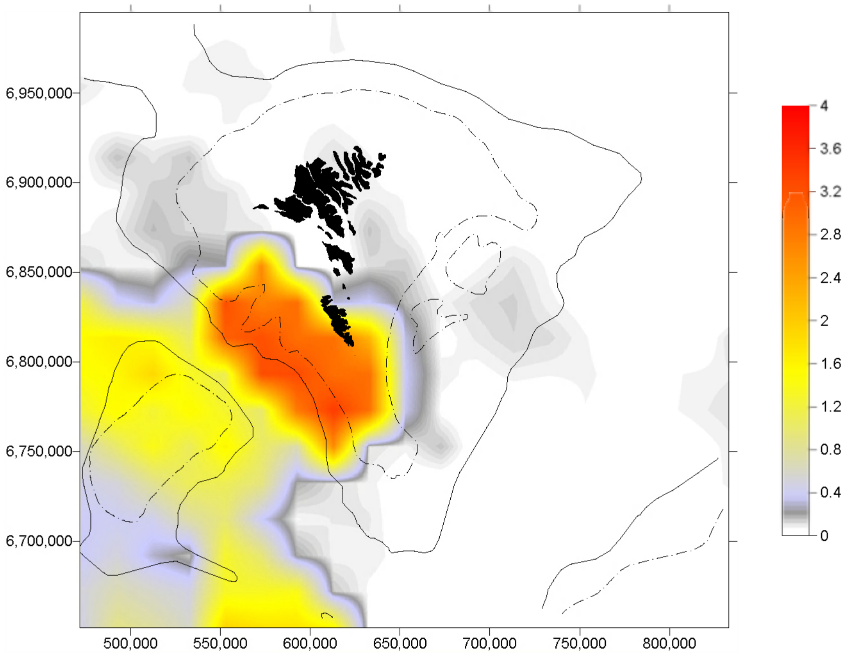
Dispersion and vulnerability of marine birds and cetaceans in Faroese waters



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Summary

- Surveys were conducted in the waters around the Faroe Islands between 1979 and 2000, yielding information on the distribution and abundance of seabirds and cetaceans.

- Totals of 37 seabird and 15 cetacean species were recorded within the study area.

Vulnerable areas

- Coastal areas of the Faroes hold vulnerable concentrations of seabirds year-round, although vulnerability levels vary greatly. These areas are rendered highly vulnerable during the breeding period from April to September because they host very large gatherings of locally breeding birds adjacent to the Faroese colonies. Outside the breeding season, from October to March, the most vulnerable species are sedentary species such as the European shag, the eider and the black guillemot and also the great northern diver. The only species of cetacean that occurs regularly in the coastal environment of the Faroe Islands is the harbour porpoise, which is recorded mainly between June and August.

- The entire area of the Faroe Plateau inside the tidal front is vulnerable throughout the year, although the highest levels of vulnerability are found during the pre-breeding, breeding and post-breeding periods from March to October. During this period, the key species are the abundant local breeders, notably northern fulmar, Manx shearwater, black-legged kittiwake, common guillemot and Atlantic puffin. Harbour porpoise and minke whale are the only cetaceans that occur predominantly in this area.

- The banks to the east of the Faroes are vulnerable throughout the year, with the largest concentrations of seabirds encountered during the pre-breeding, post-breeding periods and non-breeding periods. The Suderoy and Sandoy Banks are particularly important as the key wintering areas for common guillemots and razorbills, while the Nolsoy and Fugloy Banks are the key wintering areas for little auks. Although cetaceans from shelf-break and deeper areas may venture over the banks, the cetacean fauna here is similar to that of the Faroe Plateau with harbour porpoises and minke whales being the more common species.

- Seabird concentrations over the Faroe Bank are vulnerable during the pre- and post-breeding periods, when large numbers of piscivorous species occur there. During the pre-breeding period, the area is important mainly for Manx shearwaters and razorbills, whereas Manx shearwaters, common guillemots, razorbills and Atlantic puffins concentrate over the bank during the post-breeding period. The cetacean interest of the Faroe Bank is similar to that of the Faroe Plateau and banks east of the Faroes, with harbour porpoises and minke whales being most commonly recorded.

- The Scottish shelf in the extreme south-east of the study area hosts vulnerable seabird concentrations for most of the year, but attains particular importance during the breeding season due to breeding birds from colonies in north-western Scotland. The same species of cetacean occur over the Scottish shelf as occur over the shelf and bank areas of the Faroes, but they are supplemented by Risso's and white-beaked dolphins.

- The shelf break areas of the Faroes are vulnerable throughout the year, and large concentrations of several seabird species are found in these habitats. The southeastern and southern shelf break areas generally hold the least vulnerable seabird aggregations. The southwestern shelf break is the main area used by sooty shearwaters during July-October, and the area is also important for northern fulmars, Manx shearwaters and Leach's storm-petrels during this period. The western and northwestern shelf break is the main area used by great skuas between March and June. The northern and northeastern shelf break is the principal area used by razorbills during September-January, northern fulmars during December-March, European storm-petrels during June-August and great black-backed gulls during September-April. Razorbills concentrate over the eastern shelf break during February-April. Fin whales are seen regularly at the southeastern shelf break, while species typical of the shelf, banks and deeper waters are observed less frequently. The northwestern shelf break of the Scottish Shelf is important mainly for northern fulmars between December and March and between July and August, to great skuas between July and September, great black-backed gulls between September and April and black-legged kittiwakes between January and April.

- For the most part, slope areas hold vulnerable seabird concentrations the year. The southern slopes of the Faroe shelf are important for northern fulmars during April-June and black-legged kittiwakes during January-April, while the western lopes are used mainly by great skuas during March-April, the northern slopes by northern gannets from June-September and the eastern slopes by European storm-petrels from September-November, glaucous gulls during November-February and common guillemots from February-April. The slopes of the northwestern Scottish Shelf are mainly important for great skuas in May and June and to black-legged kittiwakes between January and April. Slope areas boast a rich cetacean fauna. The main concentrations of long-finned pilot whales are found over the southwestern slopes of the Faroe Shelf, while fin whales, sei whales, northern bottlenose whales, sperm whales, beaked whales, Atlantic white-sided dolphins and bottlenose dolphins occur regularly over slope areas and in deeper waters, particularly of the Faroe-Shetland Channel.

- Parts of the deep water areas of the Wyville Thomson Ridge, southern Faroe Bank Channel and the Faroe-Shetland Channel are vulnerable between March and November. The Wyville Thomson Ridge and the southern Faroe Bank Channel are important to black-legged kittiwakes from January-April, lesser black-backed gulls in June and July, Leach's storm-petrels during June-August and northern gannets from June-September. The Faroe-Shetland Channel is important for black-legged kittiwakes between May and July and a wide range of cetacean species: fin whales, sei whales, northern bottlenose whales, sperm whales, beaked whales, Atlantic white-sided dolphins and bottlenose dolphins.

Seabird species present throughout the year:

- Northern fulmars were the most abundant seabird in the region, with very high densities found over the Faroese shelf and shelf break areas throughout the year.

- Peak northern gannet densities occurred during June-September, just to the east of the only colony on the islands at Mykineshólmur and over the slopes of the Norwegian Sea.

- Herring gulls were restricted to coastal waters during the breeding season after which low numbers dispersed within a range of 50 km from the islands.

- Great black-backed gulls were more numerous in Faroese waters during the winter than during the summer and were recorded frequently at the shelf break.

- Black-legged kittiwakes were abundant throughout the year, but particularly so between May and July when many were found throughout the Faroe Plateau. Between August and September, black-legged kittiwakes occurred mainly on the western Faroe shelf; from October-December, their abundance decreased by at least an order of magnitude in the study area.

- Highest common guillemot densities occurred near the breeding colonies during May and June and over the Faroe Bank during July and August, whereas moderate common guillemot densities were found over the banks to the east of the islands during September and November and at the shelf break to the north-east of the islands during February-April.

- Razorbills were less abundant than common guillemots, but localised concentrations were noted over the shelf in May and June, with some post-breeding concentrations to the south-west during July and August. Highest densities were recorded to the north-east of the islands in November.

- Between June and August, very high densities of Atlantic puffins were present over most of the Faroe plateau inside the tidal front. Between September and March, numbers fell to very low levels and most were recorded to the east of the islands.

Summer seabird visitors

- Most Manx shearwaters were recorded west of Sandsoy, at the southwestern shelf break and over the Faroe Bank.

- With an estimated 250,000 breeding pairs, the Faroe Islands hold a large proportion of the total European storm-petrel population. High densities were present during July and August, particularly over the north and northeastern shelf break.

- Leach's storm-petrels were most numerous at the shelf break to the south-west of Mykines, and over the Wyville Thomson Ridge at the southern edge of the survey area, during July and August. They were less common elsewhere, and at other times of the year.

- Small numbers of Arctic skuas were recorded near the colonies but higher numbers were over the outer shelf to the north of the islands during June.

- Low numbers of great skuas were dispersed throughout the survey area, with localised, higher densities. Distribution in the Faroe-Shetland Channel, but not in the remaining part of the study area, strongly reflected fishing activity.

- Peak numbers of lesser black-backed gulls were recorded during June and July when they were scattered over the Faroese shelf and slope, often scavenging at fishing vessels.

- Most Arctic terns were seen between May and August within a radius of 25 km from the Faroes, usually close to the islands where they breed in small numbers; thereafter, birds began to disperse to the south and south-west.

Winter seabird visitors

- Glaucous gulls were frequent winter visitors, particularly during November-January when most were recorded over the slope to the east of the Faroes.

- Most little auks were seen during November-March to the east of the islands. Fewer birds were recorded closer to shore and over the Faroe-Shetland Channel to the east.

Migrant seabirds

- Thirteen great shearwaters were recorded; most were over deep water to the south-east of the Faroe Bank during August.

- Sooty shearwaters were observed between July and September; the highest densities were found within a well-defined area along the southwestern shelf break of the Faroes.

- Pomarine and long-tailed skuas were seen in small numbers as they migrated to and from their more northerly breeding grounds.

Inshore seabird species

- European shags were largely limited to coastal waters, especially during the breeding season. Some birds were seen over deep water at other times of year.

- All eiders were recorded very close to the coast.

- Common and black-headed gulls occurred most frequently close inshore, but there were a number of records over deep water to the south and south-east of the islands.

- Black guillemots were also recorded close to the coast, and may be more abundant than the observations made during this survey would suggest.

Cetaceans

- There were two peaks in fin whale sightings, occurring during May and August. All sightings in May were near the 1,000 m contour around the Faroe Bank Channel, Faroe Shetland Channel and to the north-east of the islands. All but three of the August sightings were over shallower water at the edge of the banks and along the shelf break to the east of the islands.

- Almost as many sei whales as fin whales were recorded; all but one of these were observed during August. Most sei whales were seen along the slopes and in deeper waters of the Faroe Shetland Channel.

- Minke whales were observed less frequently than either fin or sei whales. Most were recorded over the shelf and offshore banks.

- Two humpback whales were seen in the Faroe-Shetland Channel in July 1988.

- Sperm whales were recorded in continental slope waters, often in water deeper than 1,000 m.

- One Sowerby's beaked whale was observed, and a further five beaked whales were seen but could not be identified to species level.

- Killer whales were seen only ten times, all at, or beyond, the shelf break.

- Long-finned pilot whales were the second most abundant cetacean species recorded in the study area, mostly during August in slope waters.

- Atlantic white-sided dolphins were the most abundant cetacean species recorded. Large pods were seen over deep water but there was also a late summer movement into shallow shelf waters.

- There were two sightings of white-beaked dolphins on the Scottish side of the Faroe-Shetland Channel, but none on the Faroese side.

- Common dolphins were observed once and Risso's dolphins twice.

- Four bottlenose dolphin pods were recorded over the Wyville Thomson ridge.

- Most harbour porpoises were seen over the shelf, shelf break and offshore banks; 60% of all harbour porpoise sightings were made during August.

1. Introduction

1.1 Background

This report presents the results of an investigation of seabird and cetacean distribution around the Faroe Islands carried out mainly during 1997-2000 and commissioned by Geotechnical Environmental Metocean (GEM). The results will inform both the regional environmental impact assessment of oil exploration in the Faroe-Shetland Channel east of the Faroes and also oil spill contingency plans. The findings of the study rest mainly on six years of at-sea surveys, including three special charters, funded by GEM and the UK oil industry. The report identifies areas of international importance to seabirds and cetaceans as well as areas with vulnerable seabird concentrations in Faroese waters based on all available quantitative information in the European Seabirds At Sea (ESAS) database. The seabird and cetacean project is a collaborative venture between the Faroes Fisheries Laboratory, the UK Joint Nature Conservation Committee (JNCC) and Ornis Consult A/S.

1.2 Previous work

Seabird and cetacean surveys in the study area have primarily been carried out during two periods. Ornis Consult A/S collected a relatively large amount of data from ships of opportunity during the late summer periods of 1987, 1988 and 1989 (Danielsen *et al.* 1990; Skov *et al.* 1994, 1995a). During the main period of survey activity from 1994 to 1999 the JNCC and later also Ornis Consult A/S and the Faroes Fisheries Laboratory collected data throughout the year, both from ships of opportunity and chartered ships (Bloor *et al.* 1996, Taylor and Reid 2001). In between these two periods, survey effort was directed mostly towards the southeastern part of the survey area in Scottish waters (Stone *et al.* 1995), and a vulnerability analysis was undertaken using data for the waters south and west of Britain, and also Faroese waters (Webb *et al.* 1995). The contents of the combined database of observations collected in Faroese waters between 1979 and 2000 were presented by Taylor and Reid (2001); that analysis is updated in this report by the inclusion of data collected up to the end of September 2000. Although the combined database mainly contains data collected from a number of survey ships of opportunity, each covering a relatively small proportion of the study area, extensive survey coverage was achieved during six surveys. The participation of ornithologists on the three Faroese North Atlantic Sightings Surveys organised by the Faroese Natural History Museum in 1987, 1989 and 1995 made it possible to collect simultaneous seabird and cetacean observations for a large sector around the islands. The most comprehensive coverage of the study region was achieved during three special charters in August 1997, November-December 1998 and February-March 1999.

1.3 Objectives

The current objective was to identify spatial and temporal patterns in the vulnerability of seabirds (and cetaceans) in Faroese waters in order to inform offshore hydrocarbon industry activity in the study area. This was achieved by detailed spatial analyses of species distributions, both individual and composite. The vulnerability assessment addresses the potential effects of surface pollution on seabird concentrations by month and supersedes Webb *et al*. (1995), which identified vulnerability around the Faroe Islands only for the period March-September. It presents information on vulnerable concentrations of seabirds in an easily accessible form and is a development of the method to assess the vulnerability of offshore seabird concentrations to surface pollution devised by Williams *et al.* (1995). The improvements to the method for calculating oil vulnerability are described in full in section 3.4.5. The results of spatial analyses of species (both seabirds and cetaceans) distributions are presented in detail; the individual seabird dispersion patterns underlie the vulnerability patterns depicted in section 6.

2. The marine environment

2.1 Physical

The study area is dominated by the Faroe plateau, the banks to the east of the islands and the Faroe Bank to the south-west (Fig. 1). The extreme southeastern corner of the project area encloses a small part of the outer Scottish shelf. The Faroese shelf is widest in the north, and narrowest in the south, which is where the shelf break is closest to the islands. To the east of Suðuroy, the 200 m contour is only 10 km from shore. The shelf topography is more uniform to the west of the islands, and more variable to the east, where there is a series of shallow banks shoreward of the 100 m contour from Eysturoy southwards (Fig. 2). Further east, the 200 m contour is also convoluted into a series of banks also running north - south.

The Faroe Bank is the largest of a group of three banks stretching to the south-west of the Faroe Islands. Its northeastern edge is approximately 73 km to the south-west of Suðuroy. Most of the bank is more than 100 m below the sea surface but in places the water depth is less than 80 m. Between the Faroe plateau and the Scottish shelf is the Faroe-Shetland Channel, and to the south-west is the Faroe Bank Channel. Within the study area water depth reaches 1,500 m in the central Faroe-Shetland Channel, and 1,100 m in the eastern Faroe Bank Channel. The Faroe Bank Channel becomes shallower and narrower towards the north-west as it passes between the Faroese shelf and the Faroe Bank. The southern side of the Faroe Bank Channel forms the northern edge of the Wyville Thomson Ridge, which then adjoins the Ymir Ridge to the south.

More than half of the Ymir Ridge lies outside the study area. The Faroe Bank Channel, Wyville Thomson and Ymir Ridge area contains the steepest and most varied topography within the study area. The next steepest slope area is to the north of the islands, over the southern edge of the Norwegian Basin, where only 22 km of horizontal distance separates the 200 and 1,000 m contours. The slope over the sides of the Faroe-Shetland Channel is more gentle, especially over the northwestern side, where these same two depth contours are separated by 132 km of horizontal distance. The slope is also gentle over the Iceland-Faroe Rise, which separates the Iceland and Norwegian Basins. The southeastern corner of the rise lies within the study area, and is to the north-west of the islands.

The area is subject to a milder maritime climate than would be expected from its latitude, this is due to warm North Atlantic water, which flows in the upper layers of the water column between Shetland and Iceland from the south (Fig. 3). One branch (Faroes Current) flows from the west of the Rockall plateau and continues north over the Iceland-Faroe rise, before flowing eastwards over the slope to the north of the Faroes. It then continues along the eastern edge of the Norwegian basin in a northeasterly direction (Hansen 1985). Another more southerly branch of Atlantic water flows from the south-west around Bill Bailey's and the Faroe Banks, before flowing as a variable anticyclonic gyre around the edge of the Faroe plateau (Fig. 3). The exact course of this branch is variable, but it is thought to turn to the east on reaching the southeastern corner of the Faroese shelf, and then flow into the Norwegian sea along the eastern side of the Faroe-Shetland Channel (Aken and Eisma 1987). A third branch of Atlantic water flows in a northeasterly direction into the southern Faroe-Shetland Channel. It may then mix to some extent with the Atlantic stream of the anticyclonic gyre, as it turns east across the Faroe-Shetland Channel (Hansen 1985). The Scottish Slope Current is a narrow and fast flowing current of warm Atlantic water which flows north-eastwards adjacent to the Scottish shelf break over the eastern side of the Faroe-Shetland Channel. An offshoot of this oceanic water mixes with coastal water over the outer shelf, before flowing east past Orkney and into the North Sea (Dooley 1974).

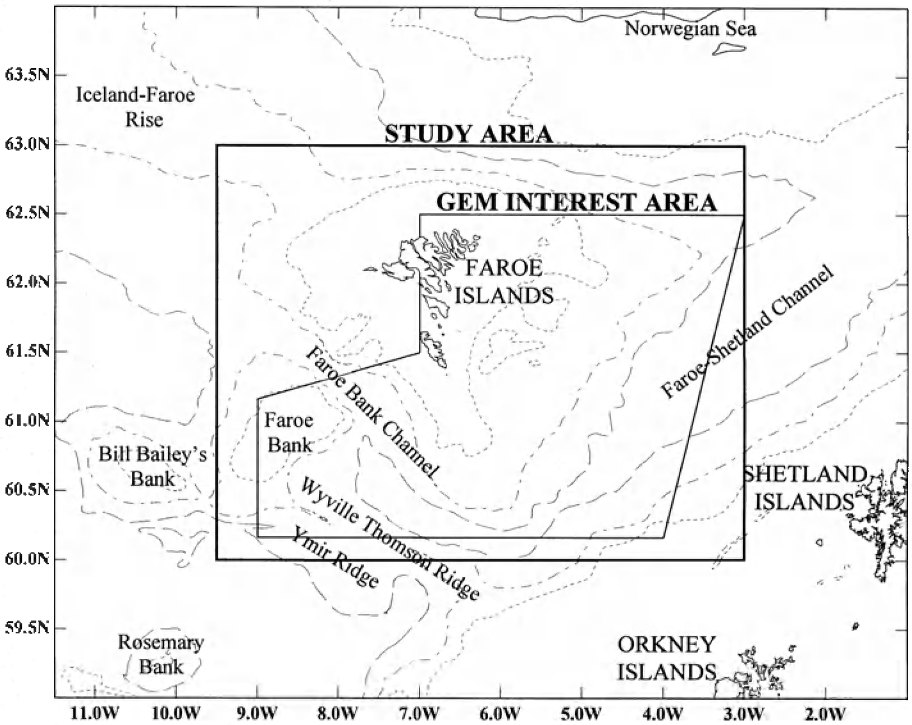


Figure 1. The study area showing licensed blocks for oil exploration, place names and bathymetry
Bathymetry: dot (200 m isobath); dotdash (500 m isobath); long dash (1,000 m isobath); dot (2,000 m isobath); solid (3,000 m isobath)

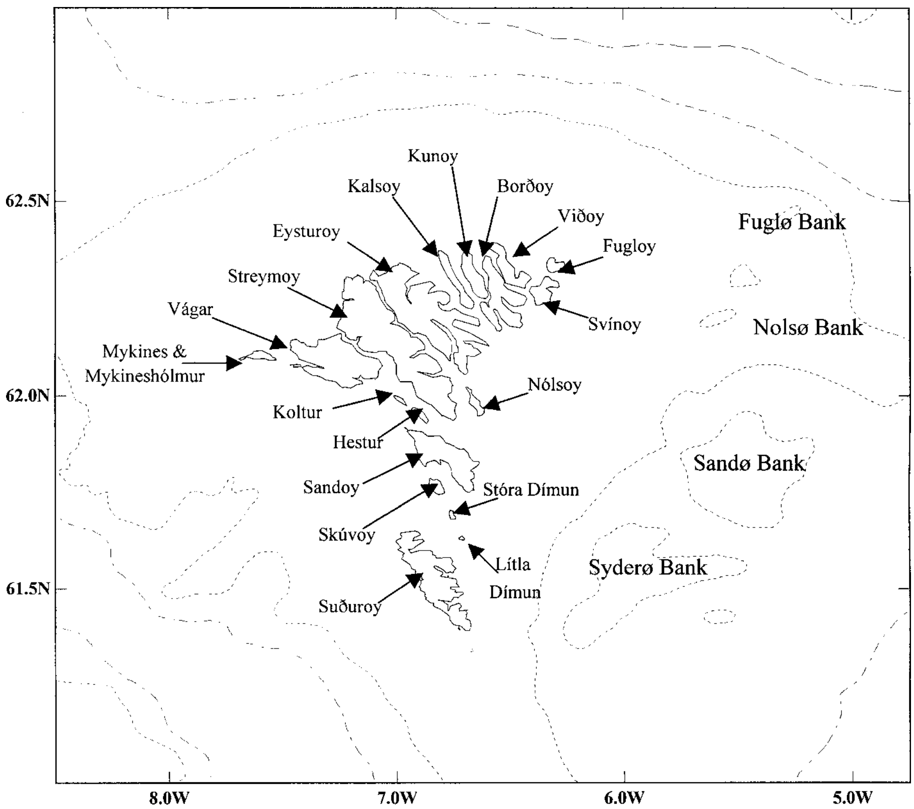


Figure 2. Faroe Island place names and banks
Bathymetry: dot (200 m isobath); dot dash (500 m isobath); long dash (1,000 m isobath); dot (2,000 m isobath)

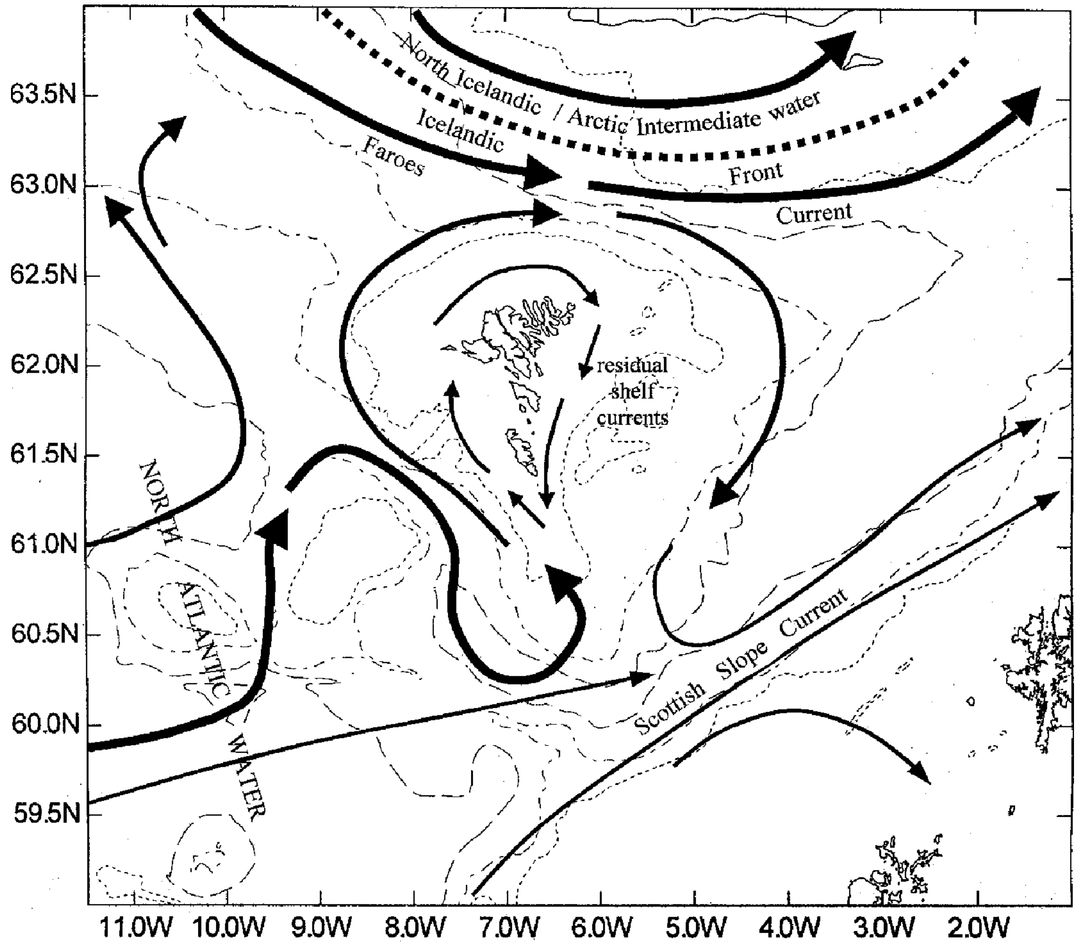


Figure 3 Water types and current flow paths in the upper water column around the Faroe Islands
Bathymetry: dot (200 m isobath); dot dash (500 m isobath); long dash (1,000 m isobath); dot (2,000 m isobath); solid (3,000 m isobath)

Tidal flow is strong over the Faroese shelf and the water column is well mixed during summer (Hansen 1992). Due to a strong residual anticyclonic current circulating the shelf and a persistent tidal front between the 100 m and 130 m contours (Davidsen and Hansen 1981), the Faroe shelf water is relatively well separated from the surrounding stratified oceanic waters (Hansen 1992). The Faroe shelf water receives input from more oceanic water through wind driven upwelling at the shelf break. Eddies also bring water from beyond the shelf break over the shelf (Huthnance 1985). Most surface flow is northerly and is balanced by a predominantly southerly flow at depth. Cold, deep Norwegian Sea water flows southwestwards out of the Norwegian Basin and along the Faroe-Shetland Channel below 500 m. Some of this water is forced up into the overlying Atlantic water during overflow events, when water flows west through the shallower western Faroe Bank Channel (Fiskirannsóknarstovan 1995), or south over the Wyville Thomson Ridge (Ellett and Roberts 1973). At the Polar Front to the north of the islands, cool water of Icelandic and Arctic origin sinks below the surface layer of modified Atlantic water, and spreads over the slope and into the western Faroe-Shetland Channel. This cooler mixed water may periodically extend upwards over the outer northern Faroese shelf and upper slope (Meincke 1978). All these current systems are subject to changes in flow path and volume, which results in marked inter-annual variation in water temperature and salinity in the Faroe-Shetland area (Dooley *et al.* 1984; Hansen 1985). Nevertheless characteristic temperature and salinity values can be assigned to each water mass. The Scottish Slope Current contains the warmest and most saline waters (9°-11°C, 35.25-35.45 Practical Salinity Units (psu)). The main branches of the North Atlantic Current further west are slightly cooler, and less saline, at between 7° and 9°C, 35.15-35.35 psu. The cooler water is generally found to the north of the islands where it has been modified by interaction with East Icelandic and Arctic Intermediate Waters. East Icelandic water is much colder than Atlantic water at 2°- 4 °C, 34.7-34.9 psu, as is Arctic Intermediate Water at between 0° and 2

°C, 34.72-34.98 psu. Waters over the Faroese shelf are between 6° and 10 °C, 35.05-35.25 psu. The Deep Norwegian Sea Water is the coldest at between 0°C and -1°C, 34.9 psu (Aken and Eisma 1987).

2.2 Biological

The distinctive hydrographical characteristics of the study area have a major influence on the marine ecosystems around the Faroes. The most important hydrographical feature is the tidal front, which separates the region into a shelf ecosystem inside the 130 m depth contour around the Faroes and an oceanic ecosystem outside the front. The homogenous shelf water has its own plankton community, which seems to be regulated by the level of nitrate depletion in the water column (Gaard 1996; Gaard *et al.* 1998). In years of nitrate depletion, the dominant phytoplankton species change from diatoms to flagellates, - a change which has been demonstrated to influence the entire shelf ecosystem. The shift from diatoms to flagellates reduces the stock of neritic zooplankton on the shelf (Gaard 1999), which is an important food source for small fish, including the juveniles of larger species as cod *Gadus morhua* and haddock *Melanogrammus aeglifinus*. Unusually low fish production occurred in the early part of the 1990s, coinciding with a decline in primary production and the shift towards more neritic zooplankton dominance in the shelf ecosystem (Gaard *et al.* in press). The abundance of sandeel *Ammodytes* spp., the major fish prey fed to chicks of breeding Faroes seabirds, seems also to be linked to the plankton dynamics of the shelf. During the early 1990's, the sandeel stock decreased to a level that affected the breeding success of common guillemot and Atlantic puffin (Olsen 1991; Olsen 1992; Olsen 1994, Gaard *et al.* in press).

The links between oceanography and biology in the oceanic stratified environment of the waters surrounding the Faroe shelf are much less known. The phytoplankton production outside the tidal front develops independently of the production on the shelf as a response to the establishment of the summer thermocline (Zeitzschel 1986). Zooplankton here is dominated by the copepod *Calanus finmarchicus*, both in the upper layers during summer (Gaard and Hansen 1991; Gaard 1996) and in deeper water during winter (Gaard 1994). The highest quantities of copepods are carried by the deep Norwegian Sea water, which during overflow events sweeps high quantities of copepods into the upper layers of the Faroe-Shetland Channel and the Faroe Bank Channel. Although euphausiids are found over the shelf, most occur over the shelf break and slope, while salp (Chordata) and cilliate (Protoza) distribution in Faroese waters may be centred further offshore in deep oceanic water (Zeitzschel 1986). Squid and fish may aggregate to feed and spawn in areas of elevated zooplankton abundance (Kiørboe and Johansen 1986). Mackerel *Scomber scombrus* and herring *Clupea harengus* feed on the abundant *C. finmarchicus* population after it rises into surface layers in the spring (Bainbridge and Forsyth 1972; Colebrook 1986). The environment of the turbulent Faroe Bank area is different from that of the surrounding ocean, as it shares characteristics similar to the Faroe shelf ecosystem (Gaard and Mortensen 1996).

There have been few smaller-scale studies in the region so little is known about the effects of the multitude of hydrographic fronts in the study area on the distribution of plankton and higher levels of the food web. These fronts are potentially important feeding locations at several trophic levels, either due to passive advection of prey items into the frontal region, or to high *in situ* primary and secondary production (Cushing 1971; Kiørboe and Johansen 1986). Zooplankton, squid, fish, seabirds and cetaceans have all been found in increased numbers at frontal systems (Schneider 1982; Kiørboe and Johansen 1986; Begg and Reid 1987; Raid 1989; Schneider 1990; Skov and Durinck 1995; Follestad 1991).

2.3 Seabird and cetacean trophic interactions

In the study area, seabirds and cetaceans feed on prey over a range of sizes at different trophic levels, from Calanoid copepod crustaceans to marine mammals. On occasion, some killer whales will prey upon other marine mammals such as long-finned pilot whales (Bloch and Lockyer 1988), whereas the large sei whale and the tiny little auk often feed on copepods (Jonsgård and Darling 1977; Bradstreet and Brown 1985; Sigurjónsson, 1995). These zooplankton eaters require high prey concentrations in order to forage efficiently; these often occur at frontal systems and upwelling zones (Brodie *et al.* 1978; Brown 1988a, b).

Seabird and cetacean diets are determined by their foraging method and preferred foraging location within the water column as these both govern the prey species available to them (Vermeer *et al.* 1987; Burger *et al.* 1991;

Jensen *et al.* 1994). The pursuit-diving common guillemot can dive down to 180 m (Piatt and Nettleship 1985), although usual foraging depths are less than this; this allows it to capture gadoid species that are less readily available to shallower diving species such as the Atlantic puffin (Blake 1983, 1984; Harris 1984). In contrast, northern gannets, which plunge-dive from a height, and Manx shearwaters, which shallow plunge dive, depend on finding fish close to the sea surface, such as mackerel, herring or sprat *Sprattus sprattus* (Wanless 1984; Brooke 1990). Northern fulmars, European and Leach's storm-petrels usually feed at the sea surface on fish, cephalopods and crustaceans (Watanuki 1985; Prince and Morgan 1987), although on occasion northern fulmars will dive to at least 10 m depth (Bourne 1997).

As would be expected, seabird and cetacean diet varies with location, and with season (Furness and Todd 1984). Falk *et al.* (1992) discovered that in the Norwegian sea, Atlantic puffins fed almost exclusively on lantern fish *Benthosema glaciale* and Gonatid squid, whereas over the Faroese shelf they ate euphausiids, sandeels and capelin *Mallotus villosus*. In Scottish waters, the proportion of clupeoids and gadoids in the diet of common guillemots increased from the summer to the winter (Blake *et al.* 1985; Halley *et al.* 1995). More generally, there is a lack of information on diet away from the coast and in winter (Jensen *et al.* 1994). Seabird diet during the breeding season is better known; sandeels and clupeoids such as sprat and herring are important prey for many species of seabird in the north-east Atlantic, including auks (Blake *et al.* 1985; Wright and Bailey 1991), terns (Monaghan and Uttley 1991), black-legged kittiwakes (Hamer *et al.* 1993), Arctic skuas (Furness 1990) and European shags (Harris and Riddiford 1989; Harris and Wanless 1991). Sandeels comprise the major prey for the young of most Faroese seabirds (Gaard *et al.* in press).

