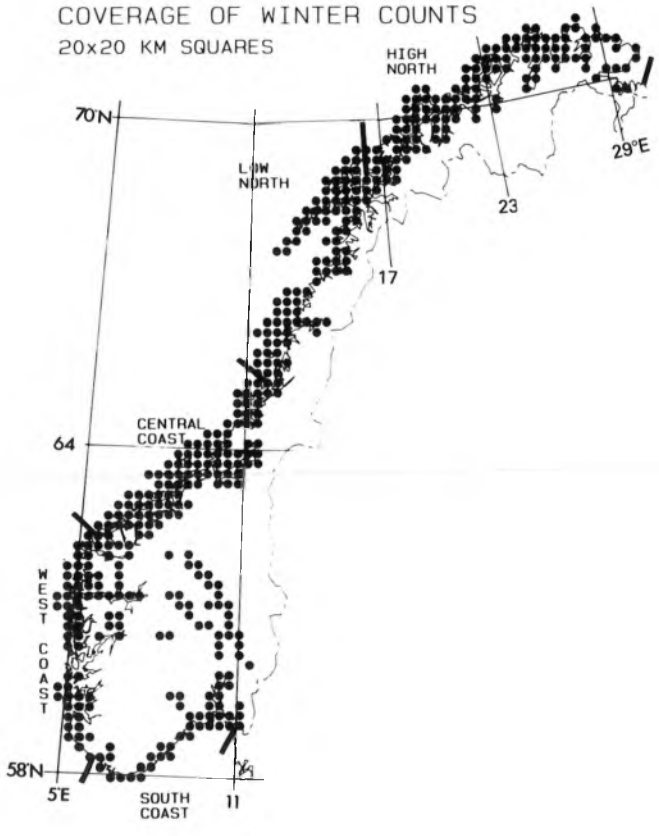


Figure 1. The coverage of winter counts of waterfowl in Norway. The dots represent 20 by 20 km squares, and mean that data are available from that square. It does not necessarily mean that the square is completely covered.

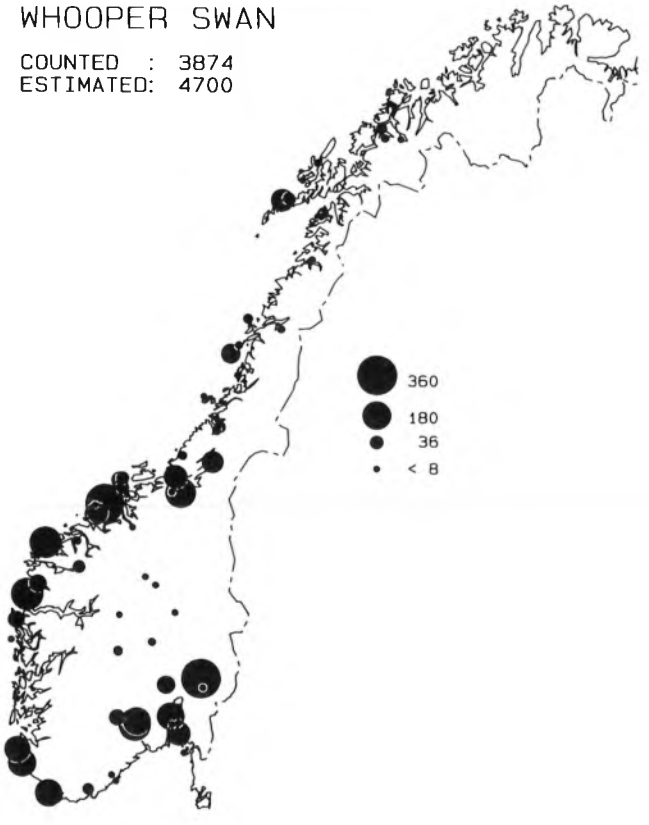


Figure 2–10. Distribution and numbers of selected species of waterfowl in Norway, aggregated to 50 by 50 km squares. The placement of circles is at the locality within the square where the species is most abundant. The plot size is proportional to the numbers, except for the smallest plot, which is fixed at 2% of maximum size, to enhance clarity. The maps are computer drawn, using the SUPERMAP program, developed by G. H. Strand and L. Kvenild at the University of Trondheim.

year and from the month closest to mid-winter in this order: January, February, December, March. Data from other months are omitted.

3. Sums the numbers for each locality into district and county totals for each species.

The program produces detailed municipality (local district) lists, and a subjective evaluation is undertaken in order to establish the final estimate, taking into account factors like quality of data and extent of coverage. Filling in the gaps in areas not censused was done by extrapolating from neighbouring distributional patterns and the habitat types available. Furthermore, such estimates were discussed with local ornithologists.

Results

The regional estimates for each species are shown in Table 1. The Mute Swan *Cygnus olor* is estimated at 1,000 birds, the majority on the south coast. The Whooper Swan *Cygnus cygnus* totals 4,500, and two major wintering areas may be distinguished. Although intergrading, it seems clear that the Olsofjord-Telemark area in the south forms a centre, as does the northern part of the western coast (Figure 2). Bewick's Swan *Cygnus columbianus* is not a regular winterer, but small flocks or single birds have been noted in many parts of the country in the non-breeding season.