Although a number of north-east Atlantic seabirds eat cephalopods, especially the procellariiforms (mostly *Ommastrephid* squid), (Watanuki 1985; Falk *et al.* 1992; Bourne 1997), cephalopods appear to be of greater importance in the diet of odontocete cetaceans (Clarke 1980; Furness 1994). Cephalopods comprise a high proportion of the diet of sperm whales (Rice 1989) and northern bottlenose whales (Clarke and Kristensen 1980), and also probably that of Sowerby's beaked whales (Ostrom *et al.* 1993). Squid comprise an important prey for long-finned pilot whales (Desportes and Mouritsen 1993) and Atlantic white-sided (Couperus 1997) and bottlenose dolphins (Barros and Odell 1990). Pelagic clupeoids and gadoids comprise a variable, and often high proportion, of the odontocete diet, including herring, mackerel, blue whiting *Micromesistius poutassou,* and Norway pout *Trisopterus esmarkii* (Desportes and Mouritsen 1993; Hoydal and Lastein 1993; Rogan *et al.* 1997; Couperus 1997). For example, the predominantly coastal harbour porpoise eats a wide range of fish species including sandeels , whiting *Merlangius merlangus*, haddock, poor cod *Trisopterus minutus*, Norway pout, pollack *Pollachius pollachius* and herring (Evans 1990; Martin 1995).

Euphausiids are the primary prey of fin whales in the Faroes area, with herring a second choice (Jonsgård 1966; Mitchell 1974). Sei whale diet in Faroese waters is less certain, but in most areas they specialise on copepods with euphausiids as a second choice, although in Icelandic waters they eat more euphausiids than copepods (Sigurjónsson 1995; Horwood 1987). In contrast to sei whales, fin whales will eat a range of fish species in addition to crustaceans, including blue whiting, capelin, herring, mackerel and sandeels (Jonsgård 1966; Mitchell 1974; Sigurjónsson 1995). Minke whales eat a wide range of prey species including euphausiids, gadoids, sandeels, herring and capelin, although herring and capelin predominate (Jonsgård 1982; Sigurjónsson 1995; Skaug *et al.* 1995; Haug *et al.* 1996).

2.4 Fisheries, and interaction with seabirds

Fisheries have the potential to both adversely, and positively, affect seabirds and cetaceans. Three main species of pelagic fish are caught in Faroese waters, namely blue whiting, herring, and mackerel. Blue whiting are fished with pelagic trawls, towed at 300-400 m depth just beyond the shelf break, mainly during late April and May. This is when they migrate into the Norwegian Basin from their spawning areas over the Wyville Thomson Ridge and further south (Hansen and Jákupsstovu 1992). The largest catches are taken by Russian factory trawlers over the upper slope to the south of the Faroes (Jákupsstovu 1999). Three herring groups can be identified in Faroese waters: those which spawn in small numbers very close to shore, the Norwegian spring spawners and the Shetland autumn spawners. The latter two are targeted by the larger purse seine vessels. The Norwegian spring spawners spawn along the Norwegian west coast, before migrating to the southern and central Norwegian Sea. In some years the autumn Shetland spawners reach the banks to the east, and south of the Faroes, during feeding migrations (Jákupsstovu 1999). Mackerel spawn to the south of Ireland and are fished in

Faroese waters using purse seines and pelagic trawls between June and September as they migrate into, and through, the survey area. The highest Russian catches have been over the deep waters of the Faroe-Shetland Channel in June (Jákupsstovu 1999). The mackerel make a return southward migration in the winter, and are caught at this time in Scottish waters, but not further west in Faroese waters (Saville 1985).

A range of demersal fish are trawled, but the most significant fishery is for gadoids. Cod, saithe *Polachius virens* and haddock comprised the greatest landing weights in 1996. Other demersal fish landed, in order of abundance during 1996, were: greater silver smelt *Argentina silus*, redfish *Sebastes* spp., Greenland halibut *Reinhardtius hippoglossoides*, ling *Molva molva*, tusk *Brosme brosme*, monkfish *Lophius piscatorius* and blue ling *Molva dipterygia* (Jákupsstovu 1999). Sandeels are locally abundant, but have never been fished commercially, as patches of suitable habitat are too small for long tows (H. Jákupsstovu, pers. comm.). Demersal fish are targeted with a range of fishing gear types and vessel sizes, ranging from small set-netters to large trawlers, and long-liners longer than 40 m. Most of the large demersal trawler fishing effort is concentrated between 300 and 600 m along the slope to the east, and north-east of the Faroe plateau, and also over the southeastern side of the Iceland-Faroe Rise (Jákupsstovu 1999). These areas over the upper slope may hold the greatest potential for seabirds exploiting discarded bycatch. Demersal trawls generate the largest amount of discards; Hudson (1986) found that demersal trawlers from Shetland discard, on average, 27% by volume of their catch. The large quantities of discards available can be important for seabirds, although their importance in comparison to the availability of natural foods and hydrographic characteristics is uncertain (Camphuysen and Garthe 1997, Skov and Durinck in press). There is little empirical information on fishery-seabird interactions in Faroese waters, but large numbers of seabirds are commonly seen feeding around fishing vessels.

Not all fishery-seabird interactions benefit seabirds. Some fishing gears can results in high levels of seabird mortality, and fisheries may cause reductions in the abundance of seabird prey. The greatest direct mortality is thought to be due to entanglement in gill nets and other fixed nets. Auks are especially prone because they forage below the sea surface (Oldén *et al.* 1988; Bibby 1972). Interaction at the ecosystem level is most significant when birds are feed in the same area in which the fishery operates and consume fish of the same size as that targeted by the fishery (Wright *et al.* 1998), a prime example being the industrial fishery for sandeels in the North Sea. Sandeel landings from the Wee Bankie, off the east coast of Scotland, have been correlated with years of low breeding success in the surface-feeding black-legged kittiwake (Harris and Wanless 1997). However, natural fluctuation in sandeel recruitment may prove more significant in other areas.

3. Methods

3.1 The study area

The study area is centred on the Faroe Islands, but extends as far south as the Wyville Thomson Ridge (Figure 1). It includes licence blocks 1-7 registered in the 1st Faroese oil licensing round and licence blocks 204, 205 and 213 registered in the 16th and 17th UK offshore oil licensing rounds. The area considered in this report is depicted in Figure 1, and is delimited by 63°00'N 9°30'W, 63°00'N 3°00'W, 60°00'N 9°30'W and 60°00'N 3°00'W.

3.2 Survey methodology

Surveys were conducted from ships largely using the methods described by Tasker *et al.* (1984) and Webb and Durinck (1992). Many vessels of opportunity were used for surveys, including research vessels, fishery protection vessels, seismic vessels and ferries, in addition to three dedicated charters. Data were collected when the vessel was steaming at speeds greater than 5 knots and its position, speed and course were recorded using a Global Positioning System (GPS). Environmental data such as wind direction and force, sea state, swell height and visibility were recorded every 90 minutes or more frequently if environmental conditions had changed.

All seabirds on the water within 90° of the ship's trackline out to a perpendicular distance of 300 m were recorded. Birds on the water were assigned to one of four transect bands (A = <50 m, B = 51-100 m, C = 101-200 m, D = 201-300 m) according to their perpendicular distance from the ship's track. A 'snapshot' technique was used to sample flying birds, so as to minimise the biases arising from the movement of flying birds relative to the movement of the ship. The frequency of 'snapshots' is determined by the speed of the vessel and the distance in front of the vessel at which flying birds could be detected. During JNCC surveys observers used the naked eye to detect birds, and binoculars to confirm species identification if necessary. During Ornis Consult A/S surveys, however, binoculars were used to scan the 300 m band transect in order to detect seabirds. Other pertinent details such as associations between species and feeding behaviours were also noted. Birds associating with fishing vessels were counted and noted as such.

Cetacean observations were recorded concurrently with seabird surveys. Two different recording methods were applied. During JNCC surveys, observers used the same distance bands as for birds but cetaceans were recorded also at greater distances from the survey vessel out-with the 300 m transect band. During Ornis Consult A/S surveys, cetaceans were searched for within 2 km on both sides of the survey ship, and radial distance and angle to the animals was taken on first sighting. Information noted during both recording procedures included species, number and age of animals (where possible) and behaviour.

3.3 Data processing

3.3.1 Data preparation

Data collected during seabird surveys were recorded on paper forms while at sea. Data were later transcribed onto a computer database and coded data were checked manually by an independent observer. Data were grouped in preparation for map production yielding total numbers of seabirds and cetaceans per 10 minute period. These totals were used to calculate densities and to prepare sightings and abundance maps. During production of seabird density maps, only those birds on the water within the 300 m band transect, or flying 'in snapshot' were included. Data collected in sea states higher than Beaufort force 5 (≅ 10% of the total database) were removed prior to analysis; data collected in sea state 5 were further removed before calculating densities of storm-petrels and auks.

3.3.2 Correction factors

In order to correct for variation in detectability of seabirds at different distances from the ship`s track line, correction factors were applied to birds recorded on the water (Table 1). These were calculated by applying functions of the Distance version 3.0 software package (Laake *et al*. 1993). The half-normal model (Buckland *et al*. 1993b),

$$g(x)=\exp(-x^2/2\sigma^2),$$

was fitted to the distribution of perpendicular distance bands to obtain a probability of observation within 300 m (p) and a correction factor (1/p) for each seabird species. Correction factors were only applied for birds on the water for which density was to be calculated. As the detection of different species varies in response to sea state, the vessel`s speed and search method (use/no use of binoculars), correction factors had to be stratified by the most important factors. The most important factors influencing the detectability of each species was determined by Generalised Linear Modelling. The models incorporated geographical and seasonal variation in detectability. Correction factors were applied to the data collected in each survey period and each location by multiplying the number of birds recorded for a species by its correction factor, thereby resulting in a corrected value for use in computing that species density (the corrected number of seabirds recorded per km^2 survey coverage).

Table 1. Correction factors used during data preparation.

Species group	**Correction factor**	**Coefficient of variation (%)**
Northern fulmar, naked eye search	**1.2**	**3.7**
Northern fulmar, binocular search	**1.2**	**2.8**
Shearwaters	**1.0**	**-**
Leach's storm-petrel	**1.8**	**15.2**
European storm-petrel, naked eye search	**2.0**	**11.8**
European storm-petrel, binocular search	**1.8**	**6.5**
Northern gannet	**1.2**	**7.9**
European shag	**1.0**	**-**
Skuas	**1.0**	**-**
Larus gulls	**1.0**	**-**
Black-legged kittiwake	**2.4**	**3.2**
Terns	**1.0**	**-**
Common guillemot, naked eye search	**1.8**	**3.9**
Common guillemot, binocular search	**1.8**	**4.4**
Razorbill, naked eye search	**1.7**	**8.9**
Razorbill, binocular search	**2.4**	**25.9**
Black guillemot	**1.9**	**11.2**
Atlantic puffin, sea state < 3 – naked eye search	**1.4**	**2.8**
Atlantic puffin, sea state < 3 – binocular search	**1.8**	**2.5**
Atlantic puffin, sea state ≥ 3 – naked eye search	**1.7**	**5.9**
Atlantic puffin, sea state ≥ 3 – binocular search	**1.9**	**4.8**
Little auk	**2.6**	**6.0**

Cetacean data were not used to produce density or abundance maps, since measurements of angle and distance were not taken during all surveys. Instead, cetacean sightings data are presented either as number of animals seen per km of survey track, or as the location of each sighting (see section 6).

3.4 Data analysis

3.4.1 Dispersion analysis

Seabird and cetacean species accounts are presented in taxonomic order, except for a summary list of rare seabirds, which comes after the main seabird accounts. Monthly effort maps were generated using Dmap for Windows version 6.5b (Morton 1998). Seasonal distribution maps for each species were generated using Surfer for Windows version 7.0 (Golden Software 1999). Densities of the more commonly recorded species of seabirds (numbers per square km) were displayed by contour maps, depicting the common fine-scale spatial autocorrelation present in the data. These maps were preferred in comparison to the standard ¼ International Council for the Exploration for the Sea (ICES) rectangles presented by Taylor and Reid (2001), as they provide a more detailed outline of the more important areas where seabirds occur. In addition, the use of contour maps can improve the oceanographical interpretation of the spatial distribution of seabirds by enabling the identification of sharper discontinuities in their distribution at banks, shelf breaks and fronts. Seabird distribution data are spatially autocorrelated, enabling density in one location to be (partially) estimated from the densities of surrounding locations. An analysis of the spatial autocorrelation in the survey data for each species of seabird (commonly) recorded around the Faroes was carried out, thereby defining the degree of dependence between adjacent samples for each species; this information was used to map species-specific dispersion patterns.

Spatial autocorrelation in the seabird data was estimated by variogram functions, which were then used in the mapping procedure known as kriging. For each species, seasonal ‘experimental’ variograms, computed from the observed data, were used to describe the spatial structure of the data. Variogram functions were fitted to the experimental variograms, and these models were subsequently used as input for the kriging method of interpolation (Matheron 1962; David 1977). The mathematical models that provided the best fit to the seabird data were the spherical and Gaussian models, which assume an increase of variability with distance for small spatial scales and a constant or nearly-constant variability for larger spatial scales.

The kriging interpolation method was used to compute local estimations of the seasonal occurrence of seabird species with the minimum error variance. Accurate estimates of abundance are produced at relatively small spatial scales with few assumptions on the sampling procedure and the statistical distribution of the data; the spatial structure information, as expressed by the variogram model, is incorporated in these estimates. For each species-season interpolation the maximum extrapolation range was set at twice the grid resolution given by the variogram model. The resulting interpolated grid of seabird densities consisted of continuous fields of density grid points for the well-surveyed parts of the study area, and blanked grid points for those parts of the area where the distance between samples exceeded the maximum extrapolation range. The interpolation procedure can be made without major alteration of the variogram model if an equal area projection in which surfaces on the map are proportional to actual surfaces on Earth is used. Therefore, Universal Transverse Mercator (UTM) projection zone 29 was deployed in the kriging and mapping. The density contours were further used to estimate the average density of selected species in specific areas as well to estimate the total abundance within the study area for each season by multiplying the average corrected density within each contour by the surface area covered by the contour. Calculation of average densities and measurements of the contoured areas were made in MapInfo version 5.5.

3.4.3 Distribution maps

The mean seasonal spatial distribution pattern of each seabird species was plotted on maps in UTM 29 projection by assigning contours and colour codes to the density grid points. In addition to modelled densities of the more common seabirds depicted in contour maps, maps showing distribution patterns of less common species of seabirds and cetaceans were prepared in geographical projection. Most of these maps resolve actual densities of less common species of seabird and common species of cetacean into ¼ ICES rectangles (15' latitude x 30' longitude), while maps depicting the location of all sightings are used for the rarely recorded species of seabird and less common cetaceans.

3.4.3 Limitations and variation within survey data

The data used in this report were collected by a number of observers from a variety of survey platforms. Consequently, several possible biases exist in the data. For example, large vessels offer a higher observer eye height that may result in improved visibility; smaller vessels afford a more detailed look at seabirds on the water, but are more affected more by adverse weather conditions, making it difficult to carry out observations during the winter. In addition, fewer vessels of opportunity were available for surveying during the winter, so significantly less survey coverage was achieved during the winter than during the summer (see Fig. 4). The use of fishery protection vessels and fishery research vessels can result in high densities of seabirds associating with the observation platform. Variation in eye height, vessel speed and stability of the platform may introduce particular biases during poor weather. Variation in weather conditions between surveys also affects the detectability of seabirds and cetaceans and high sea states, swell height, and wind speeds affect survey coverage for much of the year, but again particularly during the winter. Almost 60% of all cetacean records in the ESAS database were obtained between June and August, when sea conditions were calmer and day length longer. This seasonal increase in number of sightings is partly due to an increase in cetacean numbers and survey effort, but the more favourable observing conditions are also likely to be responsible. With the exception of the three dedicated surveys, survey tracks were not determined by the investigators – another possible source of bias.

High sea states result in biases towards detection of larger, more conspicuous species. For example, large pale birds flying high above the water are more easily spotted in rough weather than small, predominantly dark species such as the storm-petrels or auks. However, correction factors have been used in an attempt to offset bias in observations made over a range of sea states (see above). Similarly, the size and behaviour of cetaceans affects the likelihood of their detection. The sighting rates of species that surface inconspicuously, such as the beaked whales, and of small species such as the harbour porpoise decline significantly with increasing sea states (Clarke 1982; Palka 1996). The behaviour of cetaceans also influences their sighting rate, since some species such as common dolphins approach vessels to ride the bow wave, increasing their chances of detection.

As mentioned (section 3.2), Ornis Consult A/S and the JNCC applied the same surveying methodology with the exception of the continuous use of binoculars by Ornis Consult A/S. Some biases in recording may be associated with the use or otherwise of binoculars. Continuous use of binoculars allows detection of birds further ahead of the ship (but still within the transect). Naked eye only searching might lead to a bias against detecting such species if they are wary of the approaching survey vessel, such as divers, and possibly also towards detecting species that may dive before the approach of the survey vessel, such as auks. The converse is true, of course, for scans using binoculars. In addition, the continuous use of binocular scans within the transect might lead to under-recording of cetaceans, since many are detected at some distance from survey vessels using cues such as distant splashes or blows.

3.4.4 Seabird vulnerability to surface pollution

Seabirds using coastal and offshore waters around the Faroe Islands might face a number of threats to their populations, for example, oil pollution or changes in fish prey stocks. The focus herein, however, is surface pollution. The term 'surface pollutants' includes a wide range of substances including mineral oils, vegetable oils and a variety of other chemicals. Although vegetable oils and chemicals that float on water have resulted in some seabird deaths, it is mineral oils that pose the greatest threat to seabirds in Faroese waters. Although adverse effects on seabird populations resulting from an oil spill are difficult to demonstrate, there remains a risk that a large spill in the future could have significant effects. Oil spills that kill very large numbers of birds are rare, however; most oil-related seabird deaths result from small but frequent discharges of oil pollution. Such chronic pollution does kill large numbers of birds annually. The potential threat of oil pollution is one of the main reasons for undertaking offshore seabird surveys. They offer a means of assessing the importance to birds of different areas around the Faroe Islands and of ensuring that conservation advice on oil-related activities is soundly based.

The first assessments of the vulnerability of seabird concentrations to oil pollution used semi-quantitative methods (Tasker and Pienkowski 1987; Tasker *et al*. 1990). Seabird species were ranked as having a very high, high or moderate vulnerability to oil pollution depending on the relative amounts of time each spent on the sea surface, the importance of the population of each within the study area and the size of the world population of each species. In conjunction with survey-derived data on bird numbers, the rankings were use to compile maps indicating the monthly vulnerability of all seabirds in different sea areas. Subsequent analyses (Carter *et al.* 1993, Webb *et al*. 1995; Webb 1998) used a similar approach, but quantified the vulnerability of each species using the method described by Williams *et al*. (1995).

3.4.5 Vulnerability analysis

The assessment of offshore vulnerability used here also followed Williams *et al*. (1995). Four aspects of seabird biology are taken into consideration: the amount of time each species spends on the sea surface, the total biogeographical population of each species, reliance on the marine environment of each species, and the potential rates of population recovery from a surface pollution incident. The index scores for each species are shown in Table 2.

Table 2. Vulnerability to surface pollution of seabirds in Faroese waters. Offshore vulnerability indices (OVIs) were computed using the method described in Williams *et al*. (1995); larger values indicate greater vulnerability.

Species	OVI	Species	OVI	Species	OVI
Northern fulmar	**18**	Pomarine skua	**19**	Great black-backed gull	**21**
Sooty shearwater	**19**	Arctic skua	**24**	Black-legged kittiwake	**17**
Manx shearwater	**23**	Great skua	**25**	Arctic tern	**16**
European storm-petrel	**18**	Black-headed gull	**11**	Common guillemot	**22**
Leach's storm-petrel	**18**	Mew gull	**13**	Razorbill	**24**
Northern gannet	**22**	Lesser black-backed gull	**20**	Black guillemot	**29**
European shag	**24**	Herring gull	**15**	Little auk	**22**
Common eider	**16**	Glaucous gull	**17**	Atlantic puffin	**21**

While the vulnerability of seabird concentrations to oil pollution in Faroese waters was assessed using methods described by Williams *et al.* (1995), a novel method of mapping vulnerability was used. In common with the analysis of seabird dispersion (see section 3.4.1), variography and kriging were used to compile repeatedly generated, smoothed plots depicting vulnerabilty in different sea areas.

For the most part, the data on which the seabird and cetacean distribution and density maps were based were used in the vulnerability analysis. All data collected at sea state 6 were removed from the analysis, but in contrast to the seabird maps, it was not possible in the analysis to remove data collected in sea state 5 for alcids because data for all species must be included in order to calculate vulnerability. Occasionally, some species were not recorded during offshore surveys; data from these surveys were not analysed. In total, about 6% of all data were excluded from the analysis.

The procedure for generating vulnerability maps required the analysis to be carried out at a north-west European scale, a region considerably larger than our study area. All data within the limits set by 15°W, 63°N, 14°W and 47°N were used. As described in section 3.4.1, kriging works best when geographic references represent an equal area projection, such as Universal Transverse Mercator (UTM). Converting latitude and longitude to the UTM projection is only valid at small regional scales; errors are introduced when a single region conversion is applied to locations outside that region. As the analysis had to be carried out at a north-west European scale, a set of X and Y co-ordinates was calculated by measuring the distance along each axis of each seabird recording unit from an origin of 47 °N and 1 °W; all sightings were then resolved into 10-km square blocks.

As in section 3.3.2, correction factors were applied to seabird data in order to compensate for variable detection rates of species under different observation conditions and accordingly, a corrected density was computed for every species in each month in every 10 km square. A vulnerability score for each square in every month was calculated using the following formula (see Williams *et al.* 1994):

$$\text{Area vulnerability score} = \sum species\ \ln(d + 1) \times \text{ovi}$$

where d = density of each species after application of the correction factor and ovi = the offshore vulnerability index score for each species (see Table 2).

In order to describe the spatial structure of the 10-km square vulnerability data for each month in the whole area, experimental variograms were constructed. A quadratic model offered the best fit to the data.

Kriged interpolated grid files were generated in Surfer 7 (Golden Software 1999) using the variogram function fitted from the experimental variogram. When interpolating, an extrapolation range was set at the smallest limit that prevented contour maps from having a grid-like appearance. In applying this extrapolation distance any anisotropy in the variogram model was identified; generally, an extrapolation distance of up to 100 km along any one axis yielded the best maps. When interpolating to grid files, fault lines were also applied (Golden Software 1999); these prevent interpolation of data across major barriers, such as large landmasses.

Monthly contour maps were generated from the interpolated grid files using a high degree of smoothing in order to improve the appearance of the maps. Levels were set at which the contours delimited areas of low, medium, high and very high vulnerability. In making this assessment, the highest degree of consistency between monthly maps generated by this method and that used by Webb (1998) was applied (indicated by areas where coverage was identical in the two studies).

4. Survey coverage

This report summarises all ESAS data collected in the study area between 1979 and December 2000.

The total amounts of monthly survey effort achieved in the study area are shown in Fig. 4a-c and Table 3. Survey coverage was greatest during summer and least during the winter, when reduced day length, strong winds and increased swell heights restricted both ship speeds and the number of days suitable for surveying.

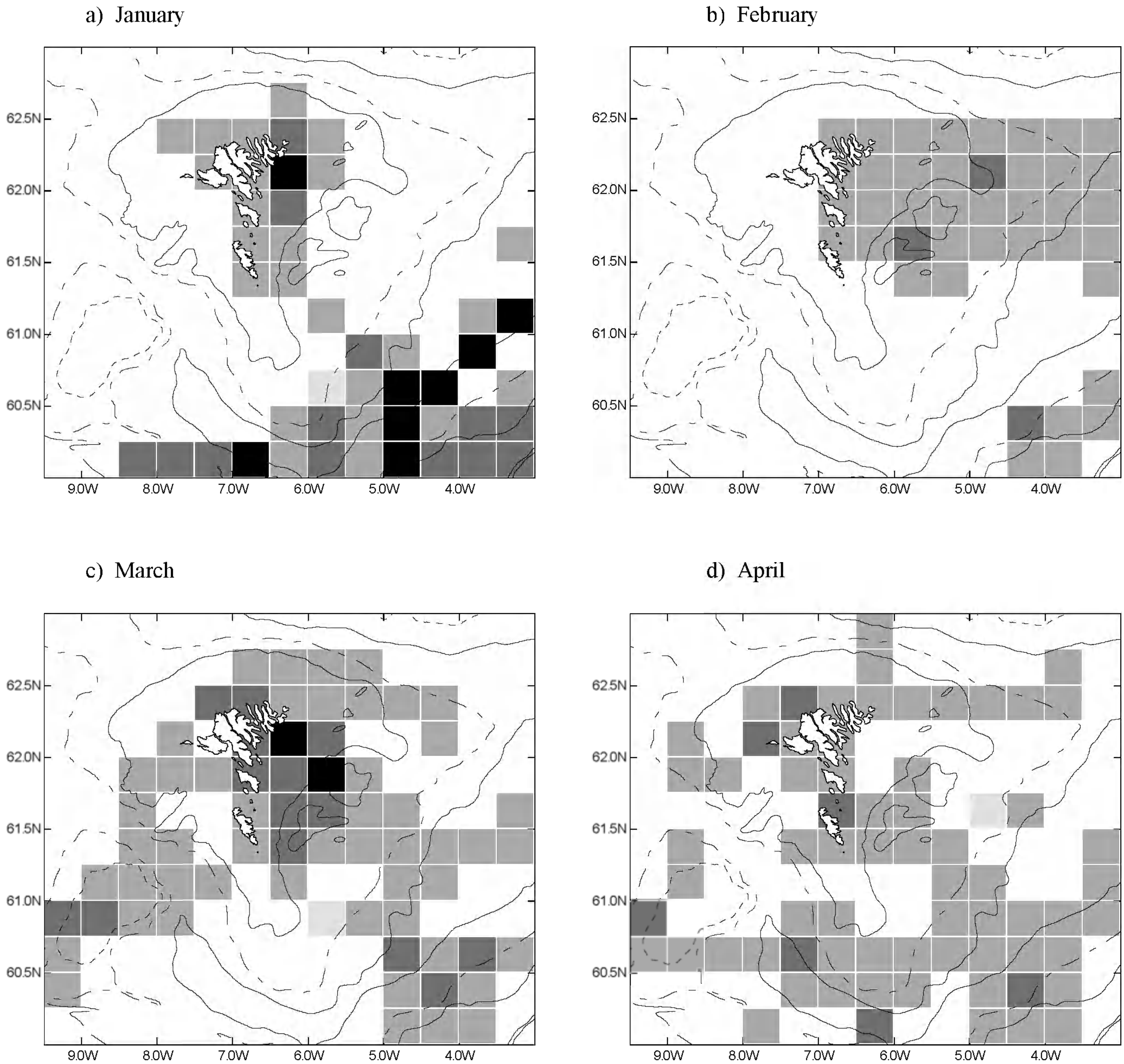


Figure 4a. Monthly survey effort (km^2) achieved in the survey area, January-April 1979-1999

Blank = No coverage   0.01-0.99   1.00-9.99   10.00-19.99   20.00+

Bathymetry: dot (200 m isobath); dotdash (500 m isobath); long dash (1,000 m isobath)

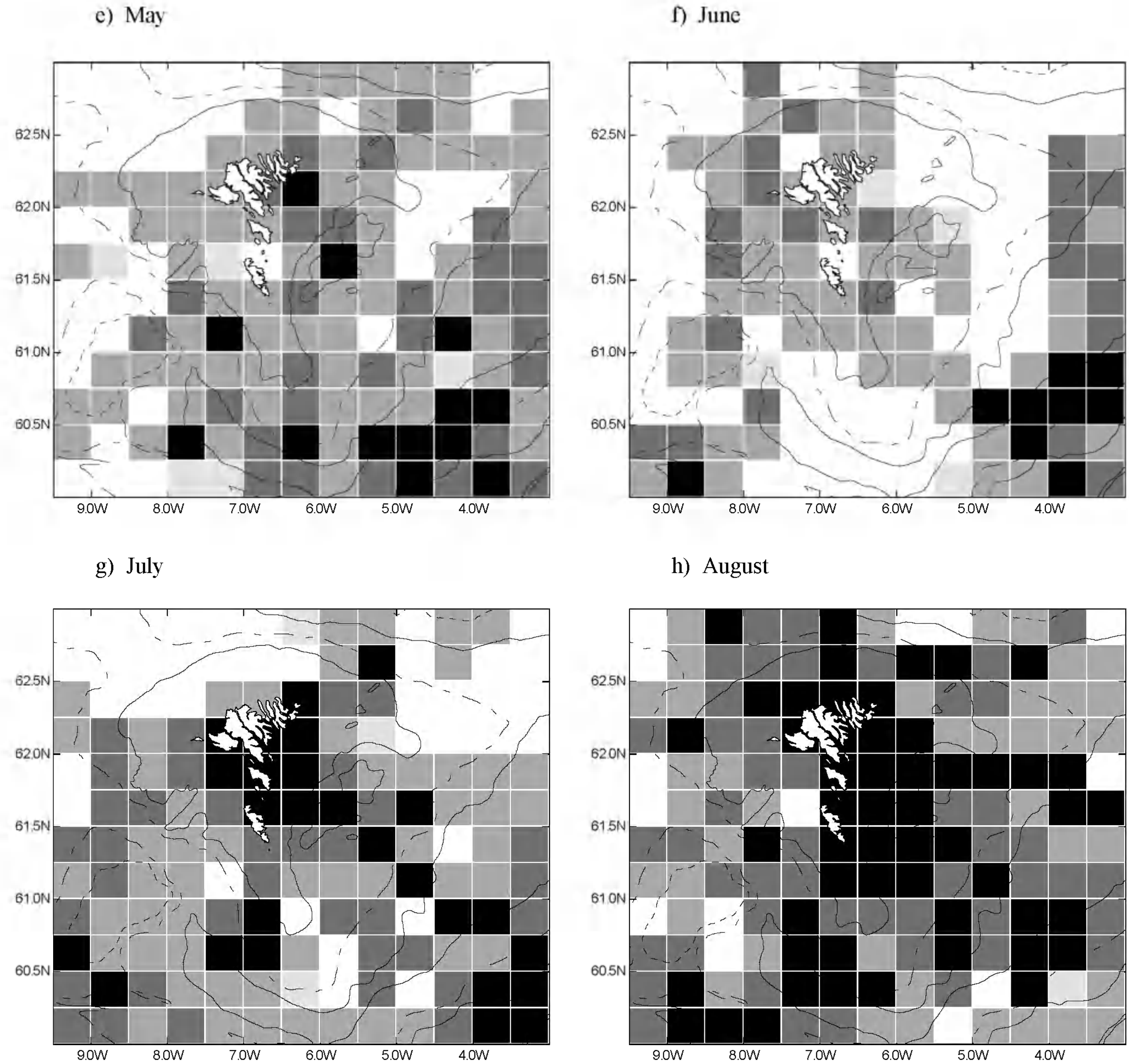


Figure 4b. Monthly survey effort (km^2) achieved in the survey area, May-August 1979-1999

Blank = No coverage | 0.01-0.99 | 1.00-9.99 | 10.00-19.99 | 20.00+

Bathymetry: dot (200 m isobath); dotdash (500 m isobath); long dash (1,000 m isobath)

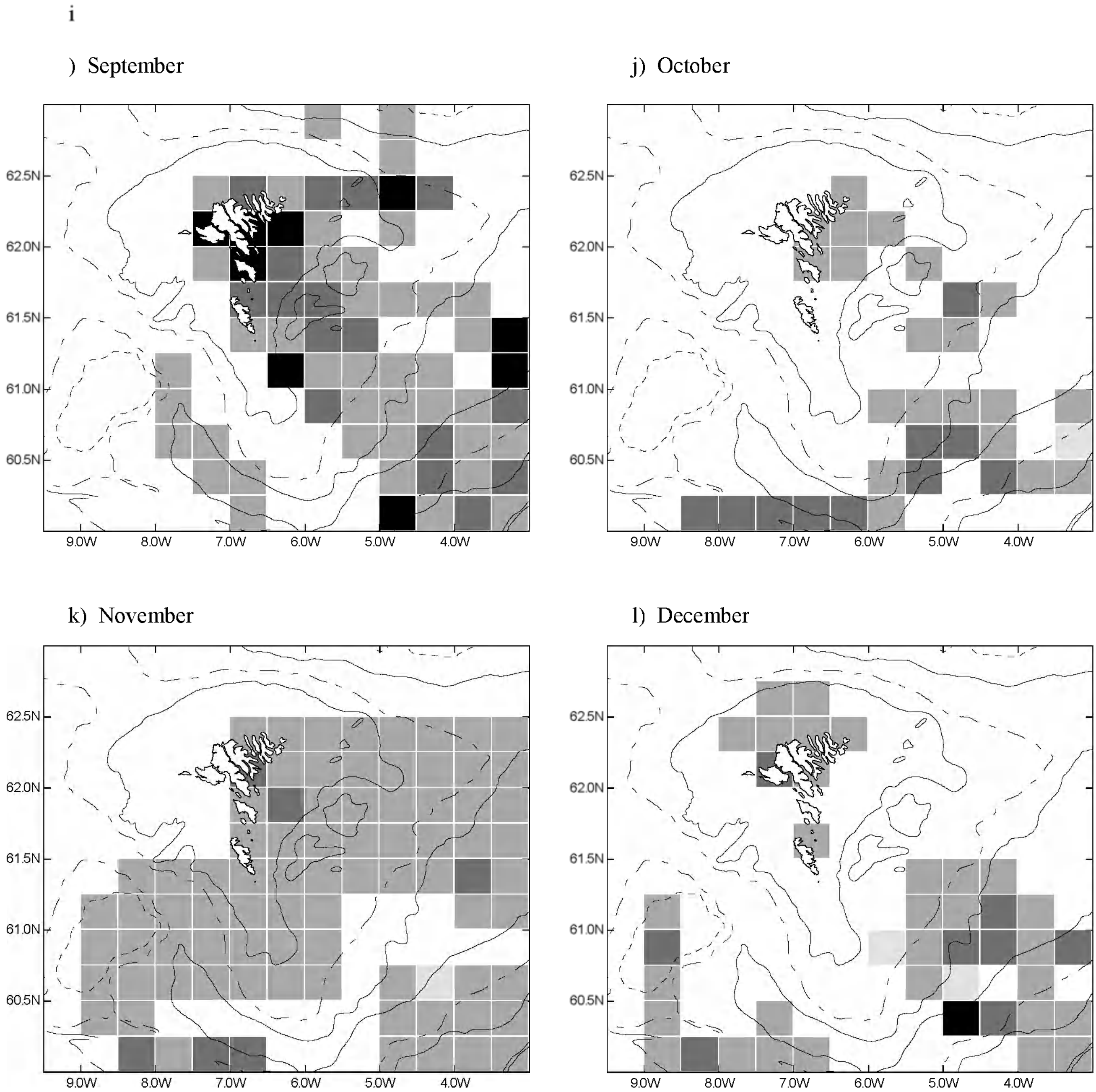


Figure 4c. Monthly survey effort (km^2) achieved in the survey area, September-December 1979-1999

Blank = No coverage 0.01-0.99 1.00-9.99 10.00-19.99 20.00+

Bathymetry: dot (200 m isobath); dotdash (500 m isobath); long dash (1,000 m isobath)

Table 3. Monthly survey effort: 1979 – 1999

Month	Survey effort (km^2)	% Survey effort
January	**461**	**4.6**
February	**276**	**2.8**
March	**510**	**5.1**
April	**411**	**4.1**
May	**1,164**	**11.6**
June	**846**	**8.5**
July	**1,601**	**16.0**
August	**2,918**	**29.2**
September	**689**	**6.8**
October	**237**	**2.4**
November	**591**	**5.9**
December	**298**	**2.9**
Total effort	**10,002**	**100**

5. Seabird distribution

5.1 The birds of Faroese waters

With respect to habitat, three broad groups of birds utilise Faroese waters: offshore, inshore and coastal. The offshore group includes the northern fulmar, storm-petrels, shearwaters, the northern gannet, skuas, gulls and auks. These birds breed on the Faroes, but frequently feed far offshore. In winter, they associate less with their nesting sites and range considerable distances in search of food. Inshore birds include divers, the European shag, seaducks, terns, some gulls and the black guillemot. These birds usually occur within sight of land, but may on occasion use sites further offshore. Although large numbers of some of these birds breed in the Faroes, others occur only in the area during the winter or on migration. The coastal bird population comprises wading birds and waterfowl, although these have small populations in the Faroes due to the scarcity of suitable inter-tidal habitats.

The Faroe Islands hold large numbers of breeding seabirds; the populations of 13 of the 19 breeding seabird species exceed 1% of the total European populations (Table 4). Northern fulmar, European storm petrel and black-legged kittiwake numbers exceed 10% of the European total, and Manx shearwater and Atlantic puffin numbers are just less than 10%. At an international level, European storm petrel numbers are very important; the islands probably hold about 40% of the world population, with one island, Nólsoy, probably containing 17% of the world population, with 100,000 pairs (J-K Jensen and T. Martin unpublished ringing data; B. Olsen pers. comm.). Northern fulmars and Atlantic puffins are the most numerous breeders, followed by European storm-petrels and black-legged kittiwakes (Table 5). The breeding common guillemot population is only about a third of the size of the Atlantic puffin population, while that of razorbills and common guillemots is much lower. The distribution of seabird breeding colonies influences seabird dispersion at sea during the breeding season, as the adults are constrained by the need to return to their nest site. For example, northern fulmars have been observed foraging at distances of 100 km, and northern gannets at distances between 150 km and 320 km, from the nearest colony (Furness and Todd 1984; Tasker *et al.* 1985; Camphuysen *et al.* 1995).

Table 4 Pairs of breeding seabirds in the Faroe Islands placed in a European context. Many of these figures, especially those for the petrels and shearwaters, are approximate. Sources: Grimmet and Jones (1989), Bloch *et al.* (1996a), Lloyd *et al.* (1991), B. Olsen pers. comm.

Species	Total for study area	European population	% of European population in study area
Northern fulmar	800,000	5,840,000	13.69
Manx shearwater	25,000	306,000	8.17
European storm-petrel	Approximately 250,000 a	Uncertain, but probably < 580,000	Probably about 40%
Leach`s storm-petrel	1,000	60,600	1.65
Northern gannet	2,000	223,600	0.89
European shag	1,500	125,000	1.20
Arctic skua	900	17,500	5.14
Great skua	450	13,600	3.31
Black-headed gull	250	1,200,000	0.02
Mew gull	1,000	488,000	0.20
Lesser black-backed gull	9,000	187,000	4.81
Herring gull	1,500	978,000	0.15
Great black-backed gull	1,200	83,100	1.44
Black-legged kittiwake	230,000	1,740,000	13.21
Arctic tern	2,000	278,000	0.72
Common guillemot	175,000 b	3,000,000	5.83
Razorbill	4,500 b	612,000	0.73
Black guillemot	3,500	100,000	3.50
Atlantic puffin	550,000	6,890,000	7.98

a Lloyd *et al.* (1991) estimated an upper world total of 380,000 pairs, which assumed that the Faroes contained at most 100,000 pairs. A decade of ringing has revised the estimated Faroese population upwards to 250,000 pairs. The colony on Nolsoy alone is thought to contain approximately 100,000 pairs, which would make it the largest colony in the world (J-K. Jensen and T. Martin unpublished ringing data; B. Olsen pers. comm.)
b Numbers of individuals multiplied by 0.55 to obtain pair estimates (B. Olsen pers comm.)

5.2 International wildlife treaties and bird conservation

Several international wildlife treaties exist that aim to protect habitats that support important numbers of coastal and inshore birds. The Faroes are not covered by the Bern Convention, the World Heritage Convention or the EU Birds Directive. However, they are covered by the Bonn Convention and Ramsar Convention, although no Ramsar sites have been designated.

Table 5 Relative abundance of seabird species at Faroese colonies listed in order of decreasing abundance. For species population estimates for each island see Grimmett and Jones (1989) or ERT (1997). Location of colonies are given in Fig. 2.	
Seabird colony	**Relative abundance**
Mykines and Mykineshólmur	**P, SP, F, K, Gu, MS, Ga, R, LP**
Vágar	**F, P, K, SP, Gu, LP, MS, BG, R**
Streymoy	**F, P, K, Gu, SP, R, MS, BG**
Eysturoy	**F, P, Gu, K, MS, SP, BG, R**
Kalsoy	**P, F, K, Gu, SP, MS, BG, R**
Kunoy	**F, P, Sp, MS, BG**
Borðoy	**F, P, SP, BG**
Viðoy	**F, P, K, G, SP, MS, BG**
Fugloy	**SP, F, P, Gu, K, R**
Svínoy	**F, SP, P, MS**
Nólsoy	**SP, P, F, K, MS**
Koltur	**P, F, SP, MS**
Hestur	**P, K, F, SP, Gu, MS,**
Sandoy	**P, F, SP, K, Gu, MS, BG, R**
Skúvoy	**Gu, F, P, K, SP, MS, R**
Stóra Dimun	**P, K, Gu, SP, R, R**
Litla Dimun	**P, K, SP, Gu, F**
Suðuroy	**F, K, P, Gu, SP,**

Species key: F - northern fulmar, MS - Manx shearwater, LP - Leach's storm-petrel, SP - European storm-petrel, Ga - northern gannet, K - black-legged kittiwake, Gu - common guillemot, R - razorbill, BG - black guillemot, P - Atlantic puffin

5.3 Northern fulmar *Fulmarus glacialis*

European population (estimated): 5,840,000 pairs; Faroese population (estimated): 800,000 pairs.

The northern fulmar is the most numerous and widespread species of seabird in the North Atlantic. Numbers have increased dramatically over the last 250 years. For example, the number of colonies in Iceland grew from one in 1640 to 155 in 1949. The total North Atlantic breeding population is more than 10 million pairs; as the species begins breeding only when 10-12 years of age there is also a very large number of subadult birds. Northern fulmars are long-lived with an adult mean annual survival rate of 94.5 %; a single egg is laid per year (Lloyd *et al.* 1991). Although northern fulmars may profit from fishery waste they appear to depend mainly on natural food (Camphuysen and Garthe 1997).

The at-sea dispersion of the northern fulmars is shown in Fig: 5:

April-June

Very high densities were associated with trawlers in the southern part of the area. This period is the breeding season and the highest densities in other areas were observed near the islands and especially north-east of Fugloyarbanki.

July-August

Most of the birds were concentrated inside the 200 m contour, the highest densities being recorded north-west of the islands, not far from land. High densities were also observed south-west of Suderoy. Late August is the period when newly fledged young disperse from the colonies while the adults still frequent the nesting cliffs. Quite low densities were observed to the east of the islands despite most of the trawling activities taking place there.

September-November

Most birds were observed close to land around Vagar, Kalsoy-Fugloy and around Sandoy. Moderately high densities were found in the area north-east of Fugloyarbanki. Trawling activities to the east and south of the islands seemed to hold little interest for the birds.

December-March

Birds were mainly concentrated around the islands as well as to the north of the islands and at the shelf break north-east of Fugloyarbanki. During this period, however, the western part of the area was surveyed little. Densities were low in the southern part of the area as well as east of the islands in spite of trawling activity in the area.

Northern fulmars breed in many places in the Faroe Islands, and the counts in 1987 (Bloch *et al.* 1996) indicate a current breeding population of approximately 800,000 pairs or around 13.7 % of the European population. In April-June the total estimated number of northern fulmars at sea in the study area was 1.3 million birds, in July-August 0.84 million, in September-November 0.9 million and in December-March 1 million birds. The high-density area to the north-west of the islands between July and March held densities of 46.5/km^2 in September-November, 53.3/km^2 in July-August and 85.2/km^2 in December-March, indicating that a significant part of the total population remains in this area for most parts of the year. The shelf break north-east of Fugloyarbanki was quite important from December-March when an average density of 116.5 birds was found within an area of 1610 km^2. The high-density area off the southern shelf break in April-June held 86.1 birds/km^2 in an area of 5040 km^2.

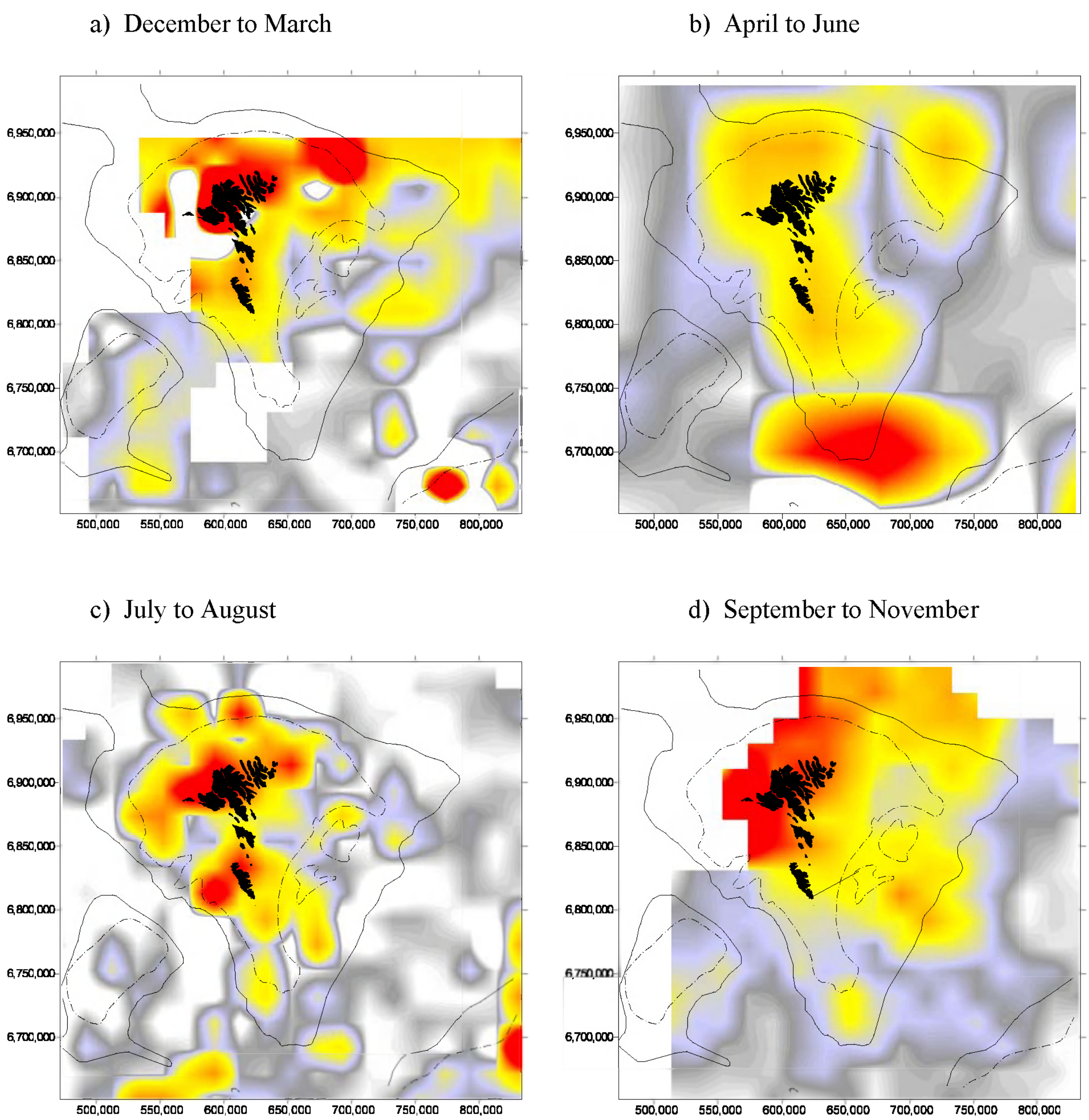
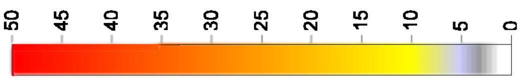


Figure 5. The seasonal distribution and density of northern fulmar
Axis scale: metres
Bathymetry: dash (200 m isobath); solid (500 m isobath)

Key: Density (birds/km²)



5.4 Sooty shearwater *Puffinus griseus*

Sooty shearwaters breed in the southern hemisphere, and during the non-breeding season migrate in large numbers to the north Atlantic (Richdale 1963), birds arrive in Faroese waters from July onwards.

At-sea dispersion of sooty shearwaters is shown in Fig. 6:

July-October

Low densities were distributed throughout the survey area, but the highest densities were over the south-western shelf break. Some of the shearwaters over the Wyville Thomson Ridge were scavenging at fishing vessels, as were a few over the northern edge of the Faroe Bank. By October, numbers had declined and there was only one November record (over the Faroe Bank).

During the period July-October the total estimated number of sooty shearwaters at sea in the study area was estimated at 35,000 birds. The key area at the south-western shelf break held an average density of 2.6 birds/km^2 within an area of 6000 km^2.

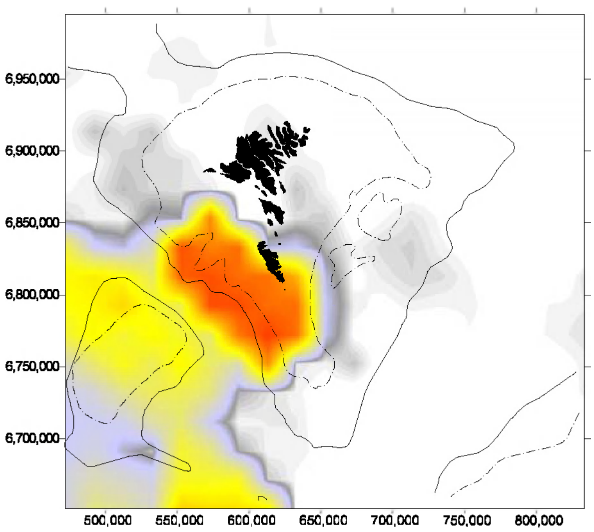
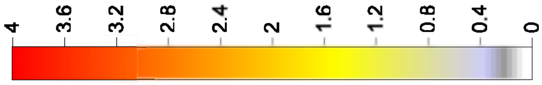


Figure 6. The distribution and density of Sooty shearwater, July to October

Axis scale: metres

Bathymetry: dash (200 m isobath); solid (500 m isobath)

Key: Density (birds/km^2)



5.5 Manx shearwater *Puffinus puffinus*

European population (estimated): 306,000 pairs; Faroese population (estimated): 25,000 pairs.

The distribution of the nominate subspecies of Manx shearwater is centred in Iceland, the Faroes, Britain and Ireland. Birds arrive in Faroese waters in March and April from their wintering quarters in the South Atlantic off Brazil and Argentina (Brooke 1990). The numbers of birds at the breeding colonies decreases through August and into September as the adults depart for their wintering grounds (Salomonsen 1955). The fledgling shearwaters leave shortly afterwards to fly south; they probably spend little time in Faroese waters (Brooke 1990). Manx shearwaters feed on small fish, squid and to a lesser extent crustaceans but the diet of Faroese breeders is not known.

The at-sea dispersion of the Manx shearwaters is shown in Fig. 7:

March-September

Manx shearwaters were not recorded in the study area between October and February. Although they have a large feeding range and are frequently observed at great distances from the main colonies on Sandoy and Skúvoy, their distribution is focused on three main areas: the Faroe Bank, the south-western edge of the Faroese shelf and the waters west of Sandoy. Feeding Manx shearwaters were often observed in mixed flocks with sooty shearwaters in the former two areas. The concentrations west of Sandoy may consist of birds returning to their colonies at dusk.

Approximately 25,000 shearwaters breed in the Faroes, 90 % of them on the west side (Grimmett and Jones 1989). This population constitutes 6 % of the world population. During March-September, the total estimated number of Manx shearwaters at sea in the study area was 55,000 birds. More than half of the birds seemed to be located in the three key areas. The high-density area on the Faroe Bank held densities of 6.3/km² in an area of 2730 km², the south-western shelf break held 13.6/km² in an area of 1235 km² and the area west of Sandoy held 11.6/km² in an area of 1285 km².

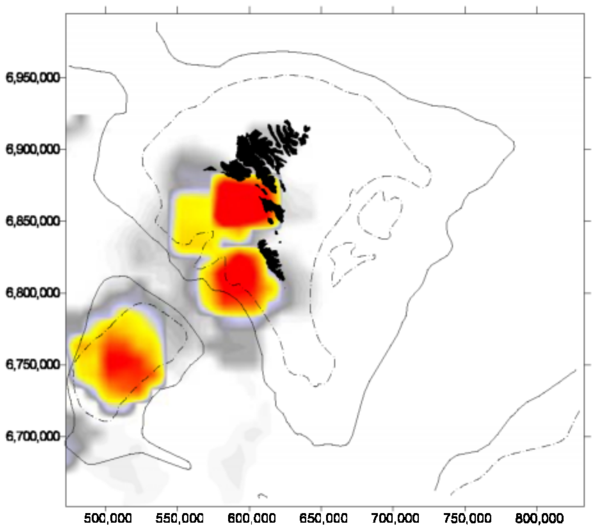
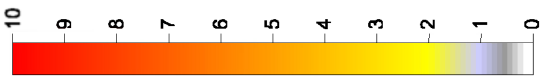


Figure 7. The distribution and density of Manx shearwater, March to September
Axis scale: metres
Bathymetry: dash (200 m isobath); solid (500 m isobath)

Key: Density (birds/km^2)



5.6 European storm-petrel *Hydrobates pelagicus*

European population (estimated): 580,000 pairs: Faroese population (estimated): 250,000 pairs.

The breeding population of the European storm-petrel only breeds in the north-east Atlantic and western Mediterranean, with the majority in Britain, Ireland, the Faroe Islands, and Iceland. Breeding birds leave their colonies during September to November and winter at sea off south and west Africa, before returning to their colonies at the end of May. Incubation lasts for 38-50 days and fledging takes 56-86 days (Snow and Perrins 1998). The main fledging period is late October to early November in the Faroes. European storm petrels feed mainly on surface-living crustaceans, small fish, jellyfish and floating oily offal. In the study area, they are occasionally seen feeding behind fishing vessels (Danielsen *et al.* 1990).

The at-sea dispersion of the European storm-petrel is shown in Fig. 8:

June-August

The highest densities were on the shelf break to the north and north-east of the islands, including the eastern edge of the Nolsoy bank. Moderate densities were recorded over the Faroe Bank and Faroe Bank Channel, as well as over the slope to the west of the islands. European storm-petrels occurred at lower densities throughout the rest of the study area during this period. The highest densities were present in July and August, when numbers are swelled by the arrival of immatures and non-breeders.

September-November

Generally, lower numbers were seen during this period; the number of birds present at colonies may peak in September. There were two moderately high concentrations of European storm-petrels during this period: one in the vicinity of the two largest colonies (Nolsoy and Sandoy) and the other just beyond the shelf break to the north-east of the Fugloyarbanki. European storm-petrels were not recorded between November and May.

The Faroe Islands probably hold about 40% of the world population of European storm-petrels. The most recent estimate of the Faroese population is about 250,000 breeding pairs. One colony alone on Nolsoy contains 100,000 pairs; about 17% of the world population and the largest colony in the world (J-K Jensen and T. Martin unpublished ringing data, B. Olsen pers. comm.). During June-August and September-November, the total estimated number of European storm-petrels at sea in the study area was 69,000 birds and 16,400, respectively. The high-density area on the northern and north-eastern shelf break held a density of 3.3 birds/km² in an area of 7100 km^2 in June-August and 2.2/km^2 in an area of 9700 km^2 in September-November. The area south-east of Nolsoy held 2.9/km^2 in an area of 7000 km^2 in September-November.

a) June to August

c) September to November

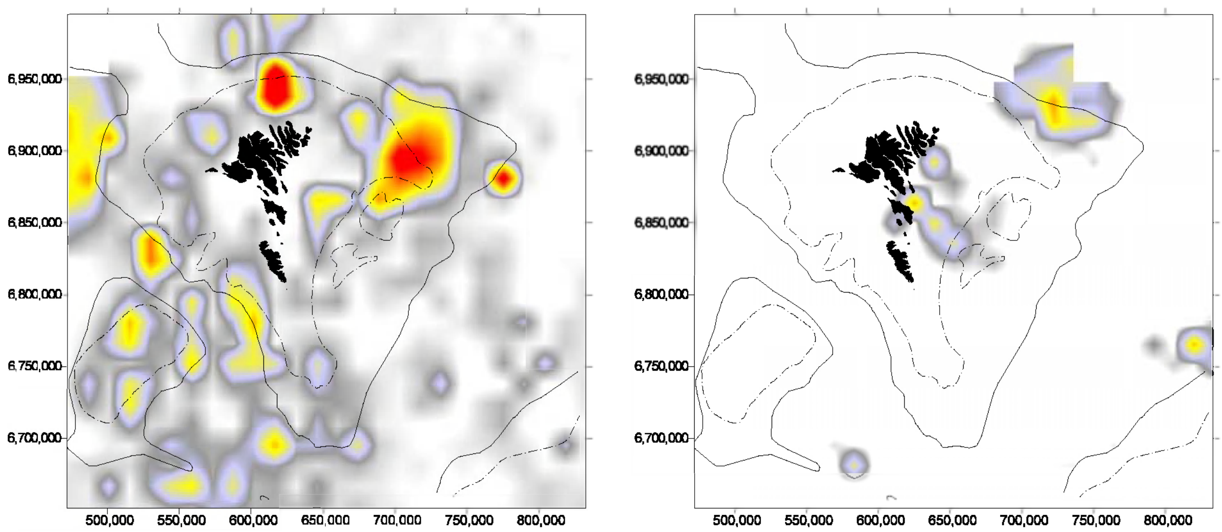


Figure 8. The seasonal distribution and density of European storm-petrels
Axis scale: metres
Bathymetry: short dash (200 m isobath); long dash (1,000 m isobath)

Key: Density (birds/km^2)

5.7 Leach's storm-petrel *Oceanodroma leucorrhoa*

European population (estimated): 60,600 pairs; Faroese population (estimated): 1,000 pairs.

The Leach`s storm-petrel breeds widely across the Pacific and Atlantic Oceans in the Northern Hemisphere, with the vast majority of the world population centred on Alaska. Birds return to the Faroes from June onwards from their tropical wintering grounds and depart again during September. It feeds mainly on planktonic crustaceans but also on molluscs, small fish and offal. Incubation lasts 41-42 days and fledging takes 63-70 days (Snow and Perrins 1998).

The at-sea dispersion of Leach's storm-petrel is shown in Fig. 9:

June-August

Peak densities occur in July and August, when numbers are likely to be augmented with non-breeders. Leach`s storm-petrels favour deep water with sharp topographic relief, as found over the Wyville Thompson/Ymir Ridge system in the far south-west of the study area, and also the shelf break to the south-west of Mykines, the location of the only colonies in the Faroe Islands. Leach`s storm-petrels concentrated over the Wyville Thompson/Ymir Ridge system are closer to St. Kilda, the largest colony in the north-east Atlantic (Lloyd *et al*. 1991), than to the Faroes.

The world population of Leach`s storm-petrel is estimated at 7-9 million pairs (Lloyd *et al.* 1991). Only 1,000 pairs breed in the Faroes and these are restricted to Mykines and Mykinesholmur. However, this represents about 1.65% of the European population (Taylor and Reid 2001).

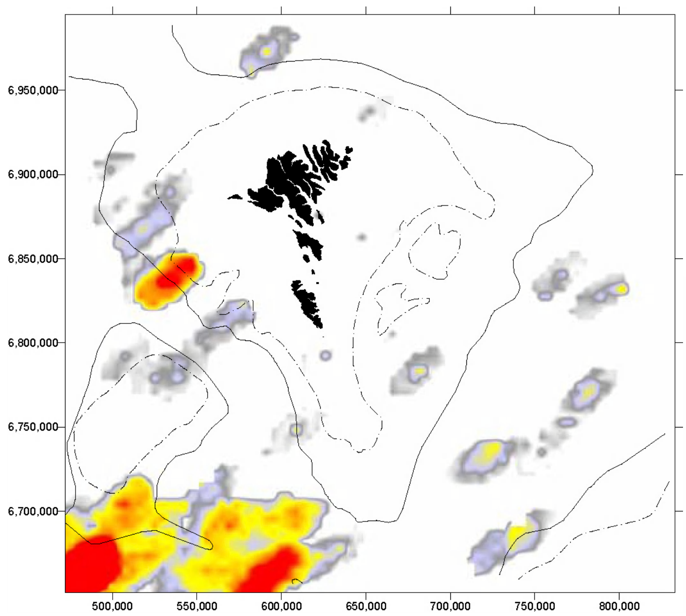
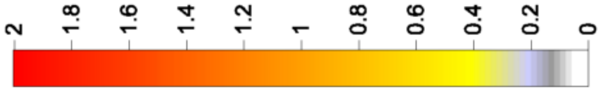


Figure 9. The distribution and density of Leach`s storm-petrel, June to August
Axis scale: metres
Bathymetry: short dash (200 m isobath); long dash (1,000 m isobath)

Key: Density (birds/km²)



5.8 Northern gannet *Morus bassanus*

European population: 223,600 pairs; Faroese population: 2,000 pairs.

The northern gannet occurs on both sides of the North Atlantic, although the majority of the population breeds in a small but increasing number of large colonies in the east Atlantic. Northern gannet colonies are usually situated on isolated stacks or small, uninhabited islands, or less frequently on mainland cliffs. The northern gannet is a partial migrant, the majority of birds moving southwards during the winter; some immatures reach the Equator.

A few adults remain in Faroese waters over the winter, but most breeding birds start to return in February and remain until October. Northern gannets lay a single egg between mid-April and mid-June. Incubation lasts 42-46 days and fledging takes 84-97 days (Snow and Perrins 1998). Within the study area, birds feed on a variety of fish such as herring, sprat, mackerel and sandeels, and also frequently take discarded fish from trawlers.

The at-sea dispersion of the northern gannet is shown in Fig. 10:

March-May

Northern gannets were not seen regularly in Faroese waters before March. In spring, moderately high densities were recorded over the outer shelf and shelf break to the south-west of the Faroes and over the Faroe-Shetland Channel.

June-September

The population during this period was swelled by the arrival of non-breeders (Salomonsen 1955), and this together with the dispersal of breeding adults in August and September (Taylor and Reid 2001), results in a much wider distribution of records. High densities were found to the west of Mykines, the location of the only northern gannet colony on the Faroes, and moderately high densities extended from the Mykines area northwards to another high-density area at the 1,000 m depth contour in the Norwegian Sea. Smaller areas of high densities were located over the Faroe Bank Channel and over the Faroe Shetland Channel. Although scavenging at fishing vessels was most pronounced during this period (Taylor and Reid 2001), no obvious overlap with the distribution of the fishing fleets was apparent.

The only northern gannet colony within the study area is on Mykinesholmur in the Mykines, and the most recent count was of 2,340 apparently occupied sites in 1996 (B. Olsen pers. comm.). This represents 0.9% of the total east Atlantic northern gannet population (Murray and Wanless 1997) and 0.75% of the total world population. During March-May and June-September, the total estimated number of northern gannets at sea in the study area was 5,850 and 25,000 birds, respectively. During the latter period, the high-density area west of Mykines held a density of 1.5 birds/km^2 in an area of 1300 km^2 and the area at the slope of the Norwegian Sea held 1.0/km^2 in an area of 890 km^2.

a) March to May

b) June to September

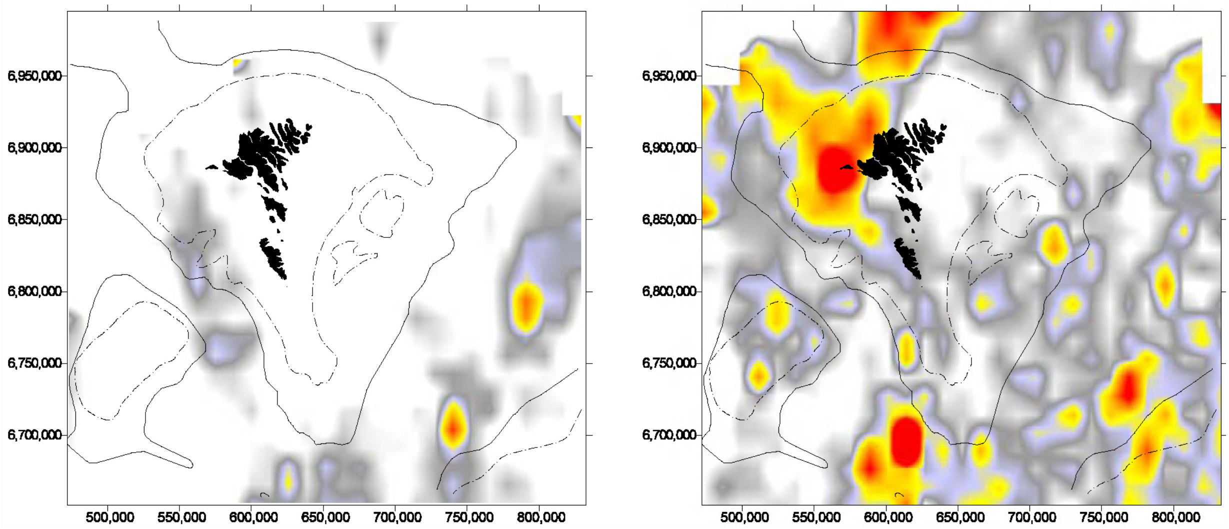
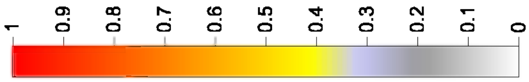


Figure 10. The seasonal distribution and density of northern gannet
Axis scale: metres
Bathymetry: dash (200 m isobath); solid (500 m isobath)

Key: Density (birds/km^2)



5.9 European shag *Phalacrocorax aristotelis*

European population: 125,000 pairs; Faroese population: 1,500 pairs.

The European shag breeds on rocky coasts in the north-east Atlantic, the population numbering 125,000 pairs (Rose and Scott 1994). European shags in the Faroes are largely sedentary. In Norway, the species feeds mainly on small fish, especially sandeels, clupeids and young gadids (Barrett *et al.* 1990).

The at-sea dispersion of the European shag is shown in Fig. 11. Low densities of European shags were found closely inshore at the Faroes. European shags are usually restricted to coastal waters as they prefer to forage in waters of between 15 m and 40 m depth (Barrett and Furness 1990; Wanless *et al.* 1993). Densities may be higher than the distribution map indicates as little survey work was conducted close inshore.

The Faroes hold between 1,000 and 2,000 breeding pairs of European shags (Bloch *et al.* 1996), less than 1% of the north-east Atlantic population (Rose and Scott 1994).

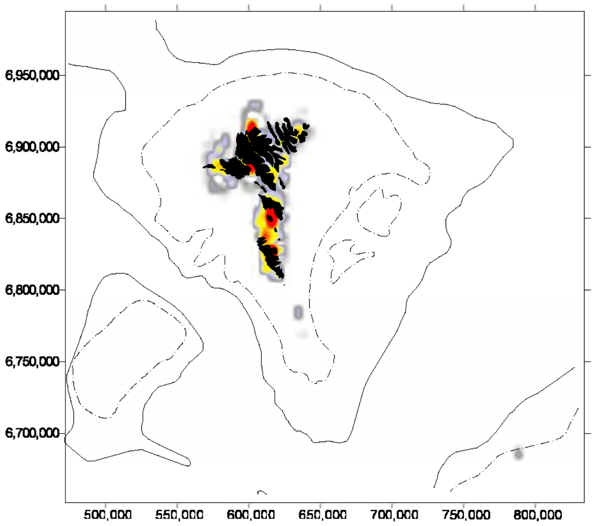
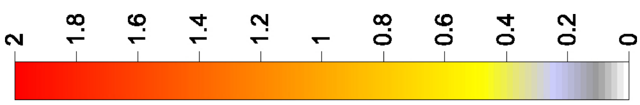


Figure 11. The distribution and density of European shags throughout the year
Axis scale: metres
Bathymetry: short dash (200 m isobath); long dash (500 m isobath)

Key: Density (birds/km^2)



5.10 Common eider *Somateria mollissia*

European population: 1,500,000 pairs; Faroese population: 3,500 pairs.