Very few mid-winter observations of the Bean Goose *Anser fabalis* have been made. Small flocks of the Pink-footed Goose *Anser brachyrhynchus* (usually less than ten) may occasionaly winter in the south-western and western parts of Norway. Both the Siberian nominate sub-species of White-fronted Goose *Anser a. albifrons* and the Greenlandic *A. a. flavirostris* are irregular winterers in the south-west, the nominate being the more frequent. In the winters of 1985 and 1987 up to 150 wintered on Jæren, Rogaland. The few hundred Greylag Geese *Anser anser* that stay, are found mostly on the south-western coast, occasional birds being further north. The Canada Goose *Branta canadensis* has four main distributional areas: the Oslofjord, Telemark, Agder and Trøndelag districts. They will regularly gather in large flocks (up to several hundred), often fed by humans in mid-winter. The Barnacle Goose *Branta leucopsis* is an irregular winterer. Occasional small flocks are reported from the south-western parts of the country (Haftorn 1971). In the autumn of 1984, 17 birds stayed on Jæren until the first week of December, but then left. Small flocks of

Table 1. Regional and national estimates of the populations of the most common species of wintering ducks, swans and geese in Norway. For regional divisions, see Figure 1.

	S Coast	W Coast	C Coast	Low North	High North	Norwegian Total	Range	NW Europe Total	% in Norway	Ref
Mute Swan	800	200	0	0	0	1000	800–1200	180000	0.6	1
Whooper Swan	2000	850	1400	400	50	4700	4500–5000	25000	18.8	2
Canada Goose	2000	200	700	0	0	3000	3000–4000	59000	5.1	1
Greylag Goose	130	200	20	5	0	400	300–600	232000	0.2	1
Wigeon	10	600	15	0	0	650	400–1000	750000	0.1	3
Teal	10	500	40	0	0	600	300–1000	400000	0.2	3
Mallard	13000	17000	15000	7000	5500	60000	50000–70000	5000000	1.2	3
Tufted Duck	1100	5000	50	5	5	7000	4000–8000	750000	0.8	3
Scaup	100	500	75	10	0	700	500–1500	150000	0.5	4
Common Eider	9000	33000	120000	160000	120000	450000	400000–500000	3000000	15.0	1
King Eider	0	50	2500	25000	50000	80000	70000–100000	100000	80.0	5
Steller's Eider	10	0	5	10	12000	12000	10000–15000	15000	80.0	5
Long-tailed Duck	1000	16000	27000	20000	30000	100000	80000–120000	2000000	5.0	1
Common Scoter	600	1200	1900	300	200	4000	2000–8000	800000	0.5	1
Velvet Scoter	300	1800	16000	5000	7000	30000	25000–35000	250000	12.0	1
Goldeneye	8500	5500	2600	100	50	17000	15000–20000	300000	5.7	1
Smew	8	35	5	0	0	50	40–70	15000	0.3	1
R-b Merganser	1800	7500	12000	3500	4500	30000	25000–35000	100000	30.0	5
Goosander	1450	750	200	100	150	3000	2500–4000	125000	2.4	1

References: 1. Pirot *et al.* (in press) 2. Owen *et al.* (1986) 3. Ruger *et al.* (1986) 4. Atkinson-Willes (1976) 5. Authors' estimate

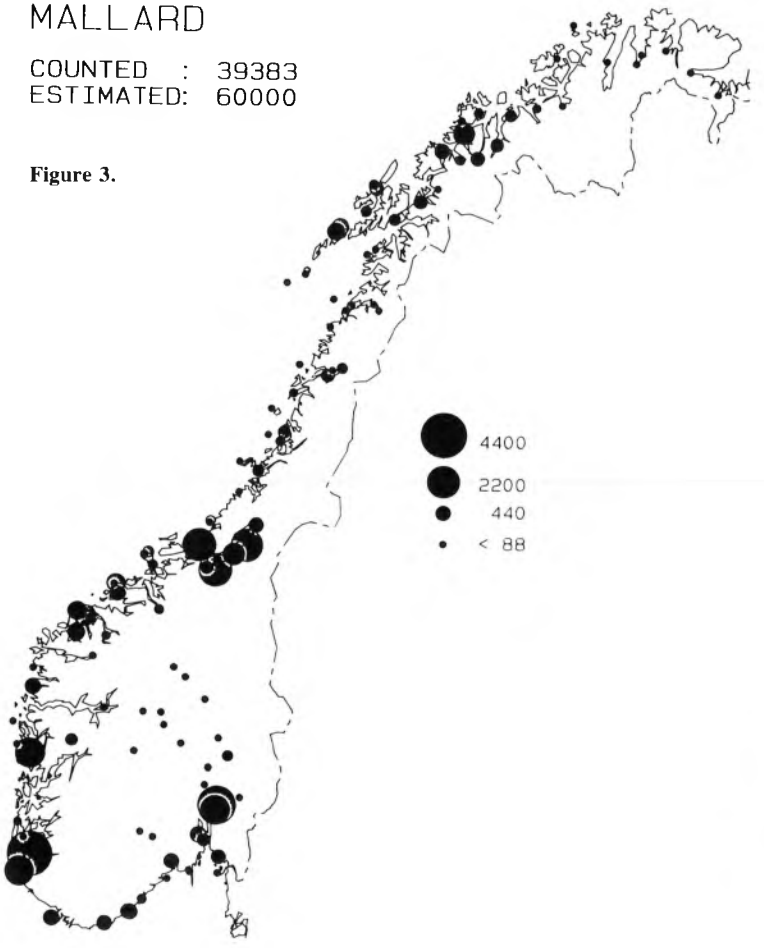


Figure 3.