The common eider breeds widely along all Arctic and temperate coasts. In common with Icelandic and British common eiders, Faroese breeders are mainly sedentary. Their main food is molluscs.

In the Faroes, common eiders prefer to feed very close to the coast, where few survey tracks were made. None was seen away from the coast, and there was no seasonal trend in the number of sightings. No other data on their distribution around the islands are currently available.

Approximately 3,500 breeding pairs breed in the Faroes (Bloch *et al.* 1996), the equivalent of 0.23 % of the European breeding population (Rose and Scott 1994).

5.11 Arctic skua *Stercorarius parasiticus*

European population: 17,500 pairs; Faroese population: 900 pairs.

The Arctic skua has a circumpolar distribution, the majority of the breeding population occurring in Canada, Alaska and Russia. They have an extensive pelagic range outside the breeding season, most birds wintering in the southern hemisphere. Breeding birds in the Faroes return to colonies from late April onwards and depart in late July to August. The clutch of usually two eggs is laid from mid-May. Incubation lasts 25-28 days and fledging takes 25-30 days (Snow and Perrins 1998). Diet consists largely of fish kleptoparasitised from other seabirds.

The seasonal distribution and density of the Arctic skua is shown in Fig. 12:

May and June

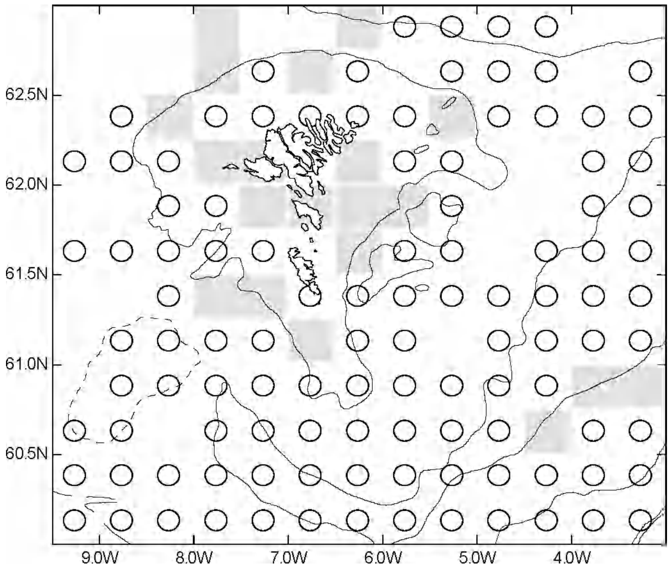
Arctic skuas were recorded at low densities over the Faroe plateau, and at the shelf break adjacent to the Shetland Islands. Densities were highest to the north-west of Mykines, which holds 50 breeding pairs.

July-September

Arctic skuas were more widely distributed throughout the study area during this period, as breeding birds begin to disperse from their colonies. In addition, birds migrating to their winter quarters from northerly colonies probably pass through Faroese waters (Taylor and Reid 2001). However, densities were highest for inshore waters around the islands of Sandoy and Skuvoy; the latter holds 100 breeding pairs (Grimmett and Jones 1989).

The Faroe Islands host an estimated 900 breeding pairs of Arctic skuas, this representing 5% of the European population. The world population is unknown, but is likely to be between 100,000 and 300,000 pairs (Lloyd *et al.* 1991).

a) May and June



b) July and September

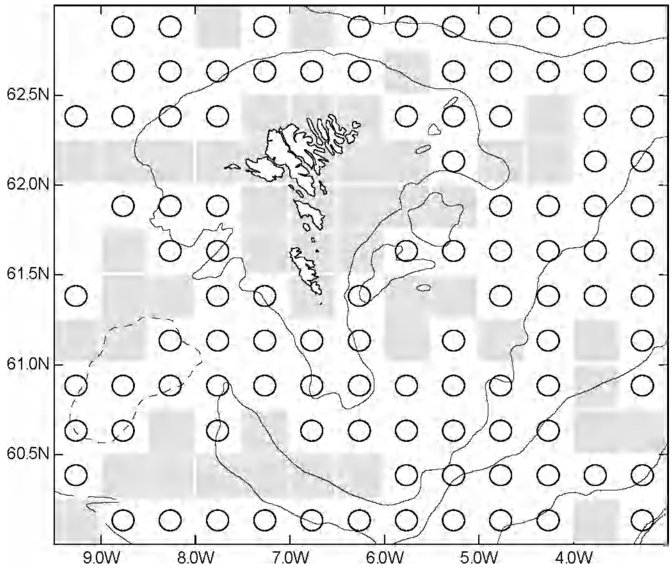
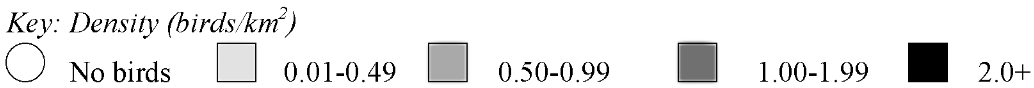


Figure 12. The seasonal distribution and density of Arctic skua
Bathymetry: short dash (200 m isobath); long dash (1,000 m isobath)



5.12 Pomarine skua *Stercorarius pomarinus*

Pomarine skuas breed in Arctic tundra regions and are circumpolar in distribution. Breeding grounds are reoccupied in mid-June and birds depart in early August to October. In the Atlantic, Pomarine skuas winter in the Gulf of Mexico and the West Indies, and off west Africa. When nesting, their diet consists mainly of lemmings, but out-with the breeding season they feed mainly on fish (Snow and Perrins 1998).

The distribution of sightings of Pomarine skuas is shown in Fig. 13. Pomarine skuas pass through the study area on migration. The sightings appeared to be randomly distributed throughout the survey area. There were 17 sightings during May, eight in June, 11 in July, a peak of 28 in August, but only a few in September and October (Taylor and Reid 2001). The most common group size in the study area was 1, with 88 birds seen in total (Taylor and Reid 2001).

The world population of the Pomarine skua is estimated to be 100,000 pairs, although few data are available (Furness 1987).

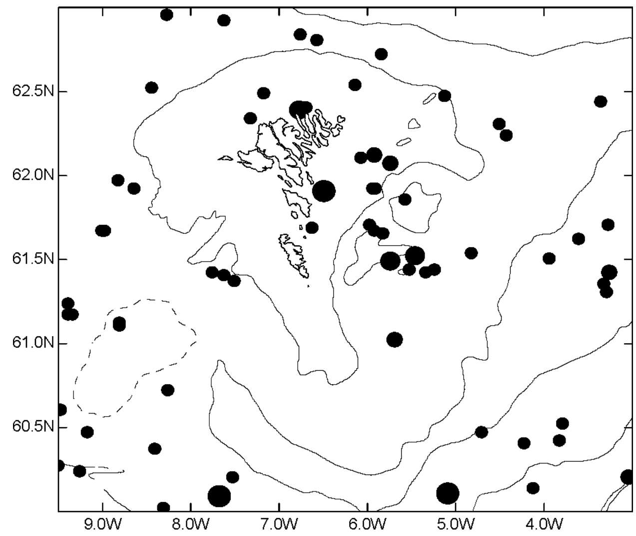


Figure 13. Sightings of pomarine skua
Bathymetry: short dash (200 m isobath); long dash (1,000 m isobath)

Key: Number of Individuals:
• 1 • 2 • 3 ● 4+

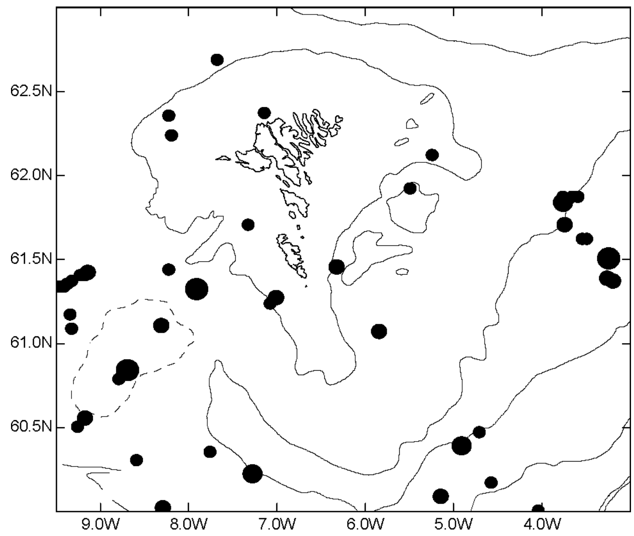


Figure 14. Sightings of long-tailed skua
Bathymetry: short dash (200 m isobath); long dash (1,000 m isobath)

Key: Number of Individuals:
• 1 • 2-3 ● 4-5 ● >6

5.13 Long-tailed skua *Stercorarius longicaudus*

Long-tailed skuas breed in Arctic tundra regions and have a circumpolar distribution. Birds return to breed from late May onwards from their pelagic wintering grounds in the southern hemisphere. Long-tailed skuas leave their breeding grounds during late July to August. On the breeding grounds their diet largely consists of small rodents, while outside the breeding season, they feed largely on marine fish (Snow and Perrins 1998).

The distribution of sightings of long-tailed skuas is shown in Fig. 14. Long-tailed skuas pass through the study area on migration. There were more pronounced sightings peaks in May and August than was the case with Pomarine skuas (Taylor and Reid 2001). A total of 88 birds was seen within the study area, but group size tended to be larger, with up to eight birds in a group (Taylor and Reid 2001).

The world population of long-tailed skuas is estimated to be 100,000 pairs, although few data are available (Furness 1987).

5.14 Great skua *Stercorarius skua*

European population: 13,600 pairs; Faroese population: 450 pairs.

The great skua breeds only in the north-east Atlantic, with the vast majority of the breeding population found in northern Scotland and Iceland. Birds arrive in Faroese waters from March onwards and return to their colonies in late April or early May. By the end of September, great skuas have mostly dispersed from Faroese waters and are pelagic during the winter, ranging north to Greenland and south to Brazil in the Atlantic. Egg-laying begins in early/mid-May, with clutch size usually 1-2 eggs. Incubation lasts 29 days and fledging takes 44 days (Snow and Perrins 1998). Food consists mainly of fish, obtained either directly from the sea, or by scavenging or piracy. Great skuas are also predators of other seabirds during the breeding season. No dietary data are available from the Faroes.

The at-sea dispersion of the great skua is shown in Fig. 15:

March and April

Great skuas were found in isolated patches over the slope, mainly to the south of the islands and none were seen over the shelf.

May and June

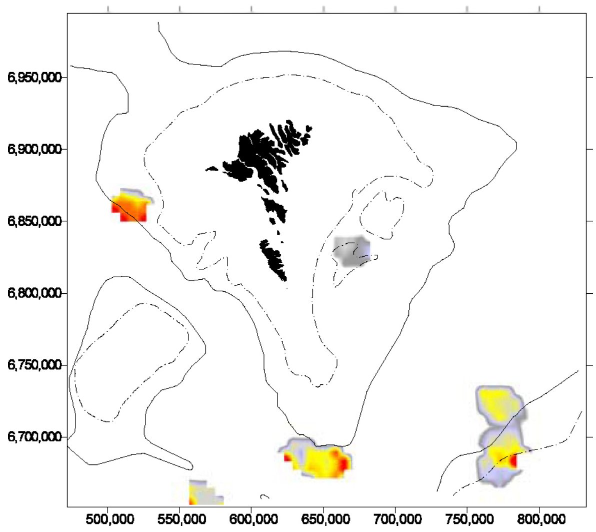
Densities peaked at sea during this period, where a widely scattered distribution was observed. On the Faroese shelf, the most pronounced concentration was found on the shelf break north-west of the islands. Around the islands, the highest densities of great skuas were noted to the south of Vagar and along the eastern side of the islands. Off the shelf discrete aggregations were found over much of the Faroe-Shetland Channel area and were probably from the large colonies in Shetland such as Foula, and are likely to include non-breeders. This is because many of the skuas were further from their colonies than their maximum estimated foraging range of 60 km (Furness and Hislop 1981). The distribution in the Faroe-Shetland Channel, but not in the remaining part of the study area, strongly reflected fishing activity. Fishing vessel discards are an important source of food for Shetland breeders (Hudson and Furness 1988).

July-September

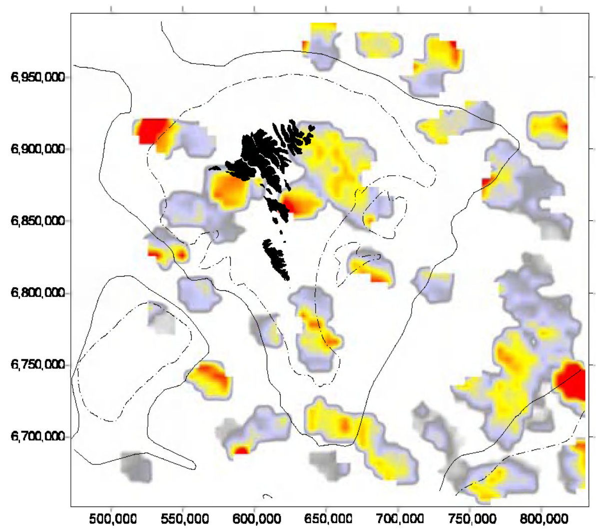
As the breeding season progresses the number of great skuas at the colonies increases, with the arrival of non-breeders (Taylor and Reid 2001). Densities were highest over the shelf to the north and west of the islands, and over much of the Faroe-Shetland Channel.

The Faroe Islands hold possibly 450 breeding pairs of great skuas (Bloch *et al.* 1996) and this represents 3.3% of the world population. During March-April, the total estimated number of great skuas at sea in the study area was 640 birds. During May and June, the estimated number was 3,860 birds and during July-September 1400 birds.

a) March and April



b) May and June



c) July to September

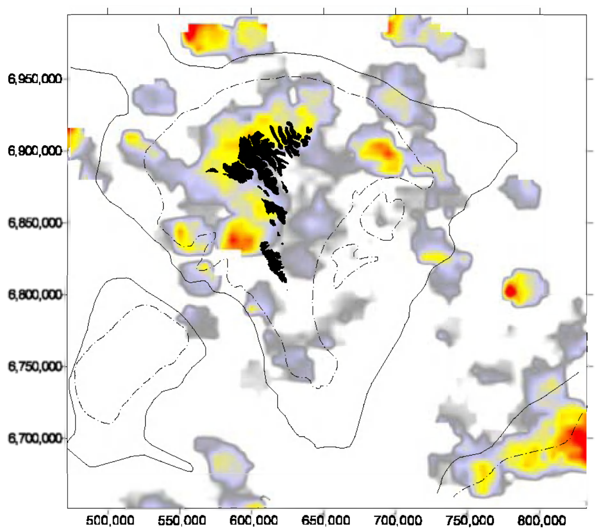
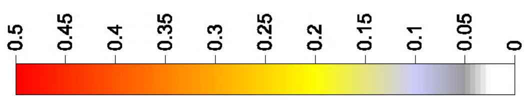


Figure 15. The seasonal distribution and density of great skua

Axis scale: metres

Bathymetry: dash (200 m isobath); solid (500 m isobath)

Key: Density (birds/km^2)



5.15 Black-headed gull *Larus ridibundus*

European population: 1,200,000 pairs; Faroese population: 250 pairs.

Black-headed gulls breed commonly across the west Palearctic region. In the Faroes, passage migrants and winter visitors seem to be more common than breeding birds (Williamson 1948).

The distribution of sightings of black-headed gulls is shown in Fig. 16. Black-headed gulls were recorded only 13 times, nine of these being beyond the shelf break. These deep water sightings were made during April, August, October and November, and may have included Icelandic birds wintering in Scottish and Irish waters (Horton *et al.* 1984).

Black-headed gulls are uncommon breeders, with 250 pairs nesting in the islands (Bloch *et al.* 1996).

5.16 Mew gull *Larus canus*

European population: 488,000 pairs; Faroese population: 1,000 pairs.

Mew gulls breed commonly across the west Palearctic region. The movements of the small Faroese population are not known for certain.

The distribution of sightings of mew gulls is shown in Fig. 16. They were mostly seen during the summer, close to shore and close to their colonies. The 12 offshore sightings did not show any seasonal trend, being evenly spread between May and December.

The Faroese breeding population is estimated at 1,000 pairs (Bloch *et al.* 1996).

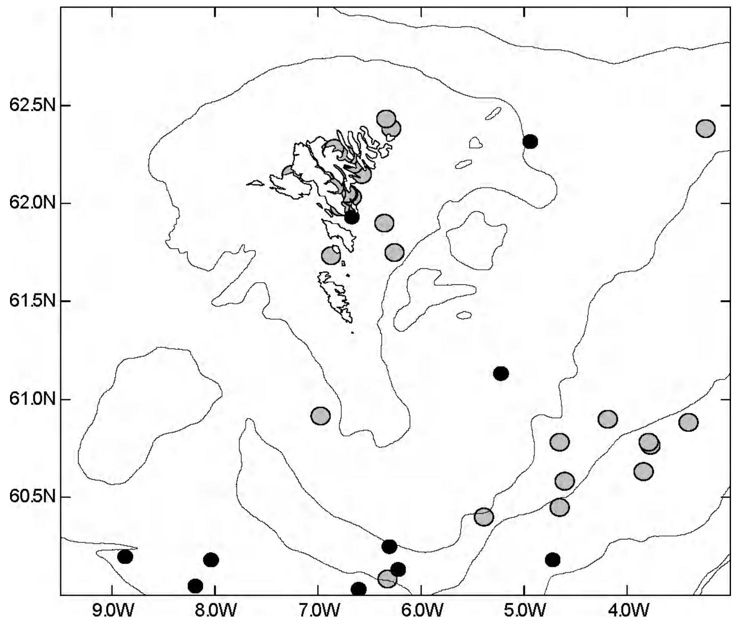


Figure 16. Sightings of black-headed and mew gulls
Bathymetry: short dash (200 m isobath); long dash (1,000 m isobath)

Key: ● *Black-headed gull*
◎ *Mew gull*

5.17 Lesser black-backed gull *Larus fuscus*

European population: 187,000 pairs; Faroese population: 9,000 pairs.

The lesser black-backed gull breeds in north and west Europe and northern parts of Eurasia; five races are recognised. The race *graellsii* breeds in Iceland, Faroes, Britain, Ireland, France, and north-west Spain. It is a migratory species and *graellsii* birds move south to winter off Spain, Portugal and north-west Africa, although it is increasingly recorded as over-wintering in southern Britain. Lesser black-backed gulls return from their wintering grounds to Faroese waters from March onwards, and depart during August. The clutch of usually three eggs is laid from early May; incubation lasts 24-27 days and fledging takes *c.* 30-40 days (Snow and Perrins 1998). The lesser black-backed gull is omnivorous, the diet including any vertebrates and invertebrates of a suitable size, plant material and also garbage.

The at-sea dispersion of the lesser black-backed gull is shown in Fig. 17:

April-May

Lesser black-backed gulls were recorded at low densities beyond the shelf break, with very few around the islands. These may have been Faroese breeding birds as Camphuysen (1995) recorded birds feeding 135 km from a colony in the North Sea, or Icelandic breeders returning to colonies from their wintering grounds. There is a limited overlap between the distribution of birds and fishing activity in the study area.

June-July

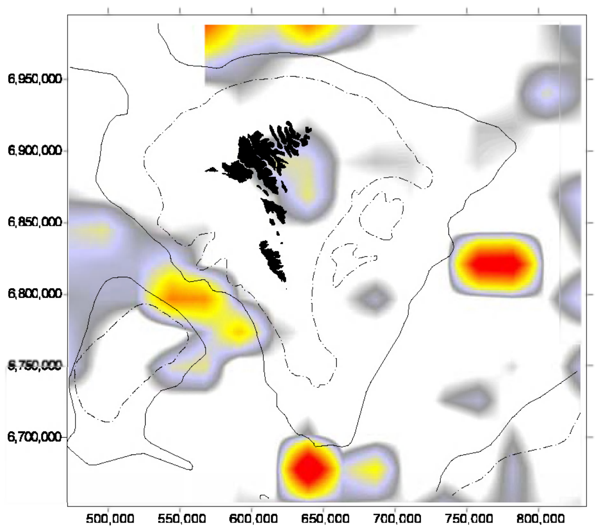
Densities were highest within a radius of 20 km from the islands, with few birds recorded beyond the shelf break. The number of breeding birds present at colonies peaks during this period.

August-September

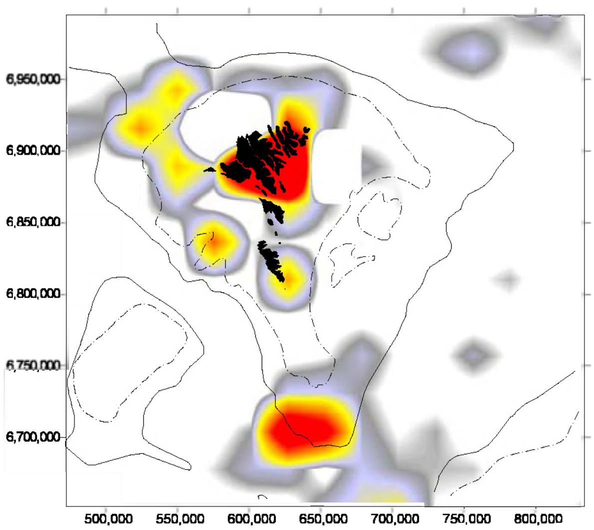
During this period, lesser black-backed gulls are frequently observed associated with fishing vessels (Taylor and Reid 2001), however large numbers of gulls were observed only near fishing vessels working within their main feeding range.

The Faroese population is estimated at 9,000 breeding pairs, representing around 5% of the European population. The total world population is estimated at 205,000 pairs, including 125,000 pairs belonging to the race *graellsii* (Lloyd *et al.* 1991).

a) April to May



b) June and July



c) August and September

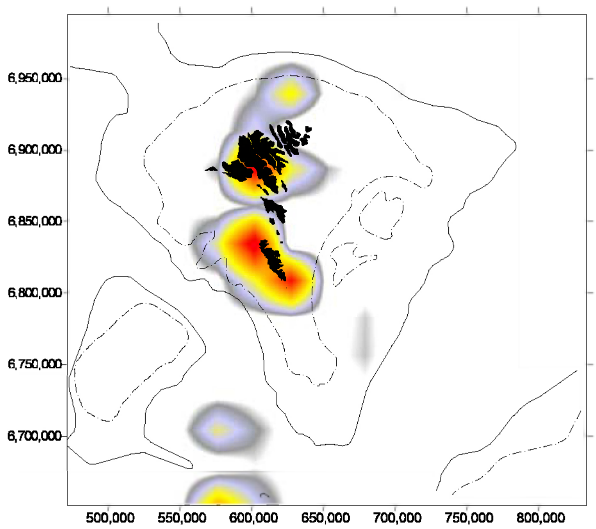
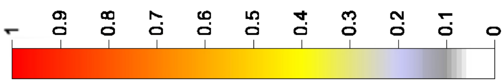


Figure 17. The seasonal distribution and density of lesser black-backed gull
Axis scale: metres
Bathymetry: dash (200 m isobath); solid (500 m isobath)

Key: Density (birds/km^2)



5.18 Herring gull *Larus argentatus*

European population: 978,000 pairs; Faroese population: 1,500 pairs.

The Herring gull is the most widespread species of large gull in the northern hemisphere. Faroese birds are thought to be mostly sedentary (Cramp and Simmons 1983).

The at-sea dispersion of the herring gull is shown in Fig. 18. During the summer, most birds were seen close inshore and in the fjords. Inshore densities may have been underestimated in this study as few surveys were conducted close inshore among the fjords. Densities of herring gulls increased during the winter when they were seen mainly on the shelf within a range of 30-50 km from the Faroes. In both summer and winter, the overlap with the target areas for large fishing fleets over the banks east of the Faroes and in the Faroe-Shetland Channel, respectively, was very limited.

Between 1,200 and 1,500 pairs of herring gulls breed in the islands (Bloch and Sørensen 1983). A total of 1.35 million pairs of *L.a.argentatus* and *L.a. argenteus* breed in western Europe (Rose and Scott 1994).

a) April - September b) October – March

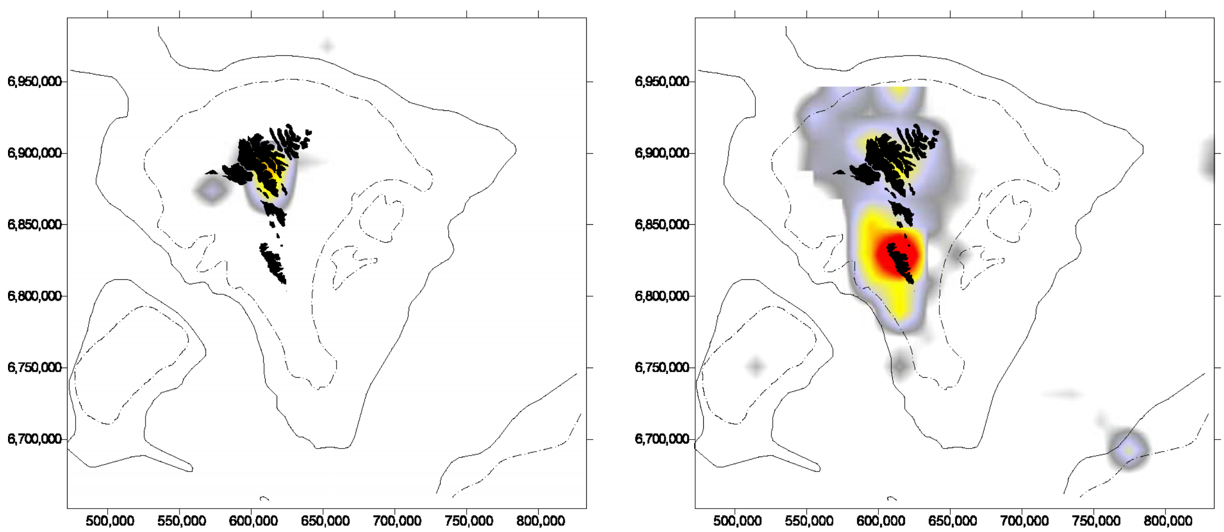
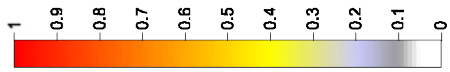


Figure 18. The seasonal distribution and density of herring gull
Axis scale: metres
Bathymetry: dash (200 m isobath); solid (500 m isobath)

Key: Density (birds/km^2)



5.19 **Glaucous gull** *Larus hyperboreus*

Glaucous gulls are winter visitors to the study area from Arctic breeding colonies, possibly those in east Greenland (Cramp and Simmons 1983).

The at-sea dispersion of the glaucous gull is shown in Fig. 19. They are most numerous between November and January, when the largest concentrations were found over the slopes of the Faroese shelf, especially to the east of the islands. Few birds were seen closer than 20 km from the islands. Although birds were seen scavenging at fishing vessels, there was no clear overlap with fishing activities.

No reliable estimates exist for the Arctic breeding populations of glaucous gulls.

a) November to January　　　　b) February to March

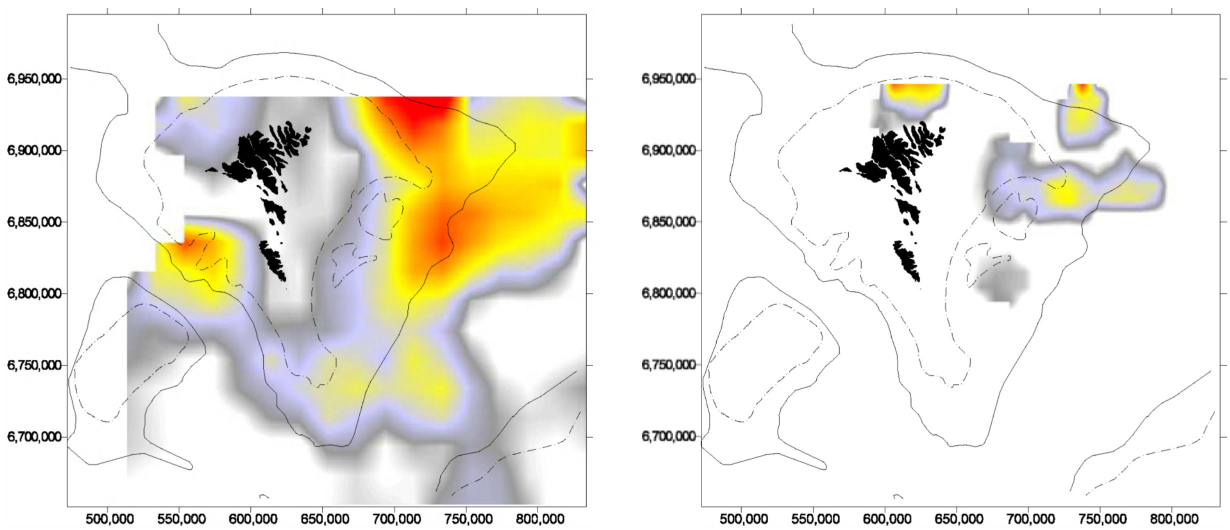
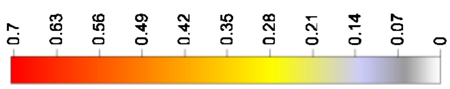


Figure 19. The distribution and density of glaucous gull
Axis scale: metres
Bathymetry: dash (200 m isobath); solid (500 m isobath)

Key: Density (birds/km^2)



5.20 Great black-backed gull *Larus marinus*

European population: 83,100 pairs; Faroese population: 1,200 pairs.

Great black-backed gulls from the northern sectors of the breeding range, including the Faroes, migrate south during winter. Some Faroese birds move south into Scottish waters during the winter, while Shetland birds are not thought to move further than 100 km from their breeding colonies (Harris 1962). Birds wintering in British waters include Norwegian and Russian ringed birds (Coulson *et al.* 1984).

The at-sea dispersion of the great black-backed gull is shown in Fig. 20. During the breeding season this species was sparsely distributed around the islands and offshore over the shelf break and the Faroe-Shetland Channel. They were frequently recorded scavenging in the study area and a clear overlap with fishing activities was noted. The concentration at the shelf break to the south-east of Suðuroy during May, included many fishing vessel associates (Fig. 20a). Higher densities were present during the winter and spring than during the summer (Fig. 20b), with notable concentrations west of Suðuroy in December, at the shelf break to the north-east of the islands in March, and over the Scottish shelf break in January (Fig. 20b). The overlap with fishing activities during this period was not so obvious around the Faroes.

The breeding population of great black-backed gulls in Western Europe, which comprises most of the world population, is estimated at 240,000 pairs (Rose and Scott 1994). Great-black backed gulls are the least numerous species of gull breeding in the islands (1,200 pairs; Bloch *et al* 1996a). The Shetland Islands to the east hold about 2,100 pairs (Lloyd *et al.* 1991).

a) May to August b) September to April

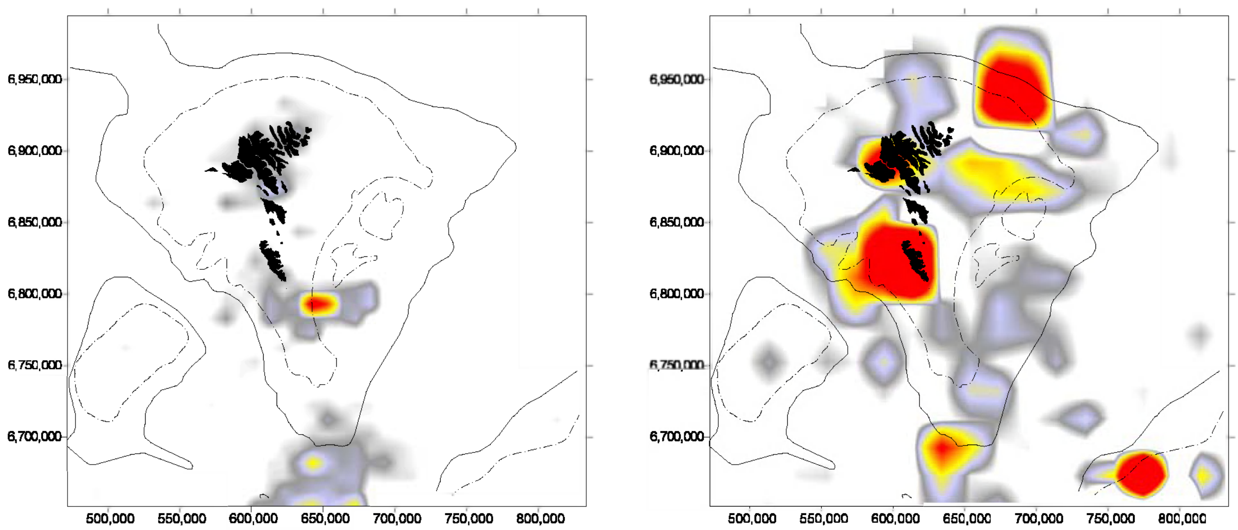
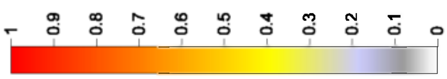


Figure 20. The seasonal distribution and density of great black-backed gull
Axis scale: metres
Bathymetry: dash (200 m isobath); solid (500 m isobath)

Key: Density (birds/km^2)



5.21 Black-legged kittiwake *Rissa tridactyla*

European population: 1,740,000 pairs; Faroese population: 230,000 pairs.

The black-legged kittiwake is distributed over the vast temperate and Arctic zones of the Atlantic, Arctic and Pacific Oceans. The occurrence of the species in the Faroes is characterised by large seasonal variation. Faroese chicks fledge in late July and early August (Salomonsen 1955).

The at-sea dispersion of the black-legged kittiwake is shown in Fig. 21:

January-April

Black-legged kittiwakes were the most widespread and abundant gull species, and were present in every month of the year. In the pre- and early breeding periods, numbers increased at the colonies. At this time, moderately high concentrations were scattered throughout the survey area, over both shallow and deep water. The highest concentrations were over the eastern Faroe Bank Channel and over the Scottish shelf break and slope on the Scottish side of the Faroe-Shetland Channel. Many birds in the latter area were associated with fishing vessels. Over the Faroese shelf high numbers were seen to the south of Vágar and Nordoyar.

May-July

During the main breeding period large numbers of black-legged kittiwakes were observed in a well-defined zone covering the central Faroe shelf, the northern and southern shelf breaks and deep water areas of the Norwegian Sea and the western Faroe-Shetland Channel. This zone only partly overlappped with the areas, where intensive fishing activities were recorded. In addition to the numbers of adults foraging at sea to feed their chicks during this period, there is a significant influx of non-breeders and immature birds from May onwards (Salomonsen 1955; Danielsen *et al.* 1990; Cadiou 1992). Shetland colonies hold at least 50,000 pairs (Richardson 1985), some of which may disperse west into the study area, further swelling numbers.

August-September

In August and September, birds were widely scattered throughout the survey area, with a notable concentration on the western shelf. No fishing activity was recorded in this area.

October-December

Between October and December, black-legged kittiwake numbers fell by at least one order of magnitude but birds were still scattered throughout the survey area at low densities.

During the main breeding period (May to July), the Faroe islands have held as many as 230,000 pairs of black-legged kittiwakes but numbers have probably been lower in recent years (Bloch *et al.* 1996a; B. Olsen pers. comm.). The total west European population is estimated at 4.2 million pairs (Rose and Scott 1994). During the main periods of occurrence from January-April and May-July, the total estimated number of black-legged kittiwakes at sea in the study area was 200,000 and 250,000 birds, respectively. The high-density area on the central Faroe shelf held a density of 10.2 birds/km^2 in an area of 15,500 km^2 in May-July.

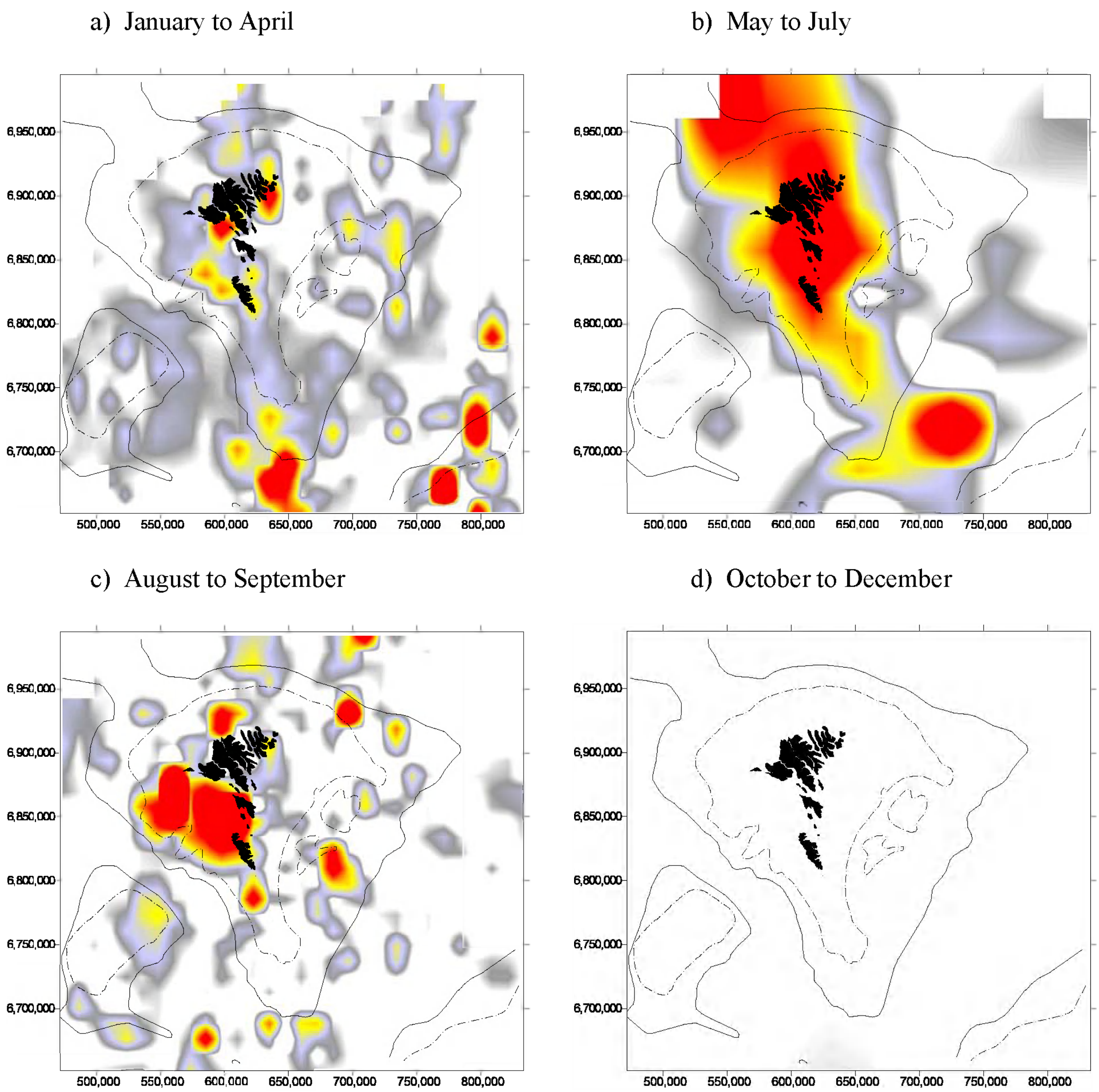


Figure 21. The seasonal distribution and density of black-legged kittiwake
Axis scale: metres
Bathymetry: dash (200 m isobath); solid (500 m isobath)

Key: Density (birds/km^2)

5.22 **Arctic tern** *Sterna paradisaea*

European population: 278,000 pairs; Faroese population: 2,000 pairs.

No Arctic terns were seen in the study area between October and April. Arctic terns migrating north from the Southern Ocean to northern European breeding grounds arrive in Faroese waters during May. At this time the Faroese breeding colonies are occupied, and the birds remain at the islands until late August (B. Olsen pers. comm.).

The at-sea dispersion of the Arctic tern is shown in Fig. 22. In May, small numbers were present over the Faroe-Shetland Channel and also closer to the islands. High densities were not recorded until June, and remained high until September. The core area of high abundance was on the inner Faroe shelf within 25 km of the islands. It is likely that birds from the larger colonies in Iceland pass through the area on southerly migration during August. Birds were still present around the islands in September, albeit in reduced numbers. The only other records during this month were on the Shetland side of the Faroe-Shetland Channel, and over the Faroe Bank Channel.

The Faroe Islands hold only 2,000 breeding pairs of Arctic tern (Bloch *et al.* 1996), while Iceland has more than 100,000 pairs, and Shetland approximately 32,000 (Lloyd *et al.* 1991).

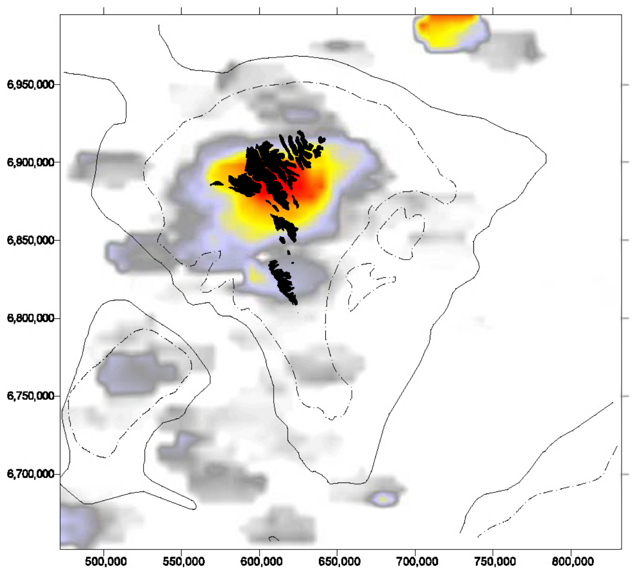
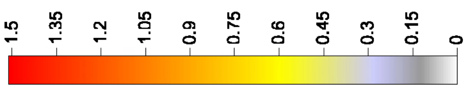


Figure 22. The seasonal distribution and density of Arctic tern, June to August
Axis scale: metres
Bathymetry: dash (200 m isobath); solid (500 m isobath)

Key: Density (birds/km^2)



5.23 Common guillemot *Uria aalge*

European population: 3,000,000 pairs; Faroese population: 175,000 pairs.

Common guillemots breed on cliffs from Svalbard in the north to the Iberian Peninsula in the south. The largest numbers are found in the British Isles and in Iceland, each holding over 1 million birds (Lloyd *et al.* 1991). They are long-lived and lay one egg per year, breed for the first time usually at five years of age; consequently there is a very large subadult population. After breeding the birds temporarily become flightless. The diet consists mainly of small schooling fish such as capelin, sprat, herring and sandeel (Harris and Birkhead 1985, Bradstreet and Brown 1985).

The at-sea dispersion of the common guillemot is shown in Fig. 23:

February-April

Adult birds arrive at the breeding colonies during February but egg-laying does not begin until May. The birds were patchily distributed; high densities were found just off the 200 m depth contour in the area north-east of Fugloyarbanki, at Husagrund and Nolsoyabanki. Very low densities were recorded in the southeastern part of the study area.

June-August

In the breeding period, birds do not forage farther away than 60 km from colonies. Hence, almost all birds were found near the islands with the Faroe Bank as a marked exception. The highest densities were found around Sandoy and during the moulting period in August on the Faroe Bank. With the exception of the lowest recorded densities all observations were made in waters less than 200 m deep.

September-January

The common guillemots had vacated the entire area during this period except for areas around Sandoyabanki and Suduroyabanki around the 200 m depth contours. Concentrations were found close to these at the Suderoybank and near Sandoy.

The common guillemot population has decreased dramatically in the Faroe Islands during the last few decades but in a 1987 census the population was estimated at approximately 175.000 pairs (Bloch *et al.* 1996). Estimates of the total size of the Atlantic population range between 3 and 4.5 million pairs, so the Faroese population comprises between 3.9 % and 5.8 % of that.

During February-April, the total estimated number of common guillemots at sea in the study area was 45,000 birds. The high-density area at the northeastern shelf break had a density of 6.4 birds/km² in an area of 5,200 km². During May-August, the total number at sea was estimated at 108,000 birds. The high-density area on the central Faroe shelf north of Streymoy held a density of 9.5 birds/km² in an area of 7,200 km², while the Faroe Bank held a mean density of 20.7 birds/km² in an area of 1,440 km². During September-January, the total numbers at sea were estimated at 90,200 birds. The high-density area around Sandoyabanki and Suduroyabanki held a density of 9.2 birds/km² in an area of 2,600 km².

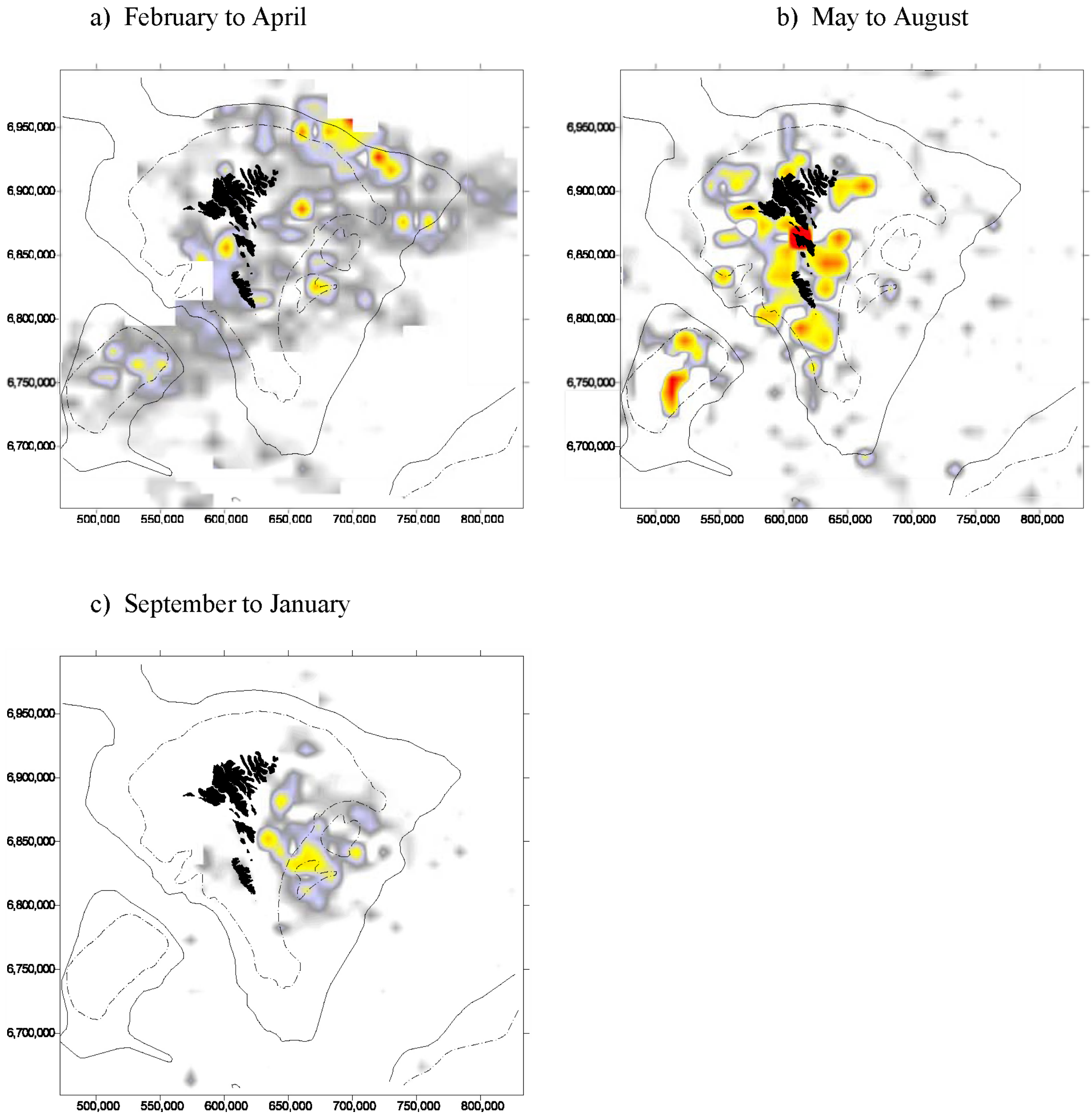
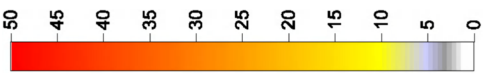


Figure 23. The seasonal distribution and density of common guillemot

Axis scale: metres

Bathymetry: dash (200 m isobath); solid (500 m isobath)

Key: Density (birds/km^2)



5.24 **Razorbill** *Alca torda*

European population: 612,000 pairs; Faroese population: 4,500 pairs.

Razorbills breed on cliffs in temperate, boreal and Arctic regions on both sides of the Atlantic. About 75% of the world population breeds in north-west Europe. More than two-thirds of the north-east Atlantic population breeds in just two large colonies in north-western Iceland. After breeding the birds become temporarily flightless (Lloyd *et al* 1991). They are long-lived and lay one egg per year in May and generally breed at an age of four to five years; there is a large subadult population. They prey mainly on small schooling fish such as capelin, sprat, herring and sandeel as well as crustaceans (Harris and Birkhead 1985, Bradstreet and Brown 1985, Nettleship and Evans 1985, Lloyd *et al* 1991).

The at-sea dispersion of the razorbill is shown in Fig. 24:

February-April

Birds return to the breeding cliffs during February and were seen in most places around the islands. The main concentrations were found to the south-east of the islands, notably south-east of Sandoy and around Sandoyarbanki. Another distinct concentration was observed over the Faroe Bank. Most of the study area, however, held few or no razorbills and most birds were seen in waters less than or around 200 m deep.

May-August

This period includes both the breeding period and the period when birds disperse flightless from the breeding colonies. Razorbills were still seen in most places around the islands but the exodus from the breeding sites resulted in the main concentrations occurring to the west of Sandoy and Suderoy and further south-west to the Faroe Bank. The Faroe Bank Channel held moderate densities. The southern and eastern parts of the study area held very few razorbills.

September-January

During this period, most razorbills had left the Faroe Bank area. The main concentrations were now observed in waters less than 200 m deep, with peak densities at the 200 m depth contour north of Fugloy Bank.

The razorbill population in the Faroe Islands is small with an estimated 4500 pairs (Bloch *et al.* 1996). The estimate of the total size of the Atlantic population is around 700,000 pairs and the Faroese breeding population comprises approximately 0.6% of that.

During February-April, the total estimated number of Razorbills at sea in the study area was 11,300 birds. The high-density area to the south-east of the islands held a density of 0.8 birds/km² in an area of 4,300 km^2, while the Faroe Bank supported a density of 0.15 birds/km² in an area of 3,300 km^2. A smaller number of razorbills was seen at sea during May-August - an estimated 3,100 birds. The high-density area west of Sandoy and Suderoy held a density of 0.44 birds/km² in an area of 2,350 km^2, while the Faroe Bank held a mean density of 0.45 birds/km² in an area of 560 km^2. During September-January, the total number at sea was estimated at 11,200 birds. The high-density area at the shelf break at Fugloy Bank supported a density of 2.2 birds/km² in an area of 3,850 km^2.

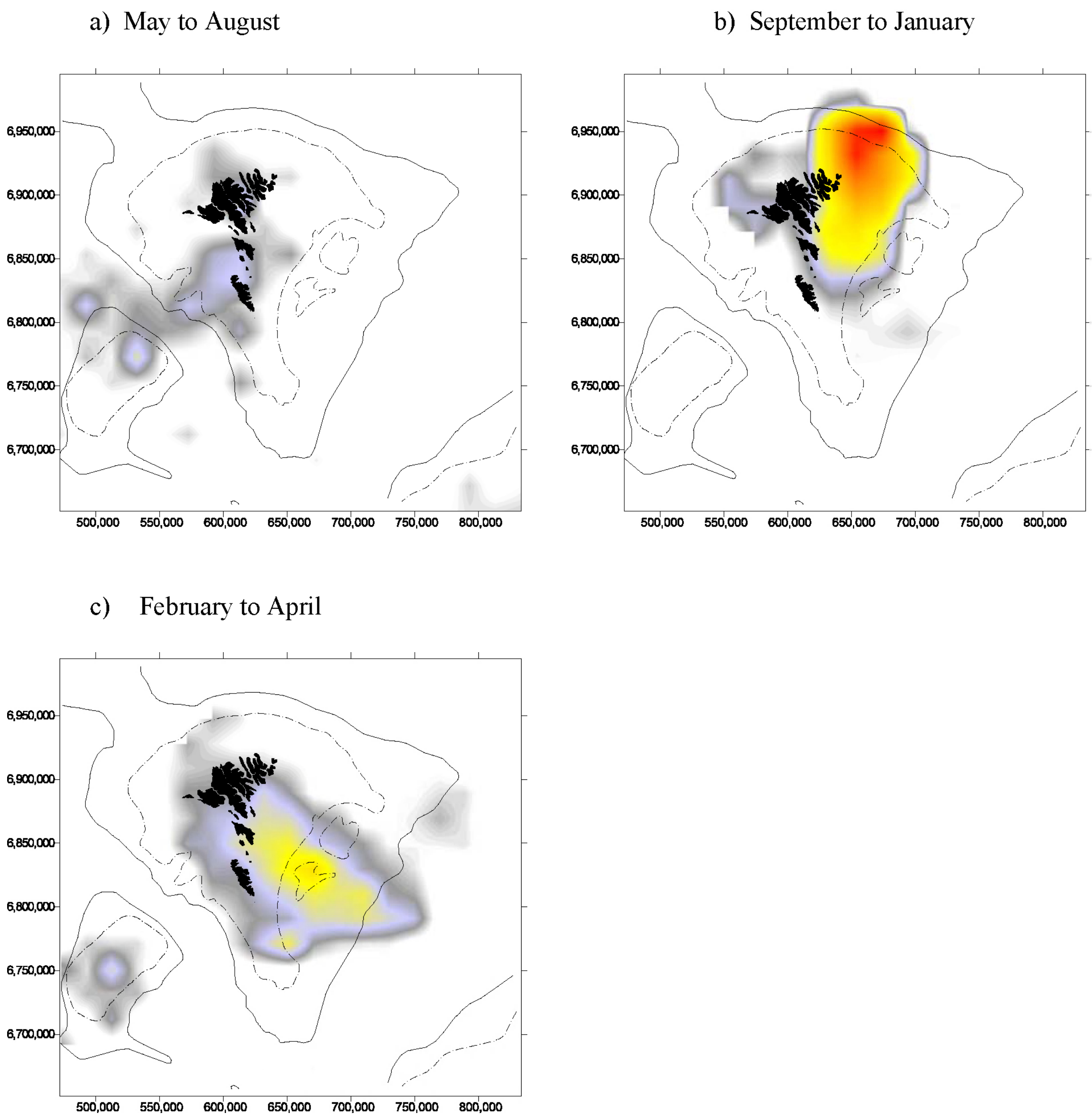
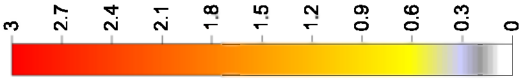


Figure 24. The seasonal distribution and density of razorbill
Axis scale: metres
Bathymetry: dash (200 m isobath); solid (500 m isobath)

Key: Density (birds/km^2)



5.25 Black guillemot *Cepphus grylle*

European population: 1,000,000 pairs; Faroese population: 3,500 pairs.

The black guillemot is the least abundant species of auk in the northern Atlantic. Black guillemots breed on both sides of the Atlantic from high Arctic to boreal regions and generally mature at 4 years of age. They are generally sedentary, although many birds winter offshore in the Baltic Sea and ice cover may force large numbers offshore in the Arctic. In the Faroe Islands, they feed mainly on small fish and benthic food such as crustaceans and polychaetes (Salomonsen 1982, Harris and Birkhead 1985, Durinck *et al.* 1994, Durinck and Falk 1996).

The at-sea dispersion of the black guillemot is shown in Fig. 25. As a sedentary bird it tends to remain in the same general areas in the Faroes year-round with little or no seasonality to its distribution. They were usually recorded close to the islands in waters less than 100 m deep. Extended aggregations of birds were found from Nolsoy to Sandoy and Skuvoy, while only few birds were found to the north of the islands. It must be borne in mind however, that black guillemots mainly frequent the coastal zone, which is not well-surveyed from ships.

Black guillemots breed on most of the Faroe Islands with a population of around 3,500 pairs (Bloch *et al.* 1996). With a total population of approximately 266,000 in the Atlantic, the Faroese birds comprise a mere 1.3% of this.

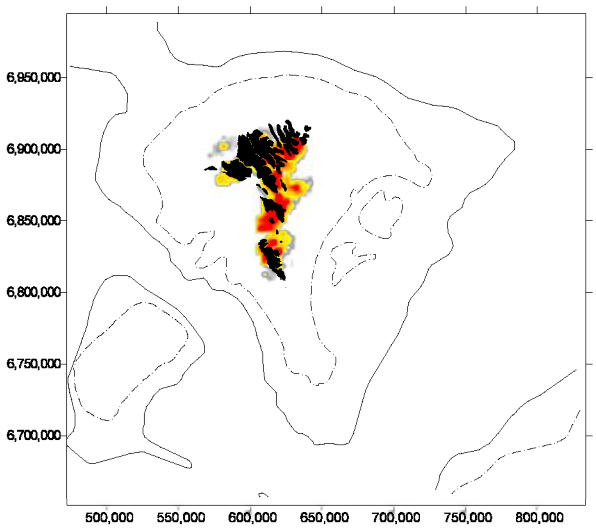
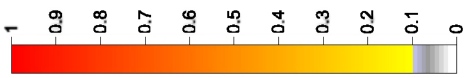


Figure 25. The distribution and density of black guillemot
Axis scale: metres
Bathymetry: dash (200 m isobath); solid (500m isobath)

Key: Density (birds/km^2)



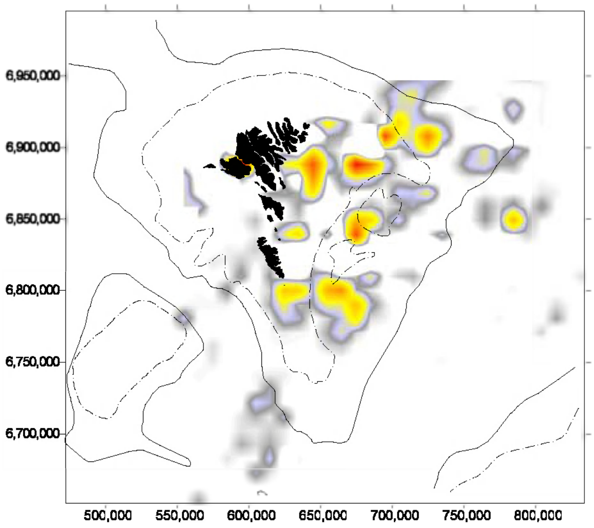
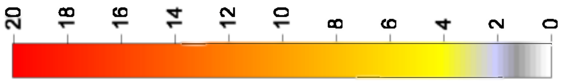


Figure 26. The seasonal distribution and density of little auk, November to March
Axis scale: metres
Bathymetry: dash (200 m isobath); solid (500 m isobath)

Key: Density (birds/km^2)



5.26 Little auk *Alle alle*

The little auk is the most abundant breeding species of seabird in the high Arctic from Baffin Island to Novaya Zemlya, the largest numbers occurring in Greenland and Svalbard. They winter in Arctic to temperate waters and generally feed on zooplankton. The provenance of birds wintering in Faroese waters is not known.

The at-sea dispersion of the little auk is shown in Fig. 26:

November-March

Little auks were seen wintering in the study area only, arriving during September and October and leaving again during March and April. The highest densities were recorded to the east and south-east of the islands along the 200 m depth contour and to the east of Eysturoy and south of Suderoy. They were generally found in quite low densities compared to the approximately 50/km² that occurs to the south-west in the Skagerrak, where 700,000 birds winter (Skov *et al.* 1995a). The apparent absence of birds to the west mainly reflects low survey effort in that area during winter.

Little auks do not breed in the Faroe Islands and with a world population of around 12 million pairs the numbers observed during this study comprise a very small part of the Atlantic population (Nettleship and Evans 1985, Bloch *et al.* 1996).

5.27 Atlantic puffin *Fratercula arctica*

European population: 6,890,000 pairs; Faroese population: 550,000 pairs.

The Atlantic puffin is one of the most abundant species of seabird in the North Atlantic. They breed from Brittany to Svalbard and Greenland. They usually breed for the first time at five years of age, which means that there is a very large subadult population. They prey mainly on small schooling fish especially sandeel and herring (Salomonsen 1982, Harris and Birkhead 1985, Anker-Nilssen, T. 1992, Falk *et al.* 1992).

The at-sea dispersion of the Atlantic puffin is shown in Fig. 27:

April-May

Atlantic puffins arrive at the breeding colonies from mid April (Salomonsen 1982) and begin laying eggs in May. The highest concentrations were recorded near Sandoy and Fugloy and in the area of Sandoyarbanki in waters less than or around 200 m deep. Localised concentrations were also found in the southern part of the study area and the Faroe Bank held low densities.

June –August

During the breeding period birds congregated around the islands. The highest densities were recorded around Mykines and Guttagrynna, around Sandoy and north of Kalsoy. The distribution of the highest densities seemed constrained by the tidal front. Less dense concentrations were observed around Fugloyarbanki and the Faroe Bank. All other areas held very low densities or no Atlantic puffins. The birds leave the colonies in late August, many dispersing over the Iceland-Faroe Ridge (Danielsen *et al.* 1990).

September-November

Very few Atlantic puffins were seen in the study area; during this period they occurred mainly in the eastern and southern part of the area.

December-March

Atlantic puffins were virtually absent from Faroese waters during this period; the small numbers recorded occurred around Nolsoyarbanki.

The Faroe Islands hold around 550,000 pairs of Atlantic puffin - about 8.5% of the total world population of an estimated 6.5 million pairs.

The number of Atlantic puffins at sea around the Faroes shows great seasonal variation. The total estimated in the study area in April-May was 174,400 birds, whereas 1.31 million birds were estimated during June-August, 27,120 birds during September-November and 11,780 birds during December-March. During April-May, the high-density area near Sandoy held a density of 40.0 birds/km² in an area of 1,275 km^2, the area at Fugloy had a density of 35.1 birds/km² in an area of 1,245 km^2 and the shelf break at Sandoyarbanki held a density of 27.6 birds/km² in an area of 975 km^2. During the period of peak occurrence during June-August the area inside the tidal front held a density of 75.2 birds/km² in an area of 15,200 km^2.

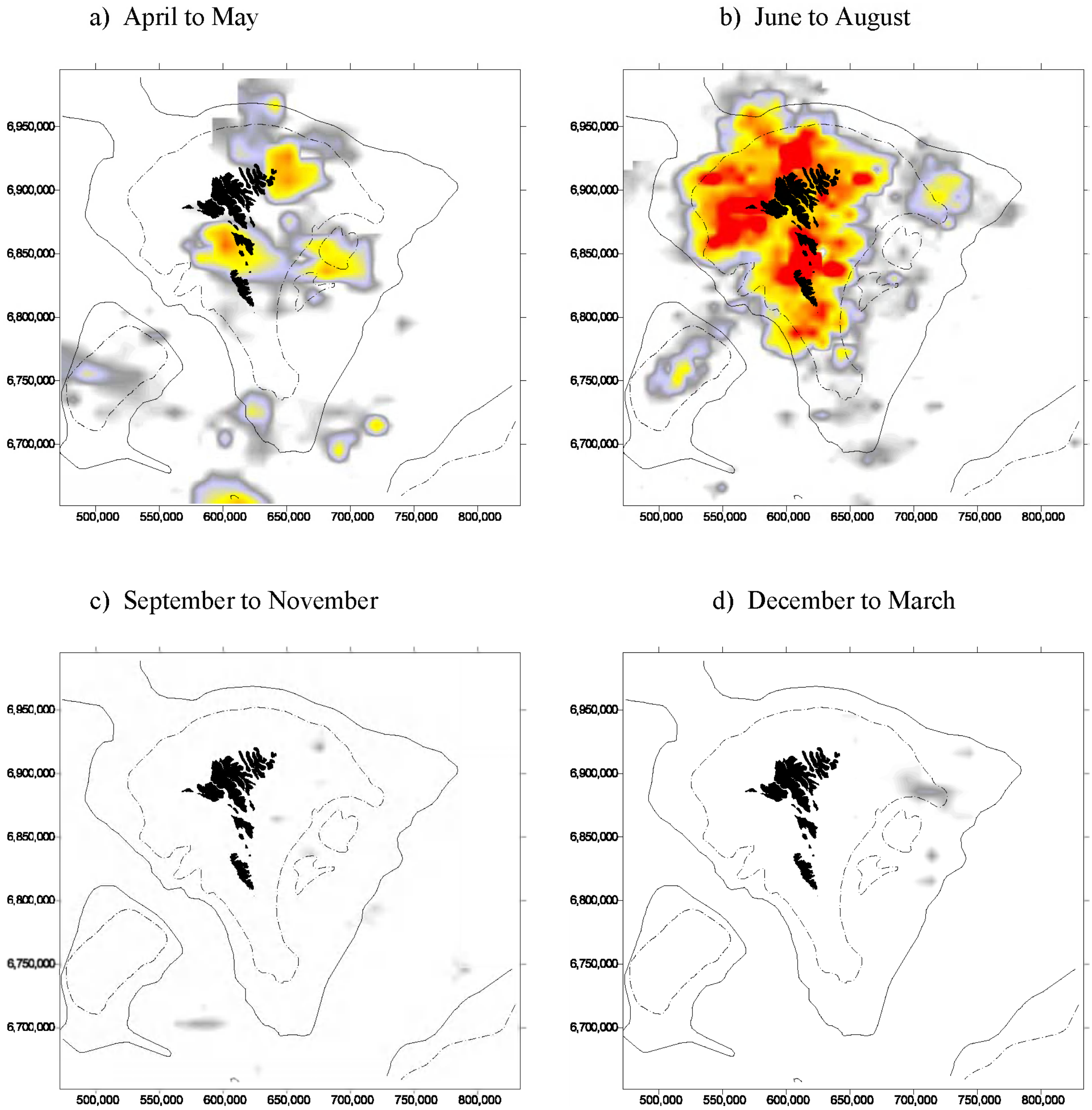


Figure 27. The seasonal distribution and density of Atlantic puffin
Axis scale: metres
Bathymetry: dash (200 m isobath); solid (500 m isobath)

Key: Density (birds/km^2)

5.28 Rare species of seabird

The following species were recorded fewer tan 20 times.

5.28.1 Red-throated diver *Gavia stellata*
Two red-throated divers were seen to the north of Suðuroy in March and another over the Faroe-Shetland Channel in July. Despite being common breeders in Iceland and Scotland, only 15 pairs breed in the Faroe Islands (Bloch *et al.* 1996).

5.28.2 Great northern diver *Gavia immer*
One great northern diver was seen over the Faroe-Shetland Channel in June and another in November. Another four solitary individuals were seen close to the islands during May. Great northern divers are frequently seen from shore as they pass through the islands *en route* to their Canadian and Icelandic breeding grounds.

5.28.3 Great shearwater *Puffinus gravis*
Large numbers of great shearwaters migrate from their south Atlantic breeding islands to the western side of the north Atlantic in the spring (Voous and Wattel 1963). As autumn approaches, numbers increase over the eastern side of the Atlantic, and a few were recorded in the study area. All 13 sightings were in August, except one in September, and almost all were of single birds. Every sighting was over water deeper than 500 m. Most were seen south-east of the Faroe Bank, and over the Wyville Thomson Ridge.

5.28.4 Cory's shearwater *Calonectris diomedea*
One was seen over Fugloy bank to the north-east of the islands, 40 km east of Fugloy, on 7 July 1988. Cory's shearwaters disperse widely over the North Atlantic away from their Meditteranean and Macaronesian breeding colonies during the non-breeding season.

5.28.5 Soft-plumaged petrel sp. *Pterodroma sp.*
A petrel of the soft-plumaged group, probably Fea's petrel *Pterodroma feae*, was seen over the Shetland side of the Faroe-Shetland Channel (113 nautical miles south-east of Sandoy) on 25 June 1996. Fea's petrels breed on the Desertas Islands, Madeira and on the Cape Verde archipelago off north-west Africa.