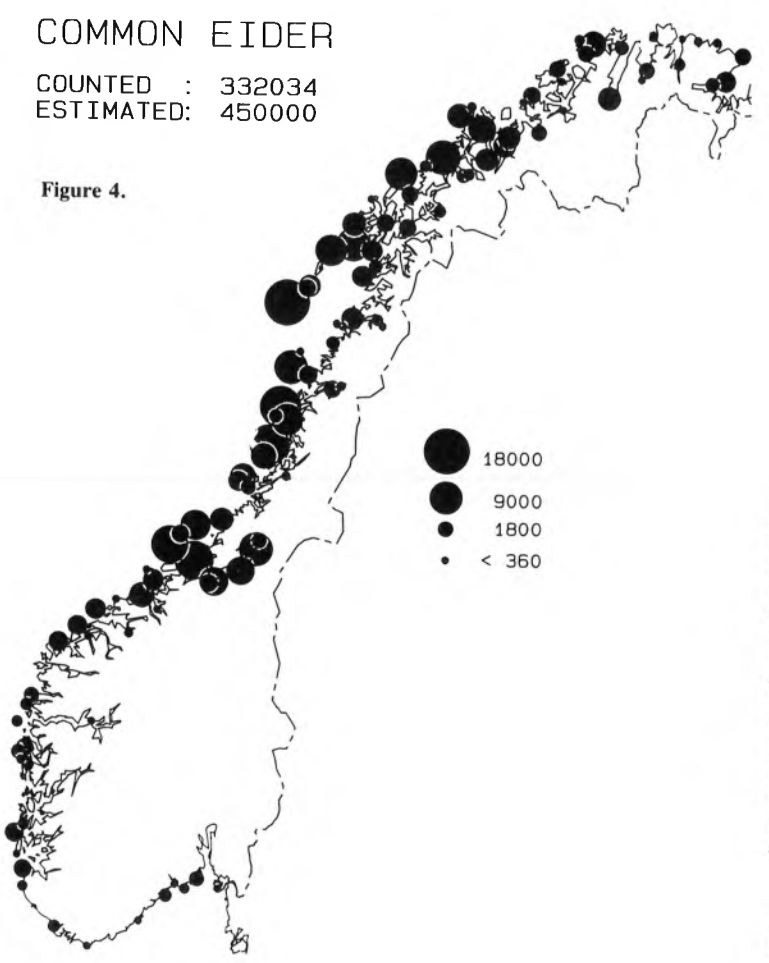


Figure 4.

Brent Goose *Branta bernicla* will occasionally winter on the south and west coasts, for instance on Jæren and Lista, but is probably the least frequent of the western arctic geese to visit Norway in winter.

The Shelduck *Tadorna tadorna* almost completely deserts the country, leaving less than a hundred on the southern and western coastal fringes.

Odd Wigeon *Anas penelope* winter up to 65°N, but the only wintering area of importance is the relatively mild and snow-free south-western coast. The Jæren coast holds the bulk of the 500 birds that winter each year, most of them being females and young birds. The only area holding an appreciable mid-winter number of Teal *Anas crecca* is the Rogaland district, where some 400 birds are found annually. Only a few birds will winter elsewhere in Norway.

The most numerous of all dabbling duck species during winter is the Mallard *Anas platyrhynchos*, totalling 60,000 birds. Many birds frequent urban areas in winter, where food may be abundant, as in the Frogner Park in Oslo. North of 65° numbers gradually drop off, but Mallard are found in sheltered areas along the whole coast, all the way to the Russian border (Figure 3).

The Pintail *Anas acuta* is a scarce bird at all seasons (locally a common breeder in the high north), but extremely few stay during winter. Less than 10 Shoveler *Anas clypeata* are present in winter.

The Pochard *Aythya ferina* is newly established as a breeding species in Norway, but is still very rare. In most winters the numbers are very low, only the open freshwater lakes of the Jæren coast may hold some tens of birds. While the breeding distribution of the Tufted Duck *Aythya fuligula* is largely northern, the winter distribution is south-westernly, the Rogaland and Hordaland districts holding two thirds of the winter population, totalling 7,000. Ice-free freshwater lakes are the preferred habitat, but seawater areas are also regularly used. Less than 1,000 Scaup *Aythya marila* winter regularly in highly variable numbers on the southern and western coast.

The most abundant sea duck both in summer and winter is the Common Eider *Somateria mollissima*. It outnumbers any other duck species almost anywhere on the coast except in the Varangerfjord in Finnmark, where King Eider and especially Steller's Eider will dominate, and in the south-east, where Mallard and Goldeneye are the most abundant. The total mid-winter population will probably reach 450,000, the figure in the high north being rather tentative. The prime habitats for this species are the shallow coastal waters between 62°N and the Tromsø region, where more than two thirds of all wintering Eiders in Norway are found. See Figure 4 for distributional pattern.

The King Eider *Somateria spectabilis* outnumbers the Eider locally in Finnmark, and large flocks containing several thousands of birds are regularly present (Figure 5). The estimates for Troms and Finnmark are quite rough, the figure of 50,000 birds in this region must be regarded as very tentative. Scattered individuals may be found on the whole coastline, but numbers drop off rapidly south of the Lofoten Islands. However, flocks seem to be distributed quite regularly down to the Vikna islands, south of which it is rather irregular in numbers. The estimated country total of 70,000-100,000 birds is quite crude.

Europe's only wintering locality of importance for the Steller's Eider *Polysticta stelleri* is the Varangerfjord in Finnmark, but occasional flocks occur (Frantzen 1985) west to 28°E (Figure 6). In late March 1985 an all time high of approximately 12,500 Steller's Eiders were recorded, and was the dominant duck species present, while the year after less than 8,000 were counted.