5.28.6 Great cormorant *Phalacrocorax carbo*
Four great cormorants were recorded just to the south of Sandoy in August 1987. Great cormorants are seen only rarely in the Faroe Islands (Bloch *et al.* 1996).

5.28.7 Red-necked phalarope *Phalaropus lobatus*
Four red-necked phalaropes were seen to the west of the islands during the space of two weeks on one survey cruise at the end of July and beginning of August 1997. Two were over the shelf to the north-west of Mykines in the west, one was over the shelf break due south-west of Mykines, and another was over the north eastern edge of the Faroe Bank. Approximately 50 pairs breed in the islands, but these sightings may have been from more northerly colonies, as the species migrates south from the breeding colonies between the end of June (females) and August (juveniles; Cramp and Simmons 1983).

5.28.8 Grey phalarope *Phalaropus fulicaria*
One grey phalarope was recorded over the shelf slope 74 km north-west of Mykines on 12 August 1988. Grey phalaropes migrate from their breeding grounds on the Arctic tundra to their wintering areas in upwelling zones off the west coast of Africa (Griffiths and Sinclair 1982).

5.28.9 Common tern *Sterna hirundo*
All nine sightings of common terns were made during three days in late August 1997. They were over shallow waters to the east of the islands, except for one which was over the slope due east of Sandoy.

5.28.10 Iceland gull *Larus glaucoides*
Most Iceland gulls do not travel far from their breeding areas in Greenland, but small numbers disperse as far as continental Europe during winter (Grant 1982). Iceland gulls were much rarer than glaucous gulls with only 15 records. All were seen between November and April. There was no obvious pattern to dispersion, but there was a number of records over the Faroe-Shetland Channel.

5.28.11 Sabine's gull *Larus sabini*
One juvenile Sabine's gull was recorded over the northern edge of the Faroe Bank Channel, to the south of Suðuroy, on 29 August 1997.

5.28.12 Brünnich's guillemot *Uria lomvia*
All four sightings of Brünnich's guillemot were in coastal waters. One was seen in July, 20 km to the south of Mykines, and another in August, close to Eysturoy in the north of the islands. The other two sightings were in January, the first 8 km to the north of Eysturoy, and the second, 19 km to the east of Sandoy. Iceland holds approximately 700,000 pairs of Brünnich's guillemots, but only small numbers have been recorded in the Faroe Islands and Shetland (Bloch *et al.* 1996; Johnston 1999).

6. Seabird vulnerability

6.1 Vulnerability maps

The results of the vulnerability analyses described in section 3.4.5 are depicted in Figs. 28-39 for every month of the year. Sea areas holding high densities of the most vulnerable species are shown as dark blue on these maps, with progressively lighter shades of blue indicating reduced vulnerability. Bird symbols are used to show which broad groups of birds are important in the areas that hold vulnerable concentrations, and these are highlighted in the accompanying text for each monthly map. Areas that have not yet been surveyed in sufficient detail are not shaded at all.

The text accompanying each monthly map describes the bird concentrations that underlie areas with the highest vulnerability to oil pollution and also their movements.

6.2 Use of vulnerability maps

The vulnerability maps that follow (Figs. 28-39) are intended to serve as practical conservation tools and should be used as such. In the event of a pollution incident, the importance of the affected area to seabirds may be assessed rapidly by consulting the relevant monthly map. Reference to this document should be part of contingency plans, both for dealing with pollution incidents and for carrying out new offshore operations, or, indeed, any activity where there is a risk of pollution. It is anticipated that the amount of resources allocated to deal with a pollution incident will be governed by the information presented here.

It is important, however, to understand the limitations of monthly vulnerability maps as birds are capable of rapid movement between areas. An area holding high densities of seabirds in one year may hold fewer birds in a later year. This is especially true for species dependent on offshore habitats, where food resources and environmental conditions can be unpredictable. The maps are based upon seabird data collected intermittently over twenty-one years and therefore show only average levels of vulnerability over this period. To obtain accurate and up to date information for a potentially vulnerable area affected by an oil spill, the best option may be to carry out a rapid survey.

When using this document to inform decisions surrounding pollution incidents it is important to refer to the maps and text relating to at least one month before and one month after the month of occurrence of these incidents; this affords a more complete indication of, and broader context in which to place, seabird concentrations and larger-scale movements. At all times appropriate liaison should be maintained with the statutory authorities responsible for pollution control and reporting.

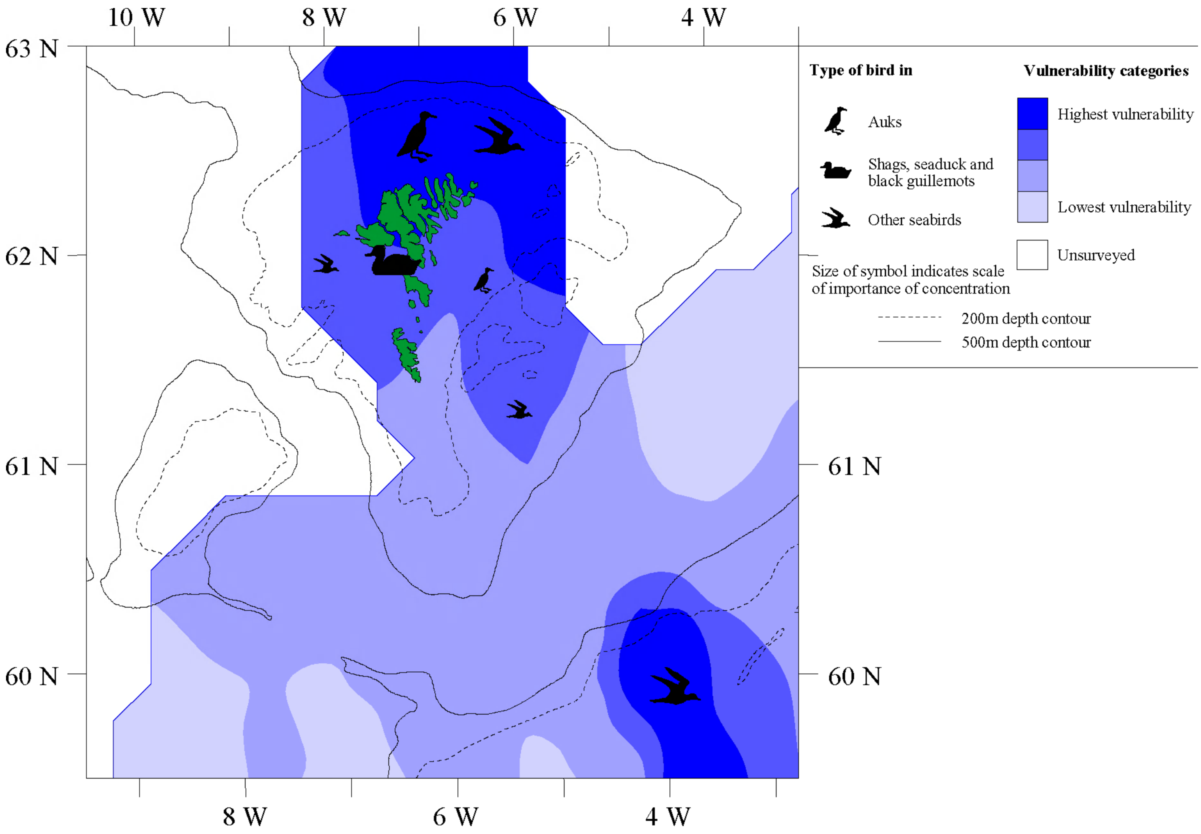


Figure 28. Seabird vulnerability to surface pollution in the waters around the Faroe Islands in January

6.3 Seabird vulnerability in January

Northern fulmar breeding ledges are fully occupied by January, and numbers are swelled further by the arrival of large numbers of non-breeders and immature birds. Densities are very high in shelf waters at this time, especially close to large colonies such as Vagar. Large numbers of northern fulmars are also found along the continental shelf break to the north and north-east of the Faroes. Densities are much lower in the southern part of the study area, although moderate densities are present over the Faroe Bank and northern Faroe Bank Channel. There is a lack of data from the western part of the study area.

Black-legged kittiwakes are the most numerous and widespread gull species in the study area; birds are present in moderate concentrations throughout the study area, over both shallow and deep water. The highest densities are recorded over the eastern Faroe Bank Channel, and over the Scottish shelf break and slope, on the Scottish side of the Faroe-Shetland Channel. Notable concentrations of great black-backed gulls are also present over the Scottish shelf break in January. Glaucous gulls are concentrated over the banks to the east of the Faroes.

Few northern gannets are recorded in Faroese waters during January, although larger numbers are present over the Scottish continental shelf. Moderate densities of razorbill are found over the banks to the east of the Faroes. Common guillemots are scarce during January, although survey coverage was poor, particularly in the west and north-east of the study area.

Populations of inshore species such as European shag, common eider and black guillemot are largely sedentary in the Faroes, and are therefore found close to the islands throughout the year (refer to April and October for details of distribution).

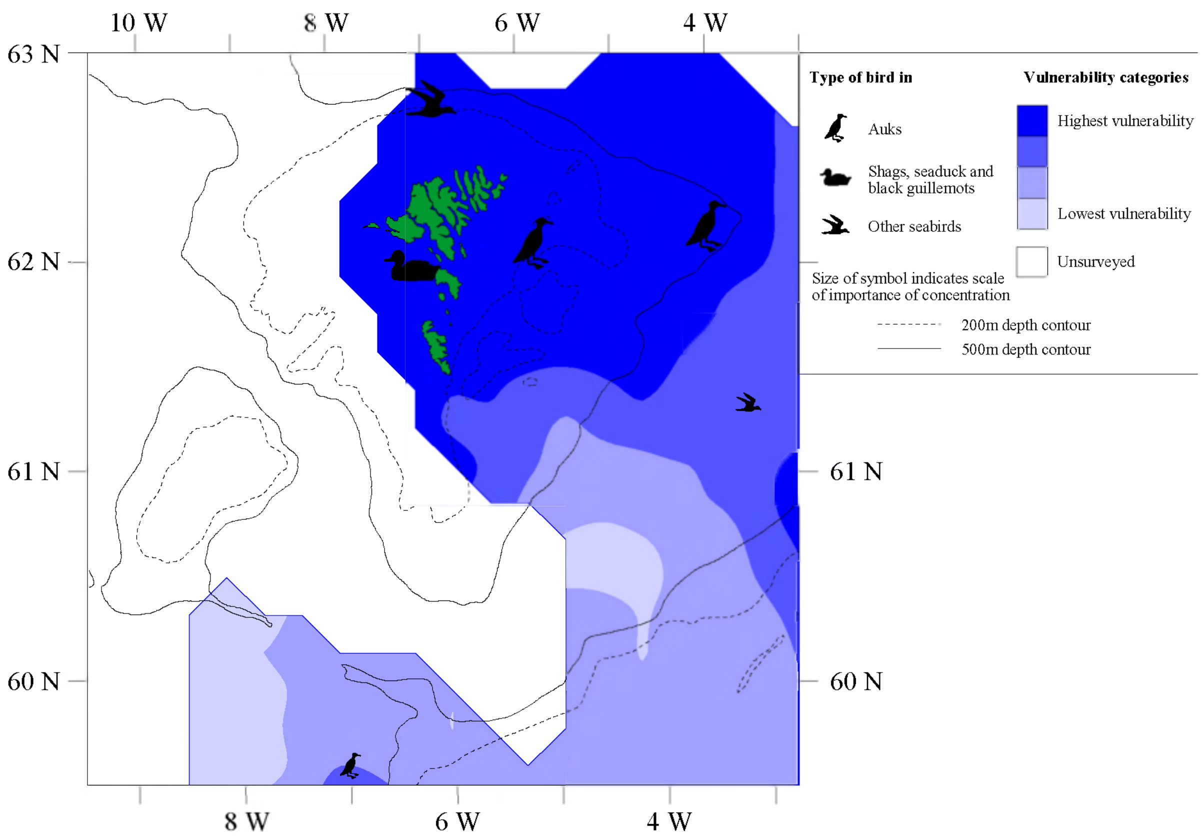


Figure 29. Seabird vulnerability to surface pollution in the waters around the Faroe Islands in February

6.4 Seabird vulnerability in February

Northern fulmar numbers are again abundant in Faroese shelf waters close to the islands and along the shelf break to the north of the islands. Numbers are higher over the southern Faroe-Shetland Channel than in January. Northern gannets are found in low densities to the west of the Faroes as they begin to return to their nest sites on Mykinesholmur in February. Black-legged kittiwakes are present in moderately high concentrations and are widely distributed over the study area.

Breeding common guillemots begin to return to their colonies from early February onwards; moderately high densities of birds are found throughout most of the Faroe Plateau. The highest concentration of common guillemots occurs just beyond the 200 m depth contour to the north-east of the islands; fewer birds are present in the Faroe-Shetland Channel. High densities of razorbills occur to the south-east of Bordoy. Little auks wintering in Faroese waters move northwards during February, and large concentrations are only occasionally recorded close inshore. The Faroe Bank, Faroe Bank Channel and western part of the study area have yet to be surveyed.

Inshore concentrations of European shag, common eider and black guillemot remain close to the islands (refer to April and October for details of distribution).

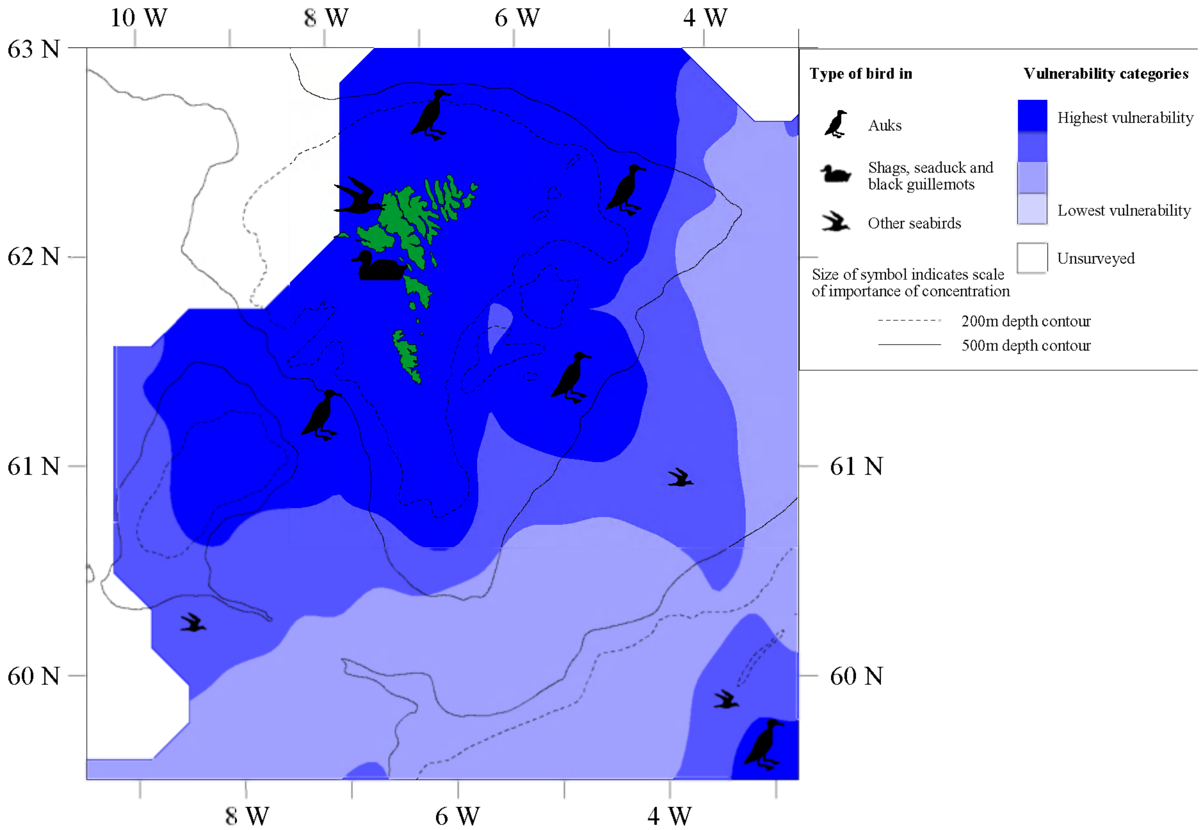


Figure 30. Seabird vulnerability to surface pollution in the waters around the Faroe Islands in March

6.5 Seabird vulnerability in March

Moderately high densities of common guillemots are again present over the Faroe plateau, and the banks to the east of the islands also hold large numbers of birds. Razorbills are concentrated over the banks to the south-east of Sandoy, and over the Faroe Bank; breeding adults return to their colonies in the Faroes during March. Atlantic puffins are present in low numbers over the shelf and slope, with some areas of higher density found at the shelf break to the north and east. Birds become more abundant and widespread close to the islands during March.

Great skuas return to Faroese waters in March, and are found in isolated patches over the slope mainly to the south of the islands, but none occur over the shelf. A notable concentration of great black-backed gulls is found at the shelf break to the north-east of the islands. Black-legged kittiwake numbers begin to build up close to the islands as birds return to their colonies. The highest concentrations are found to the south of Vagar.

Manx shearwaters return in March, although they are restricted to the Faroe Bank. Northern fulmar densities remain high over much of the study area, particularly over shelf waters and over the shelf break to the north of the islands. The number of northern gannets increases and moderately high densities are found over the shelf break to the south-west of the Faroes. The north-west and south-west of the study area has yet to be surveyed fully.

Inshore species such as European shag, common eider and black guillemot are concentrated close to the islands (refer to April and October for details of distribution).

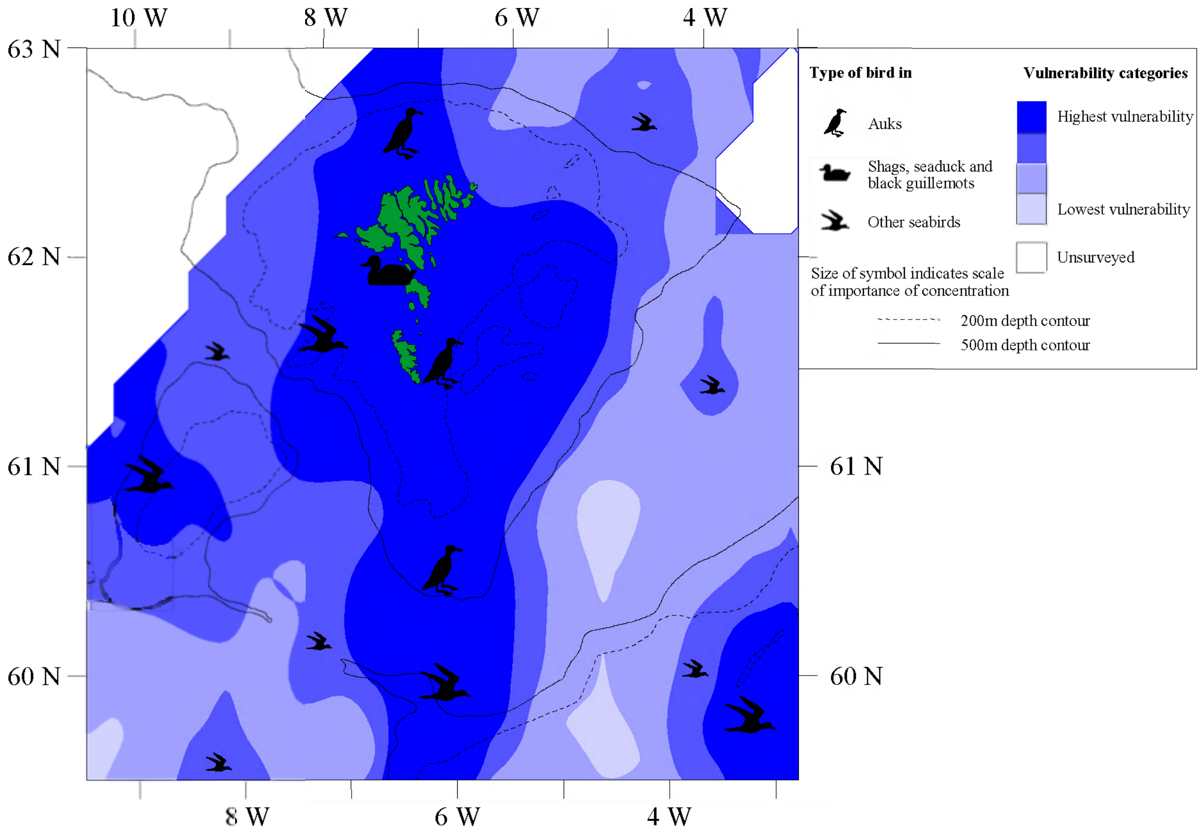


Figure 31. Seabird vulnerability to surface pollution in the waters around the Faroe Islands in April

6.6 Seabird vulnerability in April

Atlantic puffin densities are high around the islands, particularly the southern ones that have the largest colonies. Breeding adults return to their colonies in the Faroes from mid-April onwards. Adult common guillemots and razorbills are strongly associated with their colonies now. Very high densities of northern fulmars are present beyond the shelf break to the south, and this may be due to a pre-laying exodus of breeding birds from their colonies. High densities continue to be recorded close to the islands and beyond the shelf to the north-east. Manx shearwaters are again restricted to the Faroe Bank. Moderately high densities of northern gannets are found over the shelf break to the south-west of the Mykines, and over the Faroe-Shetland Channel. Both Arctic and great skuas return to their colonies at the end of the month to breed. Great skuas are found in isolated patches over the slope to the south of the islands. Black-legged kittiwake numbers continue to increase at colonies as they prepare to commence breeding. Returning lesser black-backed gulls are present in low densities and are widely scattered over the study area, mainly beyond the shelf break. Survey coverage is limited in April for the north-west of the study area.

Black guillemots forage only up to about 5 km from their nest sites and so are under-recorded because most surveying is undertaken further offshore. They are sedentary within Faroese waters and breed on most of the islands. Although black guillemots are present throughout the year, they are more easily observed in April as birds gather at nest sites to display. Low densities of European shags are recorded close to the islands throughout the year; densities may be higher than recorded as birds prefer to feed in water between 15 m and 40 m deep, whereas surveying has been concentrated further offshore. Common eiders are another species that is under-recorded by offshore surveys as they prefer to feed in water less than 4 m deep. The Faroese population is sedentary. These species occur in all inshore waters of the Faroe Islands, but in highest numbers around colonies and in sheltered waters.

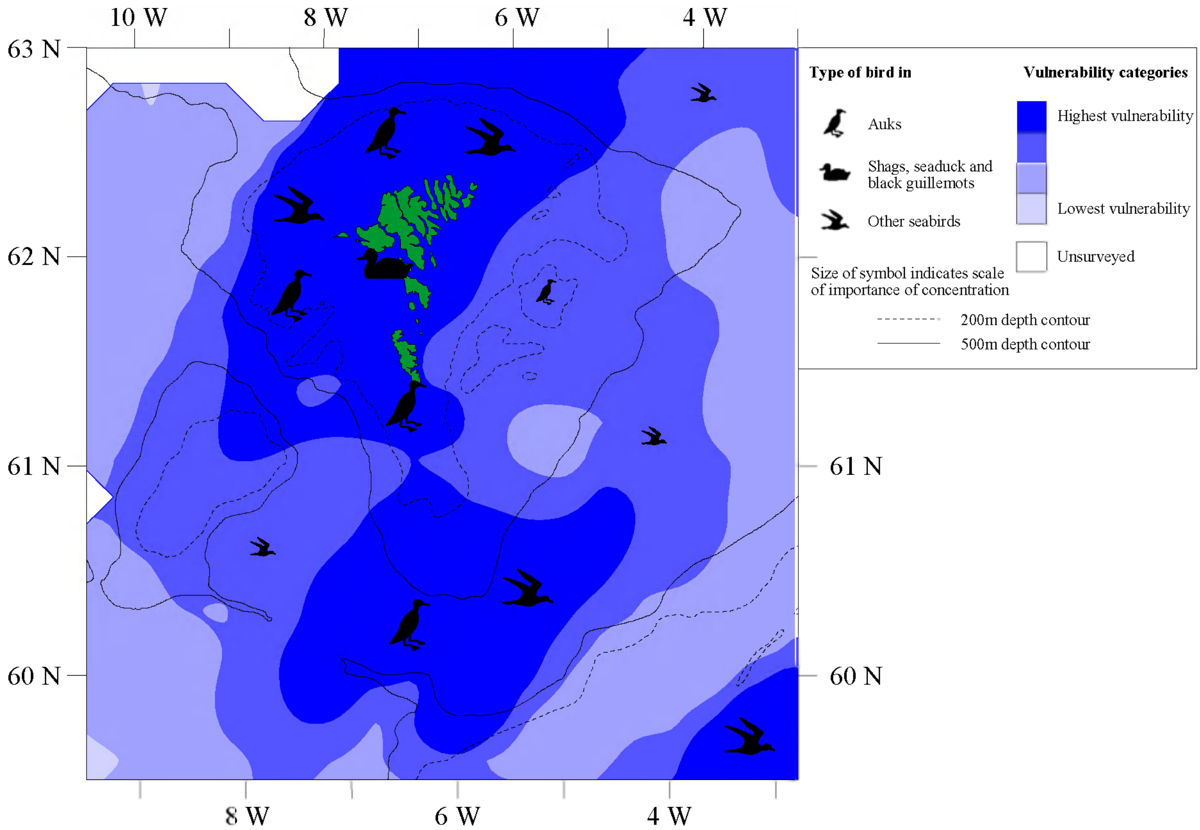


Figure 32. Seabird vulnerability to surface pollution in the waters around the Faroe Islands in May

6.7 Seabird vulnerability in May

Common guillemots are present throughout the study area, but are most concentrated near the colonies. There is a significant increase in the number of birds inshore with the arrival of non-breeders and immatures. The highest densities are recorded to the south-west of Sandoy, Skuvoy, Dimun and Suduroy, which contain the largest colonies in the Faroes. During the breeding period, razorbills are present at low densities over much of the Faroese shelf. Localised patches of higher density were recorded to the north-west of the islands during May. As the breeding season progresses, high densities of Atlantic puffins are found over much of the shelf, and also over the banks to the east and south-west, as well as the Faroe Bank Channel and the south-west Faroe-Shetland Channel. Few birds are seen over the rest of the Faroe-Shetland Channel. High densities of northern fulmars are again found over shelf waters close to the islands, and just beyond the shelf break. All breeding Manx shearwaters have returned to their colonies by May, most of which are on the western side of the Faroes. Northern gannets occur in moderately high densities to the south-west of the Mykines, and over the Faroe-Sheland Channel.

During the breeding season, black-legged kittiwakes are abundant over the central Faroe shelf, the shelf break to the north and south of the islands, and over deep water in the Norwegian Sea and Faroe-Shetland Channel. Moderately high densities are present elsewhere in the study area. From May onwards, breeding black-legged kittiwakes are supplemented by an influx of non-breeders and immatures. Herring gulls feed inshore and remain close to their colonies during the breeding season so offshore surveys may therefore underestimate densities of this species. Great black-backed gulls are sparsely distributed around the islands and offshore banks, with concentrations over the Faroe Bank Channel and to the south-east of Suduroy. Low densities of lesser black-backed gulls are widely distributed close to the islands and beyond the shelf. Arctic terns arrive in Faroese waters during May, and small numbers are seen over the Faroe-Shetland Channel and closer to the islands. Low densities of Arctic and great skuas occur over the Faroe plateau and at the shelf break adjacent to Shetland.

Inshore species such as European shag, common eider and black guillemot are concentrated close to the islands (refer to April for details of distribution).

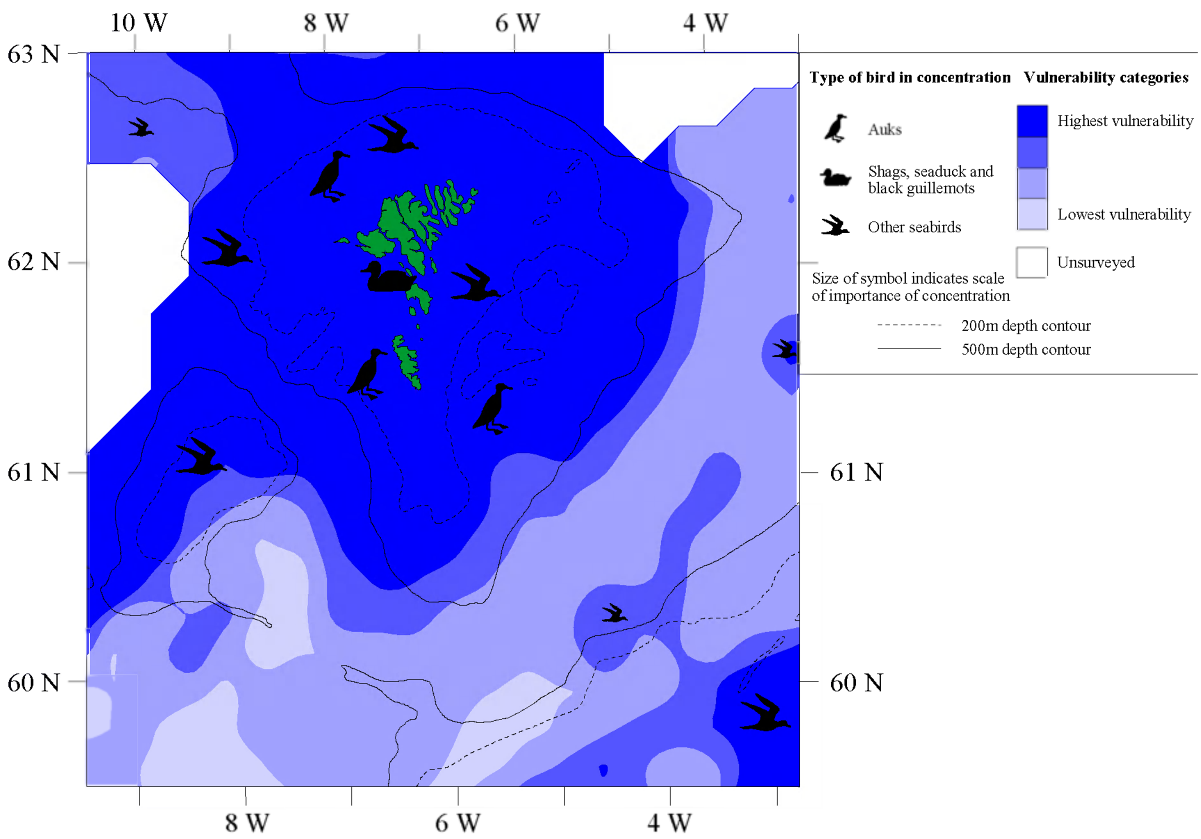


Figure 33. Seabird vulnerability to surface pollution in the waters around the Faroe Islands in June

6.8 Seabird vulnerability in June

Breeding seabirds in the study area are more concentrated close to their colonies in June than at any other time of the year. High concentrations of birds vulnerable to oil pollution are distributed throughout Faroese waters around the islands and up to the shelf break, and also in the extreme south-east of the study area close to colonies in Shetland and Orkney. Very high densities of northern fulmars are found beyond the shelf break to the south of the islands, and high densities are present throughout shelf waters. Manx shearwaters are concentrated in three areas; the Faroe Bank, west of Sandoy, and along the south-west break of the Faroese shelf. The Faroe Islands hold approximately 40% of the world population of European storm-petrels; the two largest colonies are on Nolsoy and Sandoy, and high densities of birds are found to the east of these two islands. Peak densities of northern gannets occur in June, with most birds recorded to the west of Mykinesholmur, the only northern gannetry in the Faroes.

The highest densities of common guillemots are found to the west of Mykines and to the south-west of the islands, where the largest colonies such as Sandoy are found. Breeding adults do not usually forage futher than 60 km from their colonies. Razorbills are found in localised patches of high density to the south of Sudoroy. Very large numbers of Atlantic puffins are found close to the islands and high densities occur over much of the Faroese shelf, with a notable concentration to the north-west. Atlantic puffin numbers are swelled in late June with the arrival of non-breeding birds. Breeding auks are particularly vulnerable to oil pollution. Black-legged kittiwakes are abundant close to the Faroes and over much of the shelf. Peak numbers of lesser black-backed gulls at colonies occur during June, and high densities are found over shelf waters close to the islands. Moderately high densities of Arctic skuas are present over the outer shelf to the north-west of Mykines. Great skua numbers peak at sea in June, and moderately high densities are found south of Vagar, over the shelf break to the north-west, along the eastern side of the islands, and over the Faroe-Shetland Channel. High densities of Arctic terns occur over the inner Faroese shelf, and moderately high densities are found at the shelf break to the west of Suduroy.

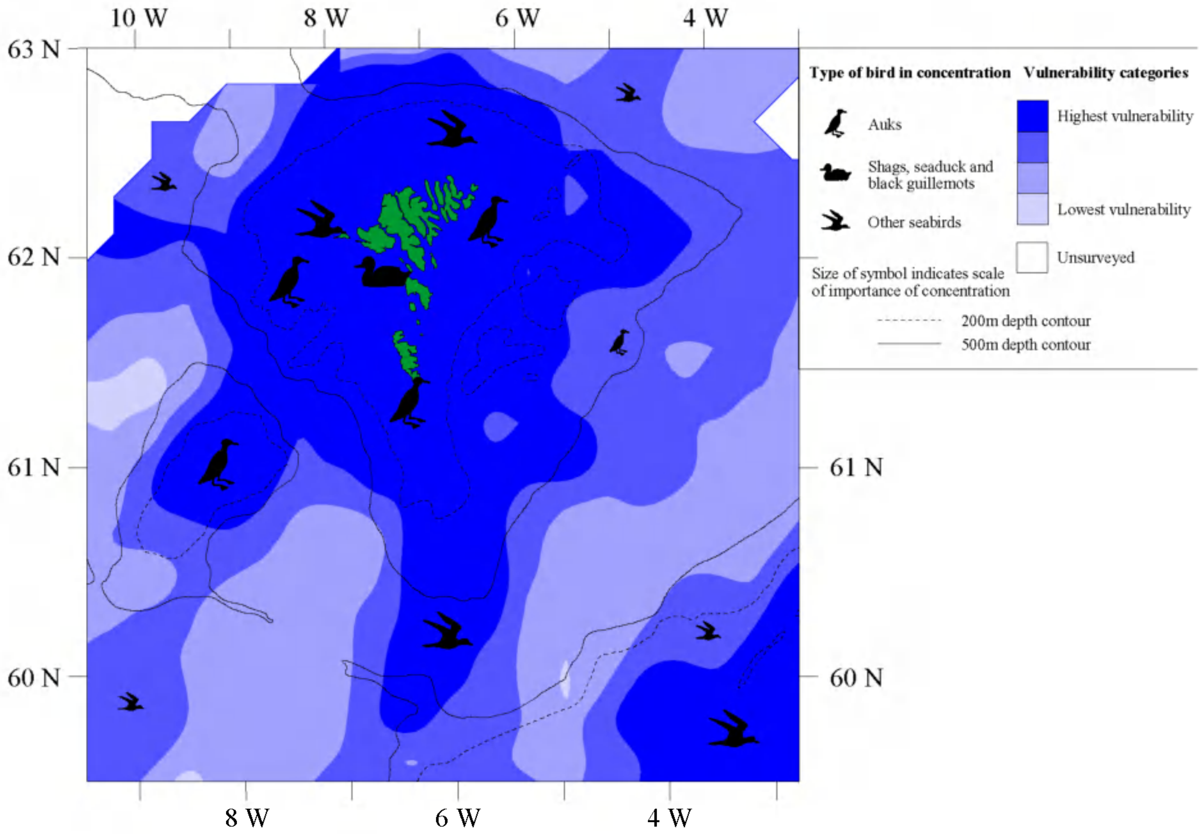


Figure 34. Seabird vulnerability to surface pollution in the waters around the Faroe Islands in July

6.9 Seabird vulnerability in July

Young common guillemots and razorbills disperse with their parents to offshore banks such as the Faroe Bank, and to the south of Suduroy. Razorbills are found in localised patches of higher density to the north-west of Suduroy and south-west of Skuvoy. Adults of both species become flightless during July, and so, with their flightless chicks, are especially vulnerable to surface pollution at this time. High densities of Atlantic puffins are found over most of the Faroese shelf, with fewer birds over the Faroe Bank and Faroe-Shetland Channel. Atlantic puffin chicks begin fledging from late July and disperse to the offshore banks. Adult auks begin moulting and are particularly vulnerable to surface pollutants as they become flightless. Black-legged kittiwakes are abundant around the islands and moderately high densities are present elsewhere in the study area. With chicks fledging from late July onwards, there is a general dispersal of adults and juveniles to the shelf break and beyond. The highest concentrations of lesser black-backed gulls occur within 20 km of the islands.

Northern fulmar densities remain high throughout shelf waters up to the 200 m depth contour, with notable concentrations to the north-west of the islands and south-west of Suduroy. Large numbers of Manx shearwaters are found to the west of Sandoy and Skuvoy, which hold the largest Faroese colonies. Numbers of European storm-petrels at sea peak with the arrival of non-breeders and immatures; densities are highest over the 200 m depth contour to the north and north-east of the islands, and over the slope to the west. Leach's storm-petrels also reach peak abundance, with numbers augmented by non-breeders. Highest densities of these are found over the Wyville Thompson Ridge, and at the shelf break to the south-west of Mykines, which holds the only Faroese colonies. Northern gannet numbers also increase by the arrival of non-breeders from mid July onwards, the highest concentrations occuring to the west of Mykines. The number of great skuas attending colonies peaks with the arrival of non-breeders; highest densities are found in shelf waters to the north and west of the islands, and over the Faroe-Shetland Channel. Arctic skuas leave their colonies during late July and are more widely distributed throughout the study area, with notable concentrations around Sandoy and Skuvoy. The highest densities of Arctic terns are found within inner shelf waters, close to the islands. Inshore species such as European shag, common eider and black guillemot are again concentrated close to the islands (refer to April for details of distribution).

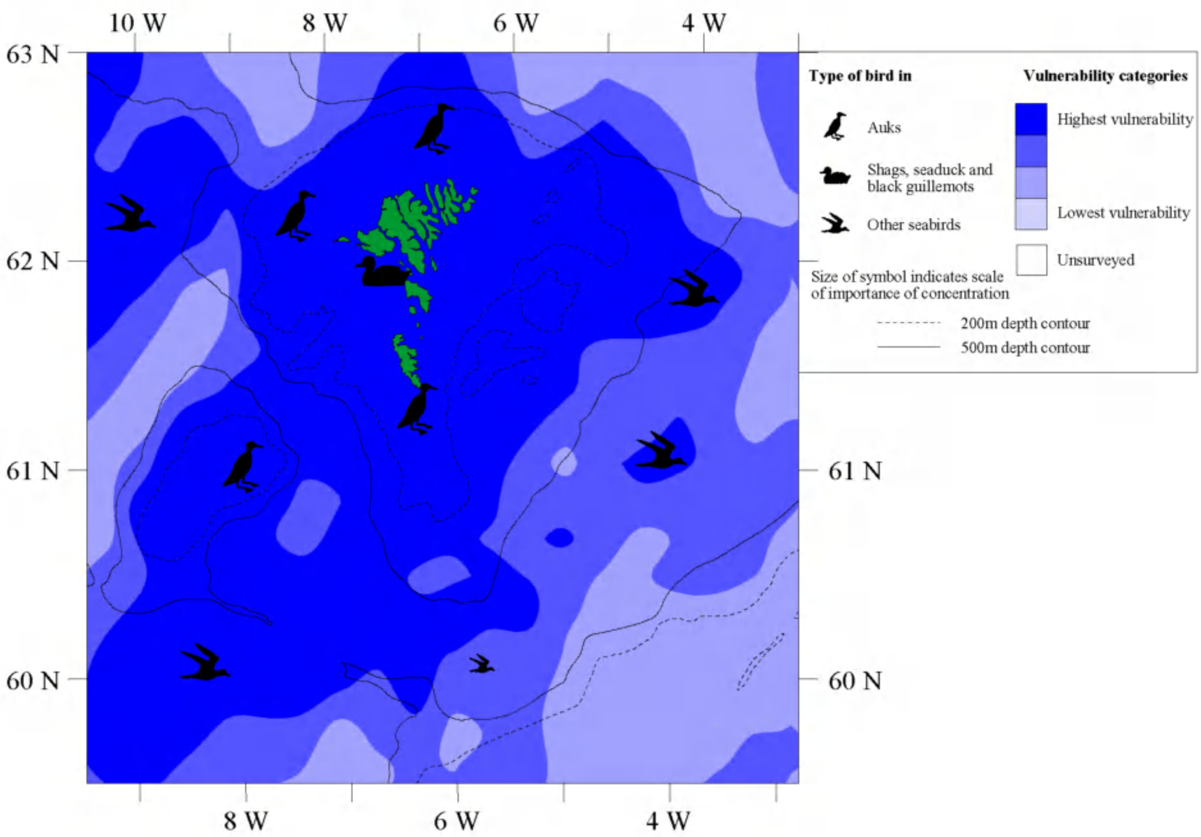


Figure 35. Seabird vulnerability to surface pollution in the waters around the Faroe Islands in August

6.10 Seabird vulnerability in August

High densities of northern fulmars are recorded over much of the shelf and slope areas, with the exception of the Faroe-Shetland Channel. There is greater dispersal away from the islands towards the slope to the south, and to the Faroe Bank Channel, as chicks begin to fledge from late August onwards. High densities of sooty shearwaters are found over the south-western shelf break. This area and the Faroe Bank is again important as a feeding area for Manx shearwaters. The number of European storm-petrels at sea is augmented by immatures and non-breeding birds, particularly over the Nolso Bank to the east of the islands, and over the shelf break to the north and north-east of the islands. Leach's storm-petrels reach peak abundance and favour the Wyville Thompson/Ymir Ridge system in the far south-west of the study area. Breeding northern gannets disperse widely over the Faroe Plateau, and numbers are further swelled with the arrival of non-breeders. Peak densities are found to the west of the Mykines, while areas of locally high abundance occur over the 1,000 m contour to the north of the islands and over the Faroe Bank Channel.

The highest densities of common guillemots are found over the Faroe Bank and south of Suduroy, comprising moulting adults and flightless chicks. There is also some post-breeding dispersal of razorbills from the south and south-west of the islands towards the Faroe Bank. Atlantic puffin densities peak over the northern edge of the Faroe Bank during August, and high densities are present to the north of the islands as they disperse towards the Iceland-Faroe Rise. Black-legged kittiwakes continue to disperse from their colonies to feeding areas at the shelf break and beyond, particularly to the west of the islands. Arctic terns are most abundant over the Faroe Bank, although moderate densities remain around the islands. Breeding Arctic and great skuas associate less with their colonies and are therefore more widely distributed throughout the study area. Concentrations of great skuas occur in shelf waters to the north and west of the islands, and over the Faroe-Shetland Channel. Pomarine and long-tailed skua numbers peak in August as they pass through Faroese waters. Lesser black-backed gulls leave their colonies and migrate south during the month. Moulting birds such as common eiders and auks are particularly susceptible to surface pollution as they are flightless and slow to take avoiding action. Inshore species such as European shag, common eider and black guillemot are again concentrated close to the islands (refer to April for details of distribution). Moulting black guillemots begin to congregate during late August in sheltered inshore waters.

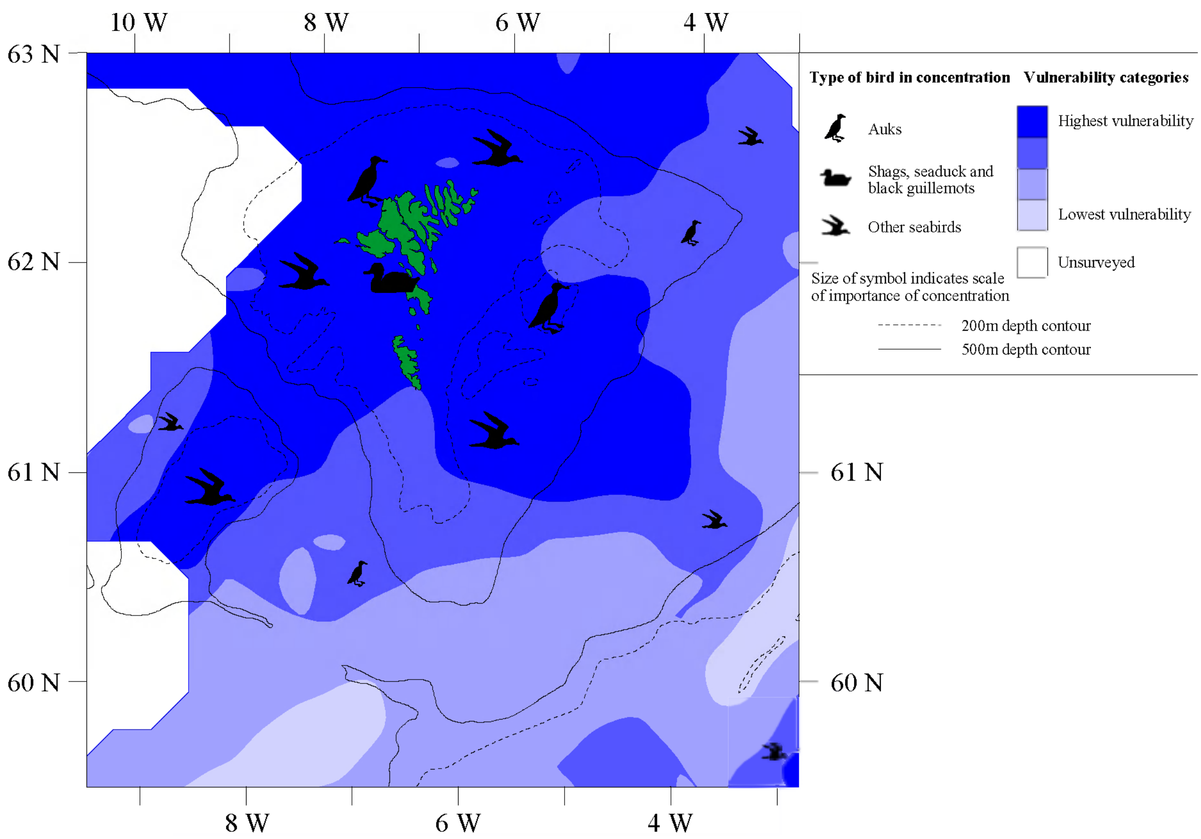


Figure 36. Seabird vulnerability to surface pollution in the waters around the Faroe Islands in September

6.11 Seabird vulnerability in September

Northern fulmar densities are very high close to the islands and over shelf waters to the north and west. Moderately high densities are present over the slope to the south-east, and just beyond the shelf break to the north-east of the Faroes. Northern fulmar chicks fledge by early September and disperse to offshore areas. The number of Manx shearwaters present at colonies continues to decrease as breeding adults depart for wintering areas; fledglings leave shortly afterwards and moderately high concentrations of shearwaters are found over the Faroe Bank. Peak numbers of European storm-petrels occur at two areas during September; one in the vicinity of the colonies and to the south-east of the islands, and the other just beyond the shelf break to the north-east of the islands. Most adult and young Leach's storm-petrels leave their colonies during the month. Breeding northern gannets continue to disperse from their colonies and are widely spread over the Faroe Plateau, with concentrations to the west of the Mykines, and also over the Faroe Bank Channel and Faroe-Shetland Channel.

Great skuas are also widely distributed over much of the Faroese shelf and slope, although few birds are present by the end of the month. Moderately high densities are found to the north and west of the islands, and over the Faroe-Shetland Channel. Arctic skuas from more northerly colonies pass through Faroese waters in September. There is a notable concentration of black-legged kittiwakes to the west of Sandoy, and birds are widely scattered throughout the study area. Numbers are further supplemented by birds, particularly juveniles, dispersing from colonies in Shetland. Arctic terns remain around the islands, although in much reduced numbers. The banks to the east and south-east of the islands hold moderate densities of common guillemots. No large concentrations of razorbills are present, although survey coverage to the west and south-west of the islands is poor. The number of Atlantic puffins decreases dramatically as most have left shelf waters.

Black guillemots undergo a flightless period while they moult during September. They form dense aggregations, usually in sheltered inlets around islands, at this time of year. Other inshore species such as European shag and common eider are also concentrated close to the islands (refer to April for further details of distribution).

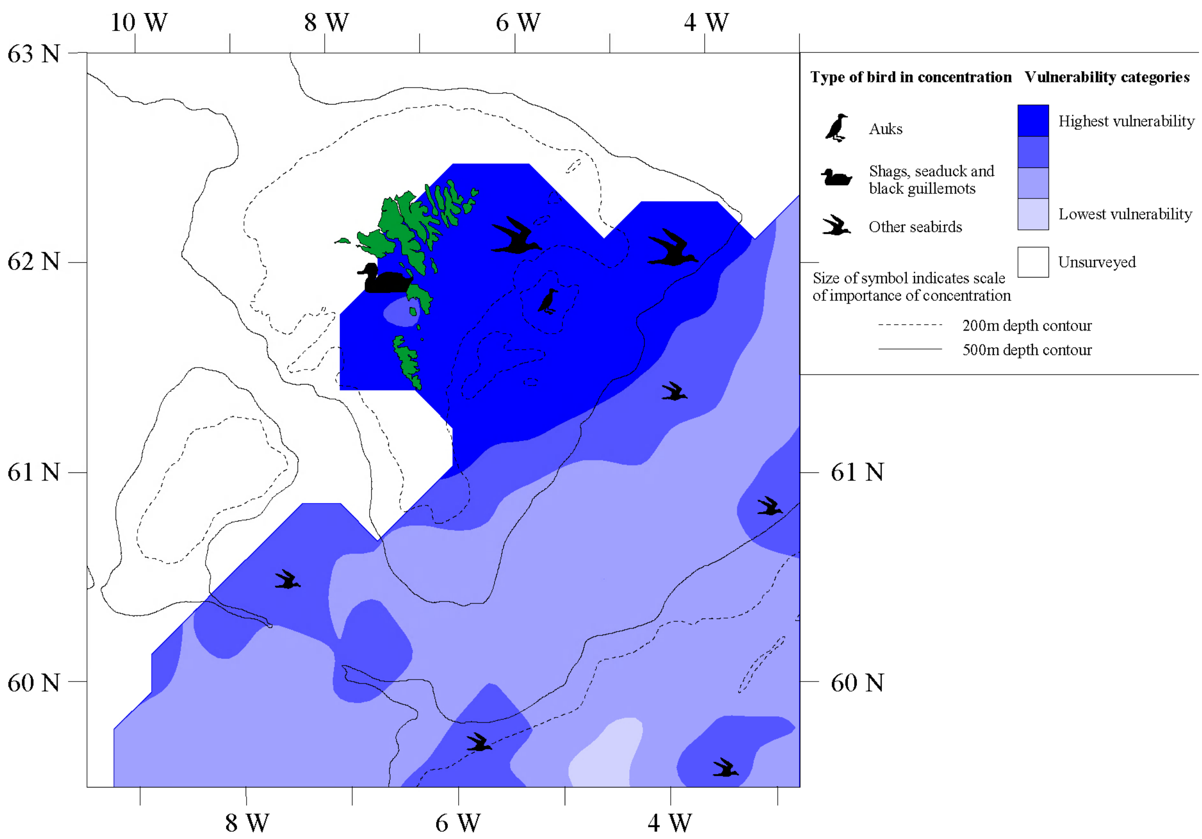


Figure 37. Seabird vulnerability to surface pollution in the waters around the Faroe Islands in October

6.12 Seabird vulnerability in October

Northern fulmar densities are very high in shelf waters to the north and west of the Faroes, and around the islands of Vagar, Kalsoy, Fugloy and Sandoy. Moderately dense concentrations are found beyond the shelf break to the north-east, and over the banks to the south-east of the islands. Only low densities of northern fulmars are found in the southern part of the study area. The main fledging period for European storm-petrels begins in late October. The northern gannetry on Mykinesholmur is deserted by early October, and very few are present in Faroese water during the winter.

Black-legged kittiwake numbers reduce considerably, but are still present throughout much of the study area at low densities. Survey effort was too low to assess the importance of the banks to the east of the islands for common guillemots, although evidence suggests they are likely to be abundant. For razorbills, distribution to the south and west of the islands needs to be clarified as survey coverage was poor. No surveying has been undertaken beyond the shelf break to the north and west of the islands during October.

After moulting, black guillemots remain in dense aggregations in sheltered inshore waters. European shags start to disperse from their colonies at this time and there is likely to be a net exodus from Faroese waters over the winter period, largely of immature birds. Common eiders that nest on the Faroe islands will remain in inshore waters for the winter.

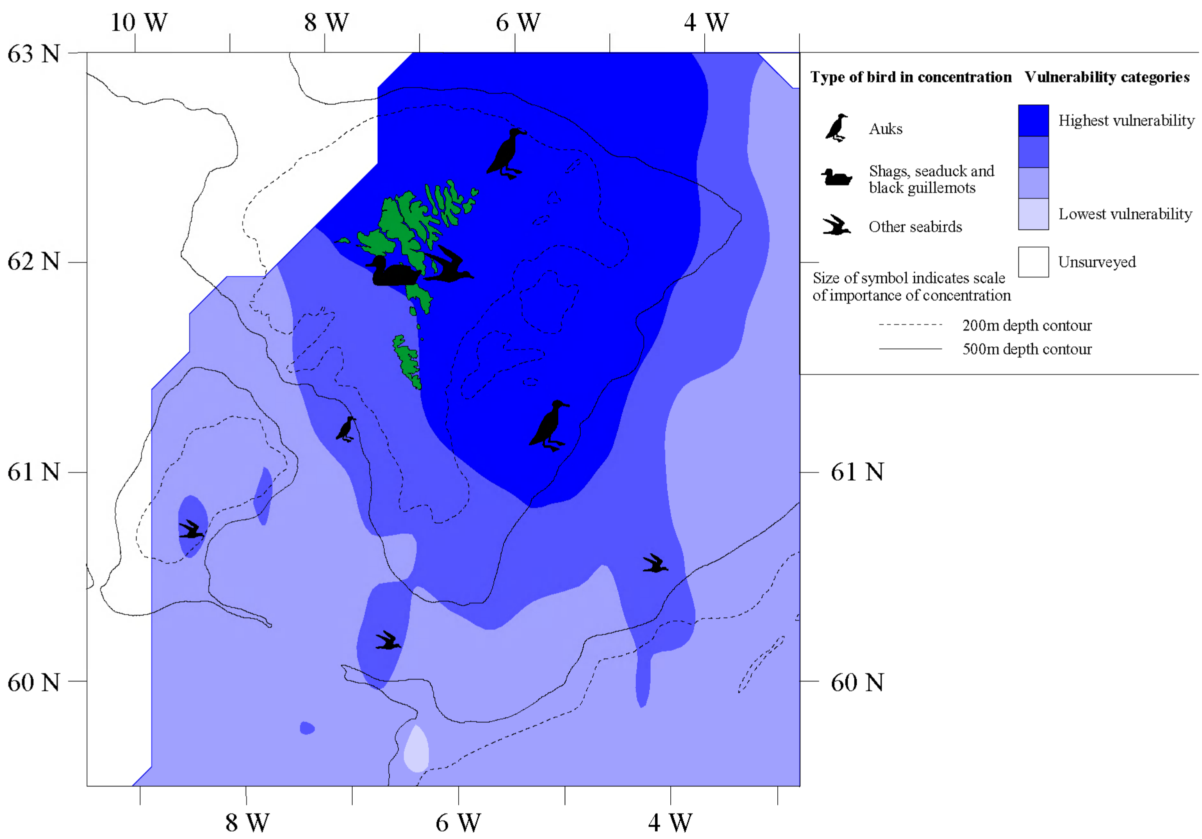


Figure 38. Seabird vulnerability to surface pollution in the waters around the Faroe Islands in November

6.13 Seabird vulnerability in November

Moderately high densities of common guillemots are associated with the banks to the east of the islands, especially around the 200 m depth contour. High densities of razorbill are found in coastal waters to the north-east of the islands and are concentrated over the 200 m contour to the north of Fugloy, while lower densities are found to the south of the Faroes. Little auks generally arrive in Faroese waters during November; the highest concentrations are found over the outer shelf and banks, especially to the east of the islands. Moderate concentrations continue east to the Faroe-Shetland Channel. Atlantic puffins are found in moderately high densities over the Faroese shelf and banks to the east of the islands.

Northern fulmars first return to their colonies during the month, and high densities are present around the islands and over the shelf break to the north and north-east. Low densities of northern fulmars are found throughout the southern parts of the study area. The main fledging period for European storm-petrels continues into early November. Wintering glaucous gulls are most numerous from November onwards, when the largest concentrations are found over the slope to the east of the islands. Black-legged kittiwakes are scattered across the study area at low densities. Survey coverage is poor to the west of the study area.

Inshore species such as European shag, common eider and black guillemot remain concentrated close to the islands (refer to April and October for further details of distribution).

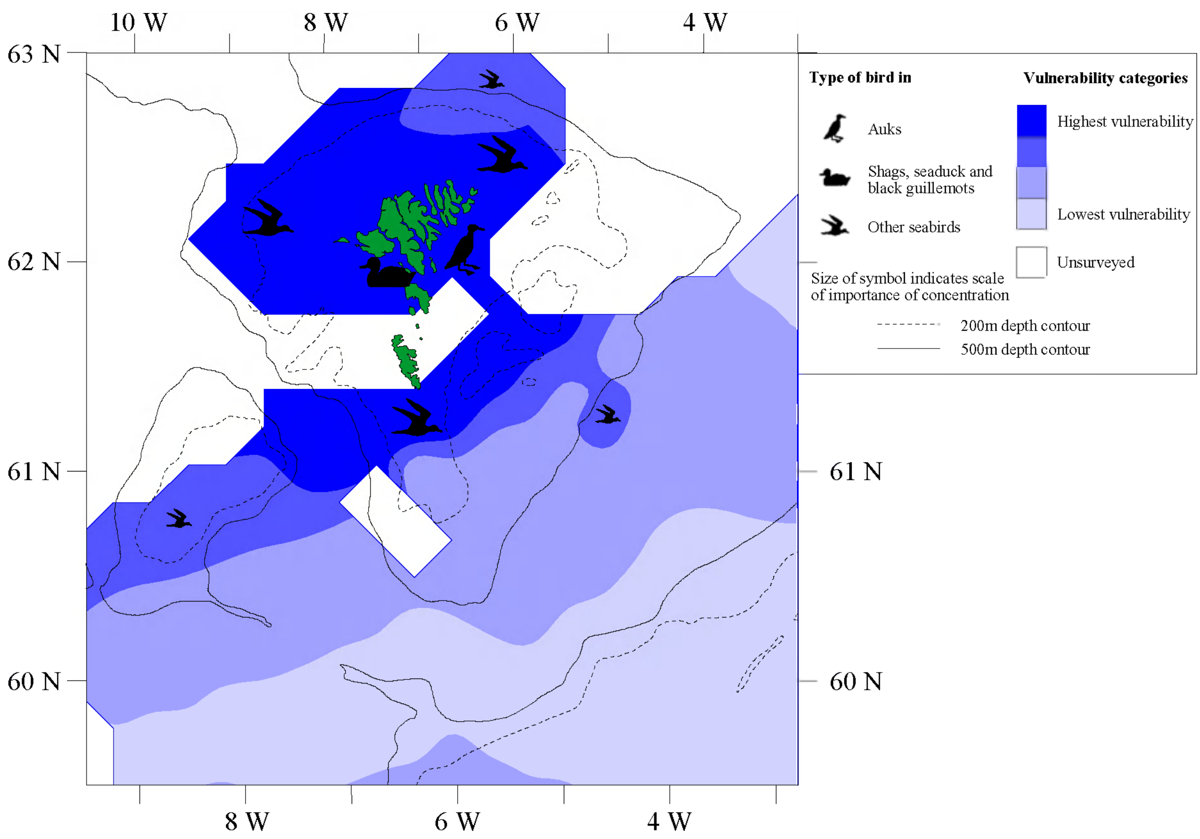


Figure 39. Seabird vulnerability to surface pollution in the waters around the Faroe Islands in December

6.14 Seabird vulnerability in December

Herring gull numbers increase during the winter over the Faroese shelf, with a notable concentration around Sandoy, although most birds are found no further than 30-50 km from the islands. The largest concentrations of glaucous gulls are again found over the slope to the east of the islands. Higher densities of great black-backed gulls are also present during the winter, with notable concentrations to the west of Suduroy.

The peak return of northern fulmars to their colonies occurs during December, although many do not disperse far from their colonies in the winter. High densities are found throughout Faroese shelf waters and over the shelf break to the north and north-east of the islands. Northern fulmars are found in lower densities elsewhere in the study area. Black-legged kittiwakes are also found scattered throughout the study area at low densities.

Survey effort is too low to assess the importance of the banks east of the Faroes for common guillemots. Few little auks occur except for the occasional concentration close inshore. Survey coverage is poor beyond the shelf break to the north-east, south-west and north-west of the islands.

Inshore species such as European shag, common eider and black guillemot occur close to the islands (refer to April and October for details of distribution).

7. Cetacean distribution

7.1 Fin whale *Balaenoptera physalus*

Fin whales are the most abundant of the large baleen whale species that occur in the north-east Atlantic (Sigurjónsson 1988; Buckland *et al.* 1992; Sigurjónsson 1995, Bloch *et al.* 2000) and were encountered regularly during this study.

The distribution of sightings of fin whales is shown in Fig. 40. There were two distinct peaks in the number of sightings, the first in May with 13 sightings (36 animals), and the second in August with eleven sightings (25 animals). There was one sighting in June, one in July, three in September and one in November. All the May sightings were in the vicinity of the 1,000 m depth contour over the Faroe Bank Channel, the Faroe Shetland Channel, and to the north-east of the islands. In contrast, all but three of the August sightings were over the edge of the banks, and shelf break to the east of the islands. This seasonal difference in sighting locations may suggest a seasonal difference in favourable foraging location. In the spring, the best feeding conditions may have been over deep water, and later in the year at the eastern shelf break. Alternatively, the whales may have made a relatively rapid transit through the survey area in May on their way to favourable feeding locations elsewhere, followed by a return to good feeding opportunities at the eastern shelf break later in the year. Although fin whales are undoubtedly less abundant during the winter months (Bloch 1998; Degerbøl 1940), they are not completely absent, as acoustic work has shown them to be present throughout the year (Clark and Charif 1998). The main wintering area for those summering in the west Norway to Faroes area, is as yet unknown (Christensen *et al.* 1992).

Both the North Atlantic Sighting Surveys (NASS) and the surveys carried out during this project indicated a discrete number of animals in the study area as compared to areas further west in the North Atlantic. During the NASS survey in July-August 1987, a minimum number of 7,167 Fin whales was estimated for Icelandic and Faroese waters (Sigurjonsson and Gunnlaugsson 1988). However, only 7 of the 247 sightings were made in Faroese waters. During the GEM-cruise in August 1997, a total of 460 Fin whales was estimated in the study area on the basis of nine sightings (Ornis Consult unpubl.). Tønnesen (1967) estimated 1776 Fin whales in the area.

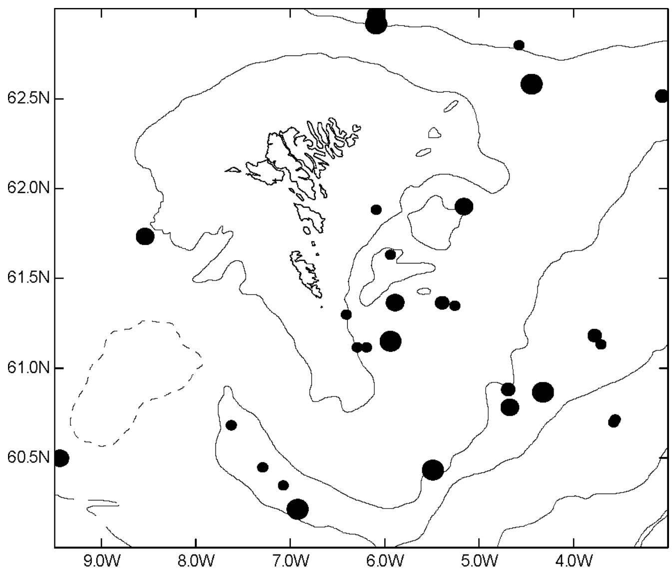


Figure 40. The location of fin whale sightings
Bathymetry: short dash (200 m isobath); long dash (1,000 m isobath)
Key: Number of individuals • 1 • 2 ● 3 ● 4+

7.2 Sei whale *Balaenoptera borealis*

Sei whales are thought to favour more temperate and oceanic waters than the other large rorquals, especially during their northward migration (Jonsgård and Darling 1977; Mizroch *et al.* 1984). Their occurrence in European coastal waters is less predictable than that of fin whales. They appear in large numbers during some years, while in others, very few will appear (Jonsgård and Darling 1977). These last few years have been characterised by larger than usual numbers in Faroese waters (Bloch *et al.* 2000), and almost as many sei whales as fin whales were seen during this study.

The distribution of sightings of sei whales is shown in Fig. 41. All but one of the 28 sightings (59 individuals) were in August, the other in May. All sightings were at the shelf break, or in deeper water further offshore, with most sightings to the east, and south-east of the islands. It is possible that most sei whales travel to the west of the Faroes during their spring northward migration, and then move into Faroese waters later in the season, maybe from Icelandic or Norwegian waters. They are known to leave Norwegian coastal waters during August (Christensen *et al.* 1992). In six years of sightings west and south-west of Iceland, almost no sei whales were seen during June and July, but numbers increased during August to reach a plateau during September (Sigurjónsson 1995). In this study the modal group size was one, but on one occasion eight animals were seen together.

During the GEM-cruise in August 1997, when unusually large numbers appeared in Faroese waters, a total of 2035 Sei whales was estimated in the study area on the basis of 23 sightings (Ornis Consult unpubl.).

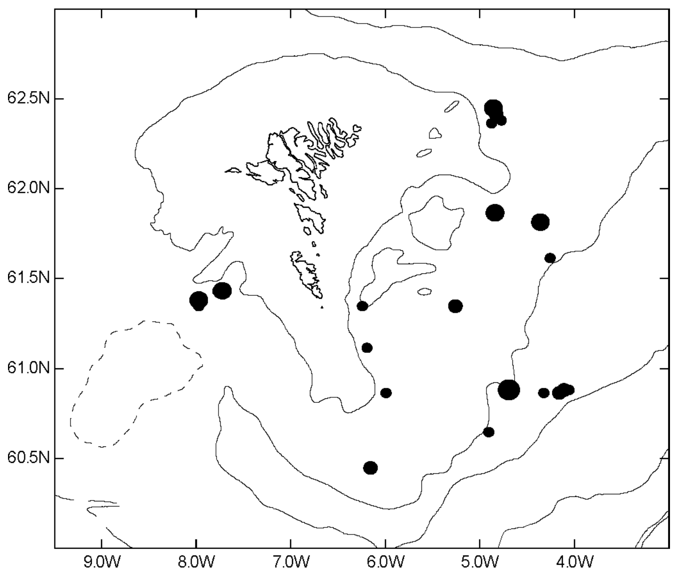


Figure 41. The location of sei whale sightings
Bathymetry: short dash (200 m isobath); long dash (1,000 m isobath)
Key: Number of individuals • 1 • 2-3 ● 4-5 ● >6

7.3 Minke whale *Balaenoptera acutorostrata*

Minke whales are abundant in some areas of the north-east Atlantic during the summer months, especially in coastal waters (Evans 1992; Schweder *et al.* 1993). However, in this study area they were seen less frequently than fin whales, with only 19 sightings (23 animals) in total. Minke whales feed on a wide range of prey species, including various gadoids, mackerel, sandeels and herring (Sigurjónsson, 1995; Skaug *et al.* 1995;

Haug *et al.* 1996). However, young herring comprises a high proportion of the diet when they are available (Haug *et al.* 1995; Linstøm *et al.* 1998).

The distribution of sightings of minke whales is shown in Fig. 42. Every sighting was in the period April to September, with 11 in August (48%). All but three sightings were in the vicinity of the shelf break, or beyond, with no animals seen close to shore. Minke whales are seen feeding between the islands every summer (Bloch 1998), so the lack of sightings during this study is probably an artefact of low survey effort close inshore. Minke whales are thought to feed on Scottish spawning herring during August (Evans 1980). These Scottish herring periodically travel west across the Faroe-Shetland Channel to the southern and eastern Faroese banks (Jákupsstovu 1999). Most of the minke whales seen during this study were over these same banks.