Our data indicate that approximately 100,000 Long-tailed Ducks *Clangula hyemalis* winter in Norway, more than half of these in the high and low north areas (Figure 7).

The Common Scoter *Melanitta nigra* winters along the entire coast, but relatively few in the north. The numbers are highly variable, around 4,000.

The coast of Møre and Romsdal, Trøndelag, Southern Nordland and Troms have important areas for the Velvet Scoter *Melanitta fusca*. It shows a clumped distribution, and occurs here and there along the whole coast, although rather sparsely in the south-east and in Finnmark (Figure 8). The estimated winter total lies in the range between 25,000 and 35,000 birds.

The numbers of Goldeneye *Bucephala clangula* drop off very abruptly north of 65°N (Figure 9). The main areas are the Skagerrak and Rogaland coast in the South, and the Trondheimsfjord. It rivals the Common Eider in being the commonest wintering duck on the South Coast, second to the

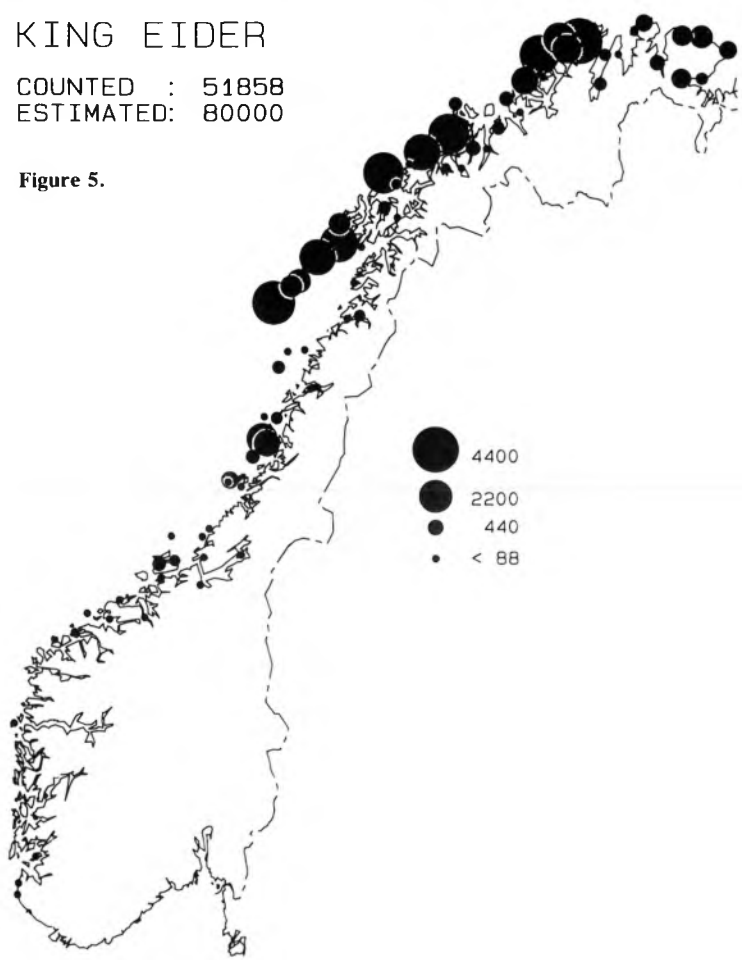


Figure 5.

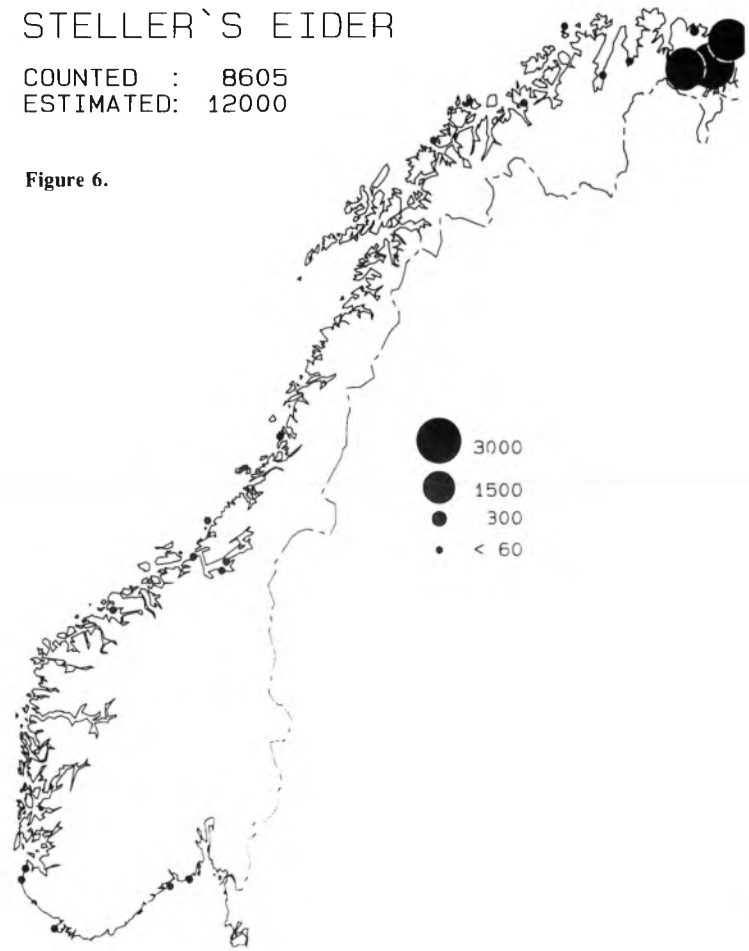


Figure 6.

Mallard.

Very few Smew *Mergus albellus* are observed, only some unfrozen lakes in the Jæren are regular wintering areas for some tens of birds.

The Red-breasted Merganser *Mergus serrator* prefers the outer areas of the archipelagos of Central Norway, but is also found in fjords. A difficult species to survey due to its mobility, the figures indicate a total of 30,000 wintering birds, the West and Central coasts holding the larger fraction of these (Figure 10).

The distribution of Goosanders *Mergus merganser* is distinctively southern, the Oslofjord and Jæren being the major strongholds in mid-winter. Confined to fresh or brackish waters and winters very sparsely north of Bergen.

Discussion

Although this study is not complete, the figures have a reasonable degree of reliability, as most species prefer the areas close to the shore, and hence have good detectability. Regarding the offshore areas, the few winter cruises in open sea have revealed no important concentrations of waterfowl, as was to be expected, as the Norwegian continental shelf is too deep for benthos feeders. There are good reasons to believe that the best open freshwater areas have been covered, since the climate is mild enough to provide such conditions only in the south and west, where the counts have been especially designed to cover this habitat.

Surface-feeding wildfowl

When judging the number of wintering waterfowl in Norway, it must be emphasised that the bulk of the freshwater lakes freeze in winter, and the fields are covered with snow most of the time. Only the relatively mild Lista and Jæren regions in the south-west offer suitable habitats for geese and dabbling ducks (Byrkjedal and Eldøy 1980). Some river mouths and hydroelectric-developed stretches will also stay unfrozen. The Norwegian seaboard is hence of limited importance to surface-feeding wildfowl on the NW European scale.

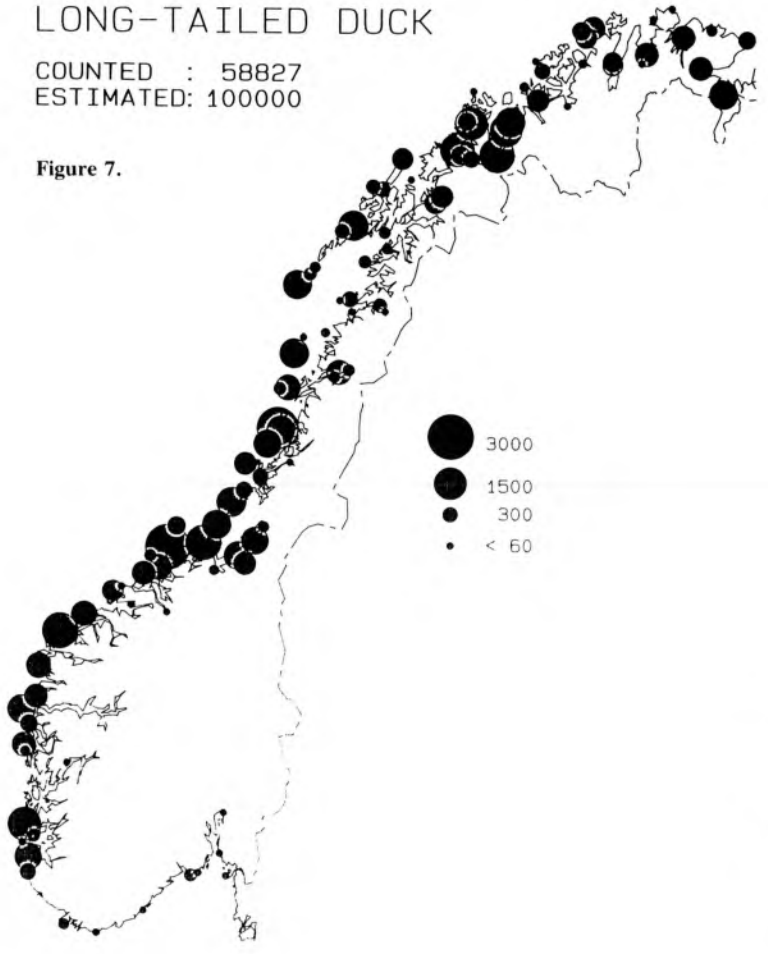
The Mute Swan has since 1937 been a regular breeding bird in Norway, and is now distributed in the southernmost part of the country, totalling 150–200 pairs (Frøstrup 1983), which is probably a low estimate. It will leave the breeding places when they freeze over, but will usually stay in locally ice-free areas not far away during the whole winter. The main wintering localities are at the mouth of the River Glomma in Østfold, the Svelvikstrømmen Sound in Buskerud, and on Jæren, where about a hundred birds may stay at each place in mid-winter, provided the ice conditions are not too severe.

The main migrational movements of the Bewick's Swan take place east of Norway through the Baltic region.

The breeding population of the Whooper Swan has increased in numbers and has also expanded its range in later years. This seems to be reflected in the number of wintering birds. Lund (1963) gave an estimate of 2,500 birds, while the current mid-winter estimate is 4,000–5,000. It is as yet unclear where these birds breed, a question only to be resolved by ringing efforts or telemetry. It is worth noting that two birds, banded with neck-collars in Iceland in 1984, were subsequently seen in the Rogaland district in November and December the same year (Rüger *et al.* 1986). One was also seen in Troms (K-B Strann pers. obs.). Most birds stay in shallow tidal areas, but will locally form quite large concentrations in open stretches, as in the Vorma River, 40 km NE of Oslo. The Pink-footed Geese that stay in winter, are believed to be of Icelandic or Greenlandic origin (Haftorn 1971), but this is not substantiated. There are equal possibilities that they could belong to the Spitsbergen population, judging from the distance from the normal flyway and wintering area.

Most Norwegian Greylag Geese winter in the Iberian Peninsula, France and the North Sea countries (Lund 1971), but small flocks winter in the south and west. It is not known which segment of the population chooses to stay, and what effect this has on the individual level in terms of fitness.

Introduced to Norway in 1936, the Canada Goose population has increased, partly naturally and partly due to further introductions. The birds leave their inland localities in autumn, wintering in sheltered fjord and coast localities, and even in ice-free rivers. Many southern breeders (from the Agder district) have to an increasing extent migrated to Denmark in recent years (Hoel 1986). The extent and directions of



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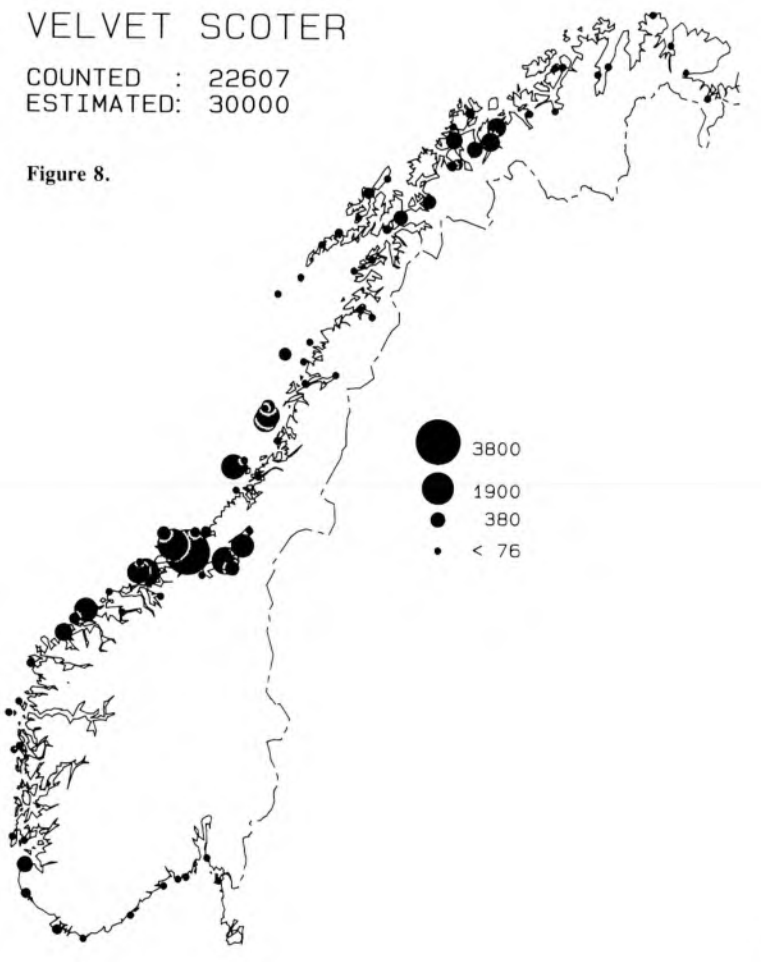


Figure 8.

the movements are not clear, but it seems likely that at least half of the breeding populations leave Norway during winter. The species is still increasing in numbers and, from the autumn of 1986, is legally hunted in certain districts. Heggberget (1987) gives a more detailed review of the history and biology of this species in Norway.

The Shelduck leaves the breeding areas, which are south of 70°N, in late summer, presumably to join the large moulting flocks in the German Wadden Sea. Some single birds, however, stay during the whole winter, most of them in the south-west.

The Teal and the Wigeon are typically migratory species, moving south-west in autumn to winter in the North Sea countries and the British Isles.

The winter habitat of the Mallard ranges from parks and harbours to the outer coastal islands. In the strictly marine habitats, shallow seaweed-rich littoral areas are favoured. It is the only dabbling duck that seems able to exploit the littoral zone in winter. Being a very opportunistic feeder, it is able to thrive on an entirely marine diet. Where it is restricted to the sea coast in winter, as in Greenland, it is able to feed almost solely on molluscs (Muus *et al.* 1981). Ringing recoveries show that some Norwegian Mallard move to the British Isles and SW Europe during winter, and that replacement by birds from the east occurs. Bentz (1985) studied the recaptures of Mallard wintering in Malmø, Sweden and in Oslo and Trondheim, Norway. The data showed that the Oslo winterers were of local origin, while a good fraction of the birds ringed in Malmø and Trondheim was later recaptured at breeding sites in USSR, Finland and Sweden. From the data it is evident that the Trondheim area recruits winterers from northern Fennoscandia, while Malmø recruits birds from southern Finland, southern Sweden and north-western USSR. This may suggest an overland flyway from the Bay of Bothnia to the Norwegian coast, like that proposed for the Eider (see below).

Diving ducks

The Pochard winters in very irregular numbers. For example, in 1985 there were 141 on the Jæren coast, while in 1982 there were none. The temperature and ice conditions on the normal wintering grounds in central and south-western Europe may account for these irregularities.

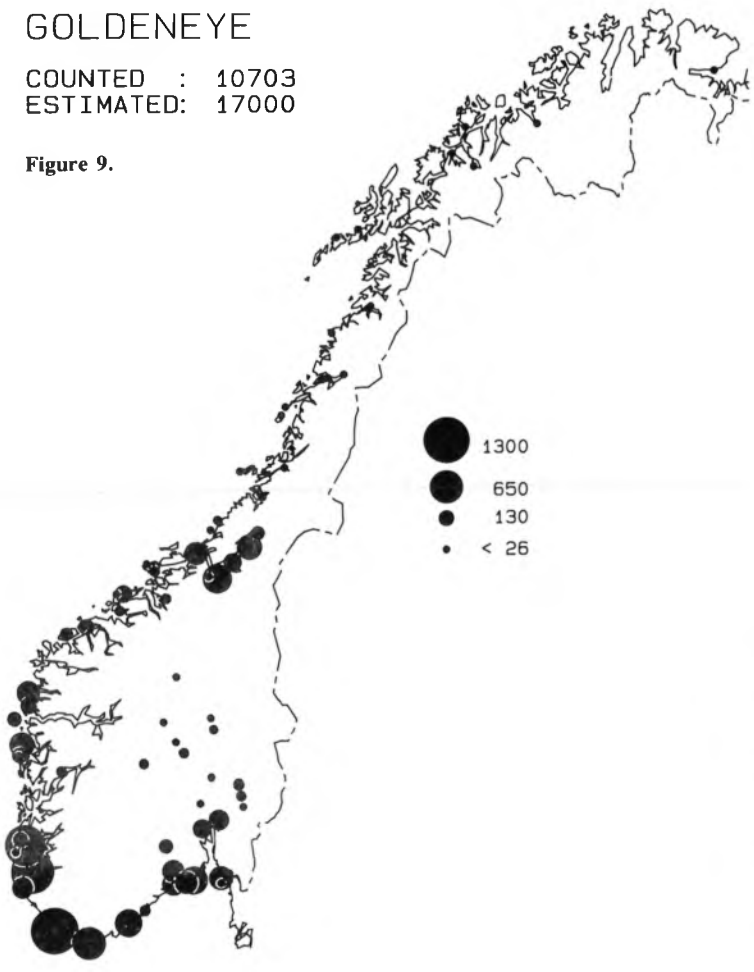
Norwegian recoveries of Tufted Ducks ringed in Iceland and in Fennoscandia, indicate that the birds wintering here partly come from elsewhere. How large a fraction of the Norwegian breeders leave the country to winter elsewhere in Europe is not known.

On the whole, Fennoscandian Scaup primarily winter in coastal North Sea waters (Joensen 1974). There is no information on the breeding origin of the 500–1,500 that normally stay.

The breeding Common Eider do not usually migrate far in the winter, as their staple food, the blue mussel *Mytilus edulis* is readily available the year round. A certain influx of foreign populations may take place. There is good evidence that populations of eastern origin perform a regular overland migration to the Central Coast of Norway in autumn, with a return in April/May (Moksnes and Thingstad 1980). In the Troms and Finnmark districts, regular wintering of birds from Svalbard and the Barents Sea region most certainly occur, as shown by the regular occurrence of yellow-billed birds of the *borealis* type. These birds are even seen as far south as 64°N. Looking at the 20,000 km long coastline of Norway, the figure of 450,000 may not seem very impressive. The fact is, however, that many of the long and steeply shelving fjords that characterise Norway's coastline have poor musselbeds. Some, however, like the Trondheimsfjord, which holds a winter population of 20,000 Eider, offer very good winter habitats.

The King Eider tend to prefer more exposed wintering localities than the Common Eider, and seem to seek food in deeper waters. It is a highly arctic species which is forced to migrate westwards when the sea ice closes the eastern parts of the Barents Sea. An appreciated food item for the King Eider seems to be eggs of the capelin *Mallotus villosus*, which spawns along the coast of Troms and Finnmark in late winter (Gjøsæter and Sætre 1974).

Where the small, isolated wintering population of Steller's Eider breeds is not known. Very few Steller's Eiders winter in the western parts of the Soviet Union (Isakov 1970; V. Bianki and L. Belopolski pers. comm.). The main wintering area for the Steller's Eider is the southern Bering Sea.



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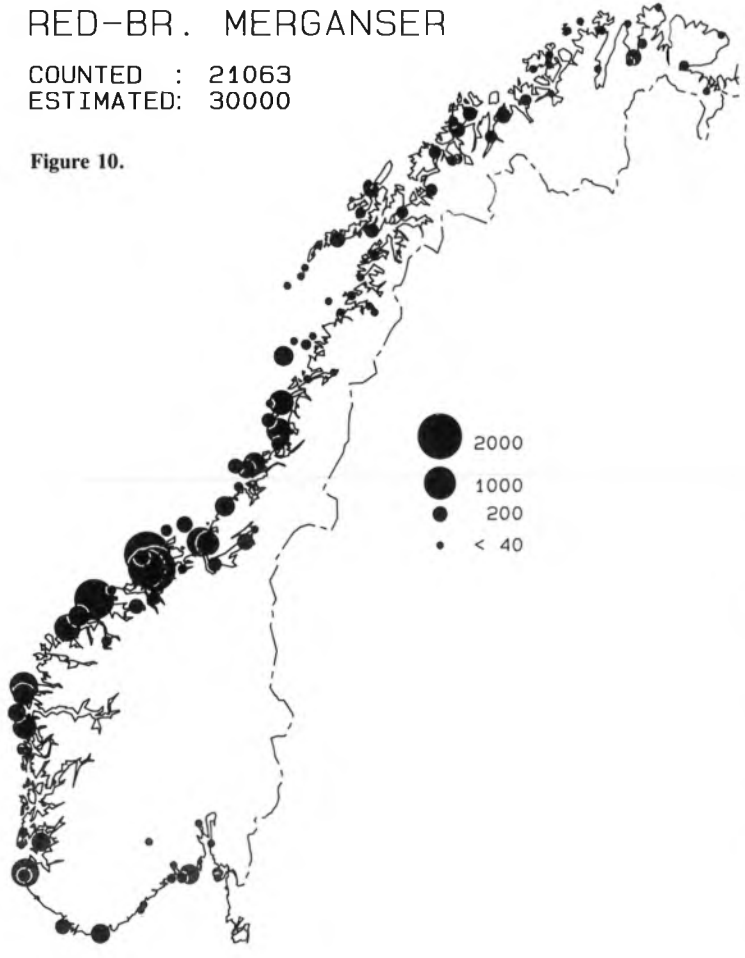

Figure 10.

There is no known regular breeding area west of the Gulf of Khatanga (Cramp and Simmons 1977). Is there a still unknown breeding area on the West Siberian tundra, possibly in the areas between the Yamal and Taymyr Peninsulas?

The Long-tailed Duck is probably the second most numerous wintering duck in Norway. As it is less confined to the shallow parts of the littoral zone than most other marine ducks, it is difficult to obtain reliable figures. Lund (1962) estimated from interviews that the winter total was at least 50,000, half of the current estimate. Haapanen and Nilsson (1979) estimated from aerial counts that the breeding Long-tailed Ducks in the Fennoscandia mountains amounted to only 3,500 breeding pairs. This clearly indicates that birds from northern parts of the Soviet Union are involved in the wintering population, which is supported by two winter recoveries on the Norwegian coast of Yamal birds (Cramp and Simmons 1977). The question is open whether birds of Icelandic or Greenlandic origin are also involved, as birds ringed in East Greenland have reached Iceland and Denmark.

Unusually high numbers of female-coloured Common Scoter occurred on the Central coast in the winter 1984–85. This invasionlike phenomenon seems to contradict the assumption that Common Scoter on the Norwegian coast are mainly of local origin (Cramp and Simmons 1977). This may be the case in "normal" years, but it seems likely that the heavy freezing of Danish waters led to the above mentioned unusual influx of females/juveniles. The estimated mid-winter total of 4,000 Common Scoter birds relates to years not involving extreme ice conditions in the Skagerrak, when numbers may be more than doubled. On their way to Danish and southwest European waters, migrants regularly occur in good numbers in the Oslofjord area in the autumn, but will not stay there in any significant numbers throughout the winter.

Considering the rather low mid-winter figures of Velvet Scoter elsewhere in Europe (Joensen 1974; Atkinson-Willes 1978), the new figures for Norway are of particular interest. The 25,000–35,000 birds may constitute 10–15% of the estimated European total. They show a clumped distribution, and whether this is due to high gregariousness or habitat selectiveness is not known. Where these birds breed is unclear, but in view of the sparse Norwegian breeding population, it seems certain that a relatively good proportion belongs to populations further east.

The Goldeneye is one of the more common breeding ducks in Norway, migrating south in winter. Some birds undoubtedly move to other North Sea countries, but on the other hand ring recoveries show an influx of birds from Sweden (Haftorn 1971). It is one of the commonest duck species on the southern coast, especially in the Vest-Agder district. The statement in Cramp and Simmons (1977) that "small flocks, perhaps of local origin, winter Varanger Fjord-Murmansk" is not verified by the present data. Since 1980, the Goldeneye has been noted only once (one in 1985) on the regular mid-winter counts in the Varanger Fjord. The Norwegian numbers amount to about 6% of the estimated NW Europe total.

Where the minute breeding population of Smew in eastern Finnmark stay in winter is not known. Nor is the breeding areas of the few tens of birds that are observed in Norwegian waters each winter. It prefers brackish or fresh water, but is also found in saltwater areas.

The Red-breasted Merganser is partly migratory, but a rather large fraction of the NW Europe population evidently winter in Norwegian waters. They are highly mobile, governed by the movement of suitable small fish prey. The Tana Fjord in Finnmark is reported to hold up to 1,500 individuals in some winters (B. Frantzen pers. comm.), possibly due to the large stocks of sandeels *Ammodytes* spp. here. No good estimates for the NW Europe population have been published so far, as no authors have had access to good Norwegian data. On these grounds, it seems justifiable to propose 100,000 birds as a tentative population figure for NW Europe, adding the Norwegian figures to the highest IWRB count (Rüger *et al.* 1986). This implies that Norway holds between one quarter and one third of the NW Europe stock.

The distribution of the Goosander is distinctively southern, but small groups are found all along the coast, often in the mouths of good salmon and sea-trout rivers. The estimated 3,000 individuals account for between two and three percent of the NW Europe estimate.

Summary

The Norwegian coast is important as a wintering area on the European scale for a number of waterfowl species, especially the marine diving ducks. The most important are the Common Eider, King Eider, Steller's Eider, Velvet Scoter, and the Red-breasted Merganser, all of these constituting more than 10% of the NW European stock. The Whooper Swan numbers are also quite high, due to its ability to use sheltered saltwater areas.

The conditions in winter are unfavourable for most geese, which are found in very small numbers. Surface-feeders like the Mute Swan and the dabbling ducks prefer more sheltered, brackish or freshwater sites. Such areas are only found to a limited extent in the south-west, hence the number of these species groups are low on the European scale.

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