During the NASS survey in July-August 1987, a minimum number of 14,807 Minke whales was estimated for Icelandic and Faroese waters (Sigurjonsson and Gunnlaugsson 1988). The vast majority of the animals were sighted in Icelandic waters.

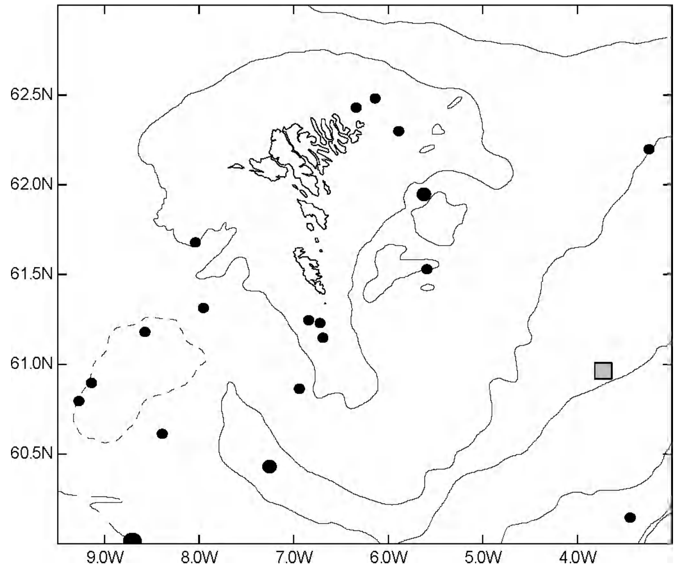


Figure 42. The location of minke and humpback whale sightings
Bathymetry: short dash (200 m isobath); long dash (1,000 m isobath)

Key: *Minke whale: Number of individuals* • **1** ● **2** ⬤ **3**
Humpback whale: Number of individuals □ **2**

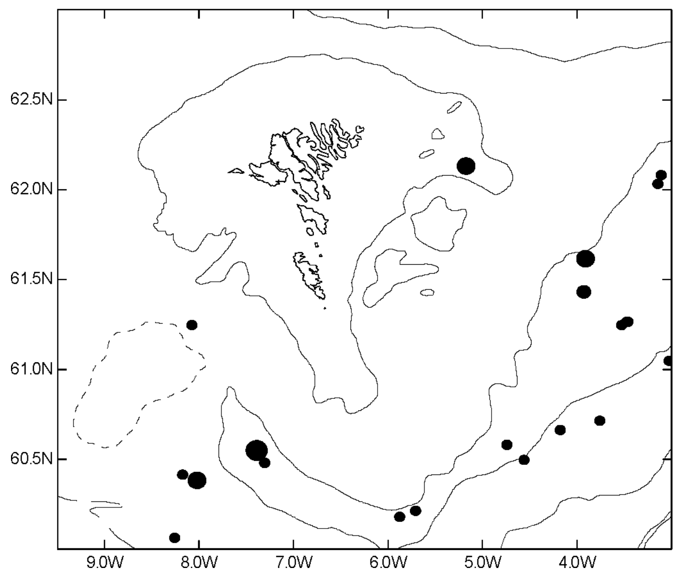


Figure 43. The location of sperm whale sightings
Bathymetry: short dash (200 m isobath); long dash (1,000 m isobath)
Key: Number of individuals ● 1 ● 2 ● 3 ● 4+

7.4 Humpback whale *Megaptera novaeangliae*

Two humpback whales were seen over the eastern side of the Faroe-Shetland Channel in July 1988 (Fig. 42). Four were seen in a similar location from seismic vessels during 1997 (Stone 1998). In the Iceland-Faroe Rise/Shetland area as a whole, acoustic monitoring has detected a minimum of between two and 10 singing males at any one time between November 1996 and March 1997 (Clark and Charif 1998).

7.5 Sperm whale *Physeter macrocephalus*

The Sperm whale has a wide distribution in the North Atlantic, occurring regularly in waters deeper than 1000 m. This pattern is also typical for this study area (Fig. 43), and as stranded and inshore sightings indicate (Berrow *et al.* 1993), the occurrence is dominated by sub-adult and mature males. The preference for deep water may be explained by their diet of Histioteuthid and Cranchiid squid, which inhabit mesopelagic depths (200-1,000 m; Clarke 1980; Rice 1989).

A total of 31 sperm whales was recorded on 21 occasions. Almost all sightings were over the slope and deep water of the Faroe Bank Channel and the Faroe-Shetland Channel. There were 21 sightings of sperm whales between January and July, and one during both September and October. Most sightings were made in June, although most individuals (10) were seen in May. Nearly all sightings were of solitary individuals, blowing at the surface between dives, but three whales were seen in close proximity to each other on two occasions. In addition to these sightings, a large group of 12 animals was seen during poor conditions on the 13 March 1998 at the Suderoy Bank (not included in the map).

During the NASS survey in July-August 1987, a minimum estimate of 1,537 sperm whales was made for Icelandic and Faroese waters (Sigurjonsson and Gunnlaugsson 1988).

7.6 Northern bottlenose whale *Hyperoodon ampullatus*

Bottlenose whales are thought to be migratory, present in greatest numbers to the north of Iceland and west of central Norway, from April until July (Benjaminsen and Christensen 1979). During August-November the whales are thought to be migrating south (Benjaminsen and Christensen 1979). Bottlenose whales forage at, or close to the sea floor, and may dive on occasion to over 1,400 m in depth (Hooker and Baird 1999).

The distribution of sightings of bottlenose whales is shown in Fig. 44. During this study there were five sightings: three in May, one in April, and one in October. Three sightings were of single individuals, two of two, and one of six, which was recorded in May. No animals were seen during August and September, when most are stranded in the Faroe Islands (Bloch *et al.* 1996). The bottlenose whales seen in the survey area were over the 1,000 m contour of the Faroe Bank Channel and the Faroe-Shetland Channel and in the deep water of the Norwegian Sea.

During the NASS survey in July-August 1987, a minimum estimate of 5,823 northern bottlenose whales was made for Icelandic and Faroese waters (Sigurjonsson and Gunnlaugsson 1988).

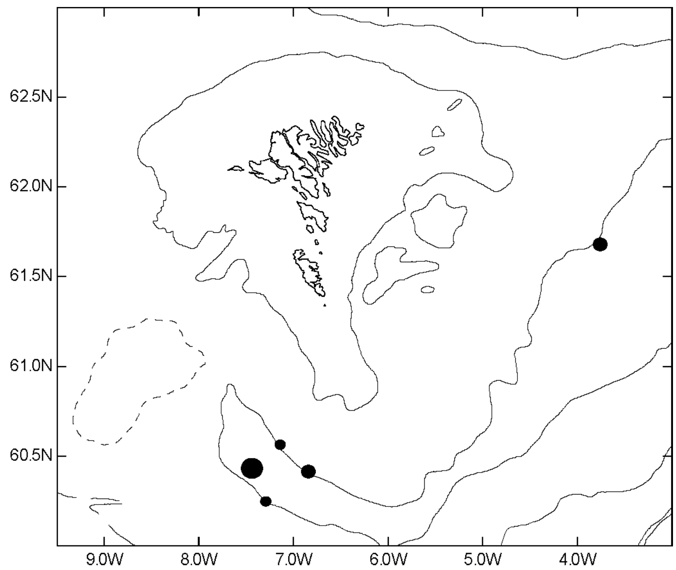


Figure 44. The location of northern bottlenose whale sightings
Bathymetry: short dash (200 m isobath); long dash (1,000 m isobath)

Key: Number of individuals • *1* ● *2* ● *6*

7.7 Sowerby's beaked whale *Mesoplodon bidens* and unidentified beaked whale species *Mesoplodon spp.*

Beaked whales of the genus *Mesoplodon* are seen only infrequently due to their preference for deep water, and because they spend only a short time at the surface between long dives (Hooker and Baird 1999). In addition, they often show rapid, elusive surfacing behaviour, and indistinct blows which renders them inconspicuous.

The distribution of sightings of Sowerby's beaked whale is shown in Fig. 45. There was only one sighting of a beaked whale that was positively identified as a Sowerby's, a further five sightings were thought to be Sowerby's, but species identification could not be confirmed. The positively identified whale was to the east of the Faroe Bank in over 500 m of water, whereas the others were over the Faroe Bank and Faroe-Shetland Channel in 1,000 m of water, or deeper. One whale was also positively identified during another survey within the study area. This sighting was over the eastern Faroe-Shetland Channel in the same location as the easternmost record in Fig. 45 (ERT 1999). Four of these seven records were of solitary individuals; the other two records were of two animals together. There was one sighting for April, June and November, and two for August and September. A further 14 *Mesoplodon* sightings were made just to the south of the study area, to the south of the Wyville Thomson ridge (Pollock *et al.* 2000).

No reliable estimates of the North Atlantic Mesoplodon stocks are available.

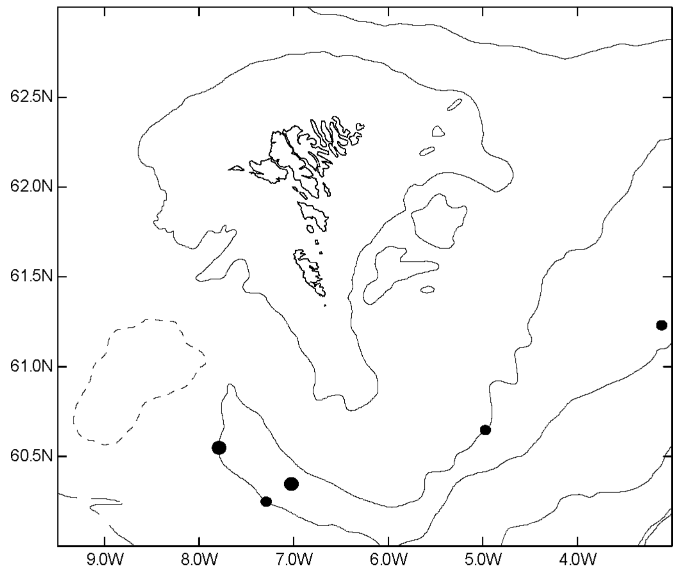


Figure 45. The location of *Mesoplodon* Sowerby's beaked beaked whale sightings
Bathymetry: short dash (200 m isobath); long dash (1,000 m isobath)

Key: Number of individuals ● *1* ⬤ *2*

7.8 Killer whale *Orcinus orca*

Killer whales are widely distributed throughout shallow and deep waters of the North Atlantic.

The distribution of sightings of the killer whale is shown in Fig. 46. Killer whales were seen ten times between March and August, with two records in March, three in May, two in June and three in August. There were no records between September and February. Two sightings were over the edge of Syderø bank to the east of the Faroes, one was over the edge of the Faroe Bank, and another was over the Scottish shelf break. The remainder were over deeper slope waters, mostly over the Faroe-Shetland Channel. The absence of records from the Faroese shelf should not be taken as true absence, as they are frequently sighted in Faroese coastal waters during the summer months (Bloch and Lockyer 1988). Pod size ranged from one to 17 whales, with a mean of 6.0.

During the NASS survey in July-August 1987, a minimum number of 8,272 killer whales was estimated for Icelandic and Faroese waters (Sigurjonsson and Gunnlaugsson 1988).

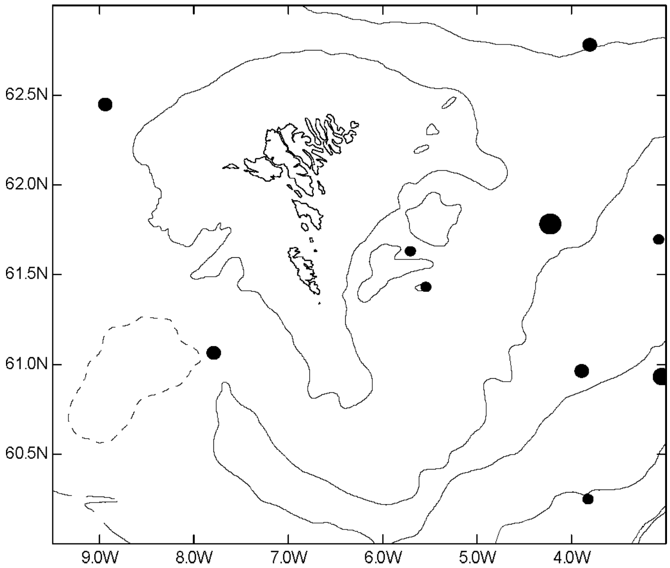


Figure 46. The location of killer whale sightings
Bathymetry: short dash (200 m isobath); long dash (1,000 m isobath)

Key: Number of individuals • 1-4 • 5-9 ● 10-14 ● 15-20

7.9 Long-finned pilot whale *Globicephala melas*

Long-finned pilot whales are one of the most abundant and widespread cetacean species in the north-east Atlantic (Buckland *et al.* 1993a). A strong increase in abundance is recorded during summer in the study area, as reflected in the July to September peak in the number of schools stranded close inshore (Zachariassen 1993). Although large pods are regularly recorded close to shore in the Faroese fjords (Bloch *et al.* 1996), most of the large pods seen during this survey were in deep water beyond the shelf break. This is where squid *Todarodes sagittatus*, and blue whiting migration is most concentrated (Hoydal and Lastein 1993; Jákupsstovu 1999). Other favoured pilot whale prey, especially when *T. sagittus* is less abundant, include another squid (*Gonatus* sp.).

The recorded densities of long-finned pilot whales in the study area are shown in Fig. 47. Pilot whales were seen in low numbers throughout much of the project area, but most were at or beyond the shelf break, with distinct concentrations at the 1,000 m depth contour in the Faroe Bank Channel. Most sightings were made during the summer, especially during August when 1,091 animals (n=14) were seen. These sightings comprise 69.5% of the total number seen for all months (n=63). The mean pod size of 24 was heavily skewed by two large pods seen during August in the Faroe Bank Channel, which contained 400, and 500 animals respectively. Many pods were subdivided into a number of smaller pods, spread over several kilometres of ocean.

The population size is estimated at 778,000 for the eastern part of the North Atlantic (Bloch *et al.* 2000).

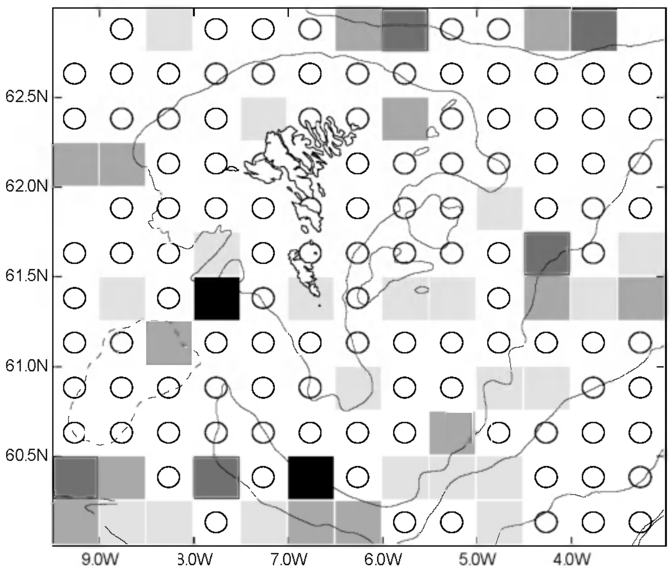


Figure 47. Abundance of long-finned pilot whales throughout the year
Bathymetry: short dash (200 m isobath); long dash (1,000 m isobath)

Key: Abundance (individuals/km)
No animals 0.01-0.09 0.10-0.49 0.50-0.99 1.00+

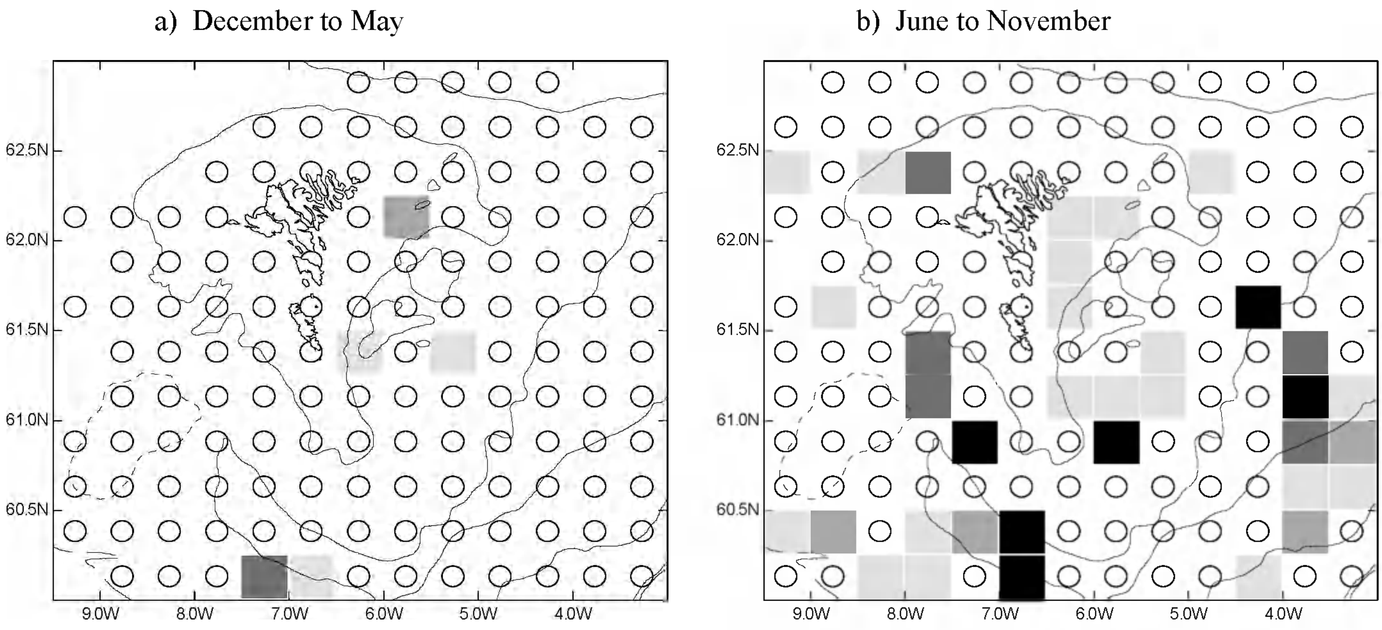


Figure 48. Seasonal abundance of Atlantic white-sided dolphins
Bathymetry: short dash (200 m isobath); long dash (1,000 m isobath)

Key: Abundance (individuals/km)
No animals 0.01-0.09 0.10-0.49 0.50-0.99 1.00+

7.10 Atlantic white-sided dolphin *Lagenorhynchus acutus*

The Atlantic white-sided dolphin was the most numerous cetacean seen with 2,791 individuals recorded.

The seasonal abundance of Atlantic white-sided dolphins is shown in Fig. 48. There were only a few scattered sightings between December and May, with none in December and February. All were over the shelf break, or over deeper water (Fig. 48a). There were both more sightings and more dolphins per sighting during June and July, when all sightings but two were over the slope. The other two sightings were at the Scottish shelf break to the south-east of the survey area. Peak abundance occurred in August, when large pods were seen along the length of the Faroe Bank Channel, and the central Faroe-Shetland Channel (Fig. 48b). Only one large pod was seen over the shelf, to the north-west of the islands, but several smaller pods were seen to the east of the islands. This was the only month when white-sided dolphins were seen shoreward of the outer shelf. This seasonal venture into shelf waters is also common elsewhere (Selzer and Payne 1988; Evans 1992; Gowans and Whitehead 1995). Within the survey area, the Faroe Bank Channel and western Ymir Ridge, have the highest sea floor relief. Mean group size was 22.9 animals, although many groups contained fewer than 12 animals. These small groups were often loosely associated with a number of other groups to form a diffuse aggregation of dolphins spread over several kilometres. It is likely that the large pods of travelling dolphins occur when a number of small pods have coalesced into one large one (Gaskin 1992). By September, numbers of white-sided dolphins had declined again, and all dolphins were seen over deep water to the south of the islands. There was only one sighting in October. In November, dolphins were seen over the central Faroe-Shetland Channel, southern Faroe-Bank Channel and one pod was seen over the shelf break to the south-east of Suðuroy.

During the GEM-cruise in August 1997, a total of 59,765 Atlantic white-sided dolphins were estimated in the study area on the basis of 39 sightings (Ornis Consult unpubl.).

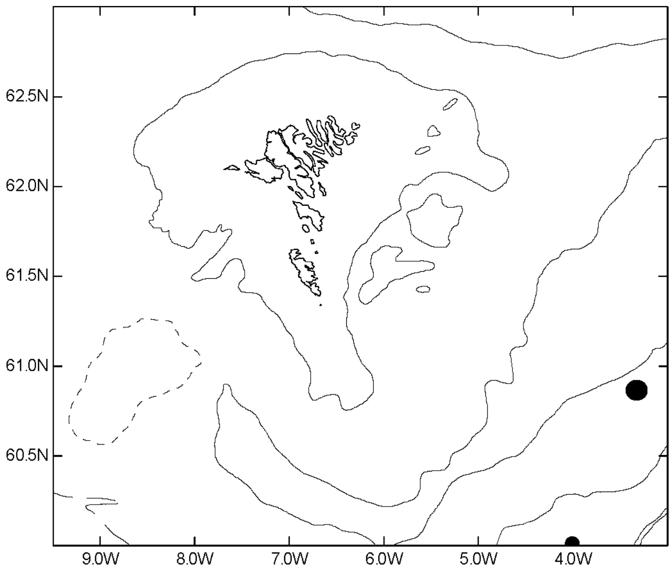


Figure 49. The location of white-beaked dolphin sightings
Bathymetry: short dash (200 m isobath); long dash (1,000 m isobath)
Key: Number of individuals ● **3** ● **4**

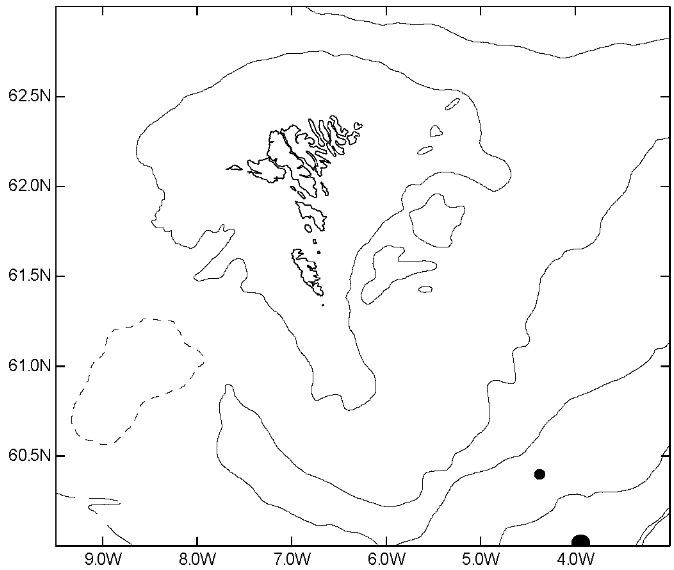


Figure 50. The location of Risso's dolphin sightings
Bathymetry: short dash (200 m isobath); long dash (1,000 m isobath)
Key: Number of individuals ● **1** ● **3**

7.11 White-beaked dolphin *Lagenorhynchus albirostris*

Despite its abundance in north-west Scottish waters (Pollock *et al.* 2000; Evans *et al.* 1993) this species is rare in the study area. The distribution of sightings of white-beaked dolphins is shown in Fig. 49. Four were seen in December over the Scottish side of the Faroe-Shetland Channel, and three in September over the Scottish shelf, to the south-east of the study area. None were recorded over the Faroese shelf, but they are occasionally stranded in the islands (Bloch 1998).

7.12 Common dolphin *Delphinus delphis*

There was only one sighting of common dolphins during this study - of four animals in November 1997 over the eastern side of the Faroe-Shetland Channel. However, this species has been commonly recorded in waters south of the Wyville Thomson Ridge, to the south of the study area (Pollock *et al.* 2000). In another study, common dolphins were found in warmer and more saline water than white-sided dolphins (Selzer and Payne 1988). The Atlantic waters to the south of the ridge, and along the Scottish slope, are warmer and more saline than the waters over the Faroe plateau, and this may have contributed to the difference in occurrence between the two species.

7.13 Risso's dolphin *Grampus griseus*

The were only two sightings of Risso's dolphins, and they were both over the Scottish side of the Faroe-Shetland Channel. Three were over the shelf in November 1997, and one was over the slope in December 1998 (Fig. 50).

7.14 Bottlenose dolphin *Tursiops truncatus*

The distribution of sightings of bottlenose dolphins is shown in Fig. 51. Six of the seven bottlenose dolphin pods recorded were near the 1,000 m contour over the Faroe Bank Channel and Wyville Thomson ridge during May, September and October. The other sighting was of two animals over the 100 m depth contour to the north-east of the islands (east of Fugloy) in July. There were a further five sightings just to the south of the study area between September and March (Pollock *et al.* 2000). They were not seen to associate with any other cetacean species, except on one occasion in September 1995, when 10 white-sided dolphins were associated with 23 bottlenose dolphins over the Faroe Bank Channel. Close association with pilot whales have been recorded on the Bailey's Bank south of the study area (Skov *et al.* 1995b), an association that has been described as typical (Bloch *et al.* 1993; Gowans and Whitehead 1995). The bottlenose dolphin found in Faroese waters is presumably from the most northerly of the offshore North Atlantic population(s); the most northerly inshore population occurs on the eastern side of Scotland. Only one bottlenose dolphin has been observed off Shetland (Bloch *et al.* 2000).

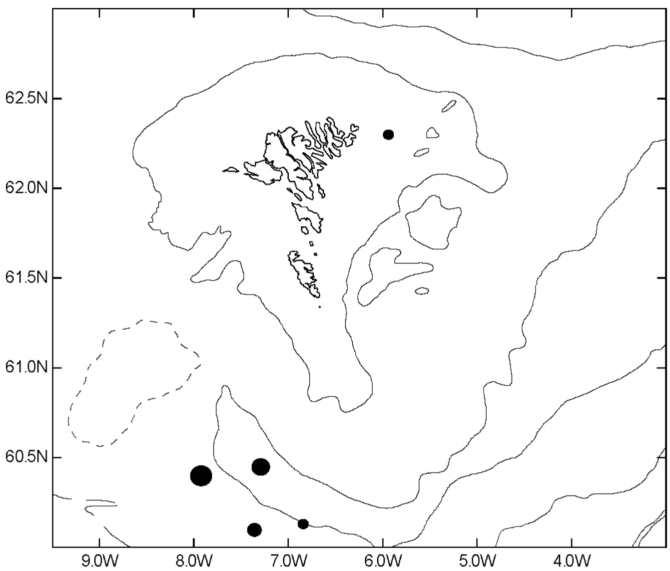


Figure 51. The location of bottlenose dolphin sightings
Bathymetry: short dash (200 m isobath); long dash (1,000 m isobath)
Key: Number of individuals • 1-3 • 4-8 ● 9-20 ● 21+

7.15 Harbour porpoise *Phocoena phocoena*

Porpoise abundance is known to vary seasonally. There is a summer increase in northern coastal waters, which may be due to a seasonal offshore to inshore movement (Northridge 1996; Rosel 1997). The peak calving period in British waters is during June and July (Lockyer 1995). During the winter and spring, harbour porpoises were only rarely encountered in Faroese waters. No sightings were made in February, and only a few between March to June. From June onwards, numbers increased with a distinct peak in numbers during August, when over 60% of the sightings were made. Numbers declined rapidly after August, and by October few porpoises were seen, with only four sightings during November.

The species was recorded throughout all depth zones, yet most sightings in shallow water close to the islands and at the shelf break to the south, and east of the islands (Fig. 52). However 26% of sightings were seaward of the shelf break, mostly in the vicinity of the Faroe Bank Channel and the Faroe Bank. A model of the relationship between water depth and density of porpoises observed around the Faroes in August 1997 indicates low abundance in waters deeper than 300 m, high abundance in shallower waters and a peak abundance at the shelf break (Skov and Bloch in press). The two first distribution features are confirmed by the summarised data, whereas the peak abundance at the edge of the shelf is less clear. The modal group size was 1.0, although the mean was skewed to 1.9 individuals by a few large counts, including one group of 10 and another of 25. These two pods were seen over the slope to the south of the islands during November.

During the GEM-cruise in August 1997, a total of 7,585 Harbour porpoises were estimated in the study area on the basis of 38 sightings (Ornis Consult unpubl.).

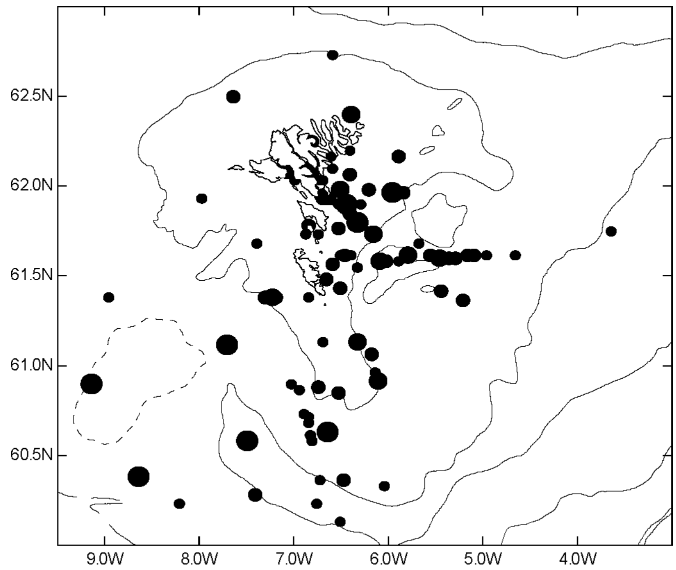


Figure 52. The location of harbour porpoise sightings
Bathymetry: short dash (200 m isobath); long dash (1,000 m isobath)
Key: Number of individuals • 1 • 2-3 ● 4-5 ● >6

7.16 Important areas for cetaceans

Cetaceans would appear more able to cope with the immediate effects of an oil spill than do seabirds. Once oiled, seabird plumage can very easily lose its insulative properties, and become water-logged, whereas cetacean skin is very impermeable (Geraci 1990). There is no evidence that oil or tar balls significantly foul the feeding apparatus of baleen whales, although the long term effects of pollutant accumulation in toothed whales might prove significant in some instances (Geraci 1990; Kiceniuk *et al.* 1997). The sound generated by seismic surveys have the potential to disturb cetaceans (Turnpenny and Nedwell 1994; Stone 1998), and so it is useful to outline the high use areas for cetaceans within the project area. Cetaceans showed an opposite trend to seabirds in their habitat use, with most seen in deep water, whereas most seabirds were seen in shallow water. Cetaceans were seen more frequently in some areas than in others, such as over the Wyville Thomson Ridge, the southern Faroe Bank Channel, the Faroe-Shetland Channel, the shelf break and banks to the east, and the south-east of the islands.

7.16.1 The Wyville Thomson Ridge, southern Faroe Bank Channel and the Faroe-Shetland Channel

Several of the odontocetes favoured deep water, such as long-finned pilot whales, which were widespread over the entire area, but were most numerous in August. White-sided dolphins were also widespread between June and November. Harbour porpoises were not infrequently seen over the deep water of the Faroe Bank Channel. The distribution of sperm whales, northern bottlenose whales and unidentified beaked whale species, was centred over the 1,000 m contour, particularly in the southern Faroe Bank Channel. Most fin and sei whales were seen over shallower water, and there was a number of sightings of Sei whales over the southern Faroe Bank Channel, and the central Faroe-Shetland Channel, in August and September.

7.16.2 The Faroe Bank, northern Faroe Bank Channel and the southern Faroese shelf

Although not common, minke whales were the numerous baleen whale species seen over this area of predominately shallow water. Harbour porpoises were also frequently seen over the shelf break to the south of the Faroes.

7.16.3 The shelf break and banks to the east of the islands

Most of the fin whales sighted in the project area were over the banks to the east of the islands, especially around Sydero Bank. Most sei whale sightings were also in the vicinity of the eastern banks, and western Faroe-Shetland Channel. The Syderoy and Sanday Banks held higher numbers of harbour porpoises in August than the surrounding waters.

7.16.4 Coastal areas

Several species were encountered in coastal waters, but the only one, which was regularly recorded in coastal waters was the harbour porpoise. Most were recorded between June and August.

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Appendix I. Scientific, English, Faroese and Danish names of seabirds and cetaceans.

Latin name	English name	Faroese name	Danish name
Seabirds			
Gavia stellata	**Red-throated diver**	**Lómur**	**Rødstrubet lom**
Gavia immer	**Great northern diver**	**Havgás, Imbrimil**	**Islom**
Fulmarus glacialis	**Northern fulmar**	**Havhestur, Náti**	**Mallemuk**
Pterodroma sp.	**Soft-plumaged petrel sp.**	**Skurvutur marjallur**	**Blød petrel**
Calonectris diomedea	**Cory's shearwater**	**Nevgulur skrápur**	**Kuhls skråpe**
Puffinus gravis	**Great shearwater**	**Stórskrápur**	**Storskråpe**
Puffinus griseus	**Sooty shearwater**	**Gráskrápur**	**Sodfarvet skråpe**
Puffinus puffinus	**Manx shearwater**	**Skrápur**	**Alm. skråpe**
Hydrobates pelagicus	**European storm-petrel**	**Drunnhvíti, Havtyrðil**	**Lille stormsvale**
Oceanodroma leucorhoa	**Leach's storm-petrel**	**Sýldur drunnhvíti**	**Stor stormsvale**
Morus bassanus	**Northern gannet**	**Súla**	**Sule**
Phalacrocorax carbo	**Great cormorant**	**Hiplingur**	**Storskarv**
Phalacrocorax aristotelis	**European shag**	**Skarvur**	**Topskarv**
Somateria mollissima	**Common eider**	**Æða**	**Ederfugl**
Phalaropus lobatus	**Red-necked phalarope**	**Helsareyði**	**Odinshane**
Phalaropus fulicarius	**Grey phalarope**	**Sundgrælingur**	**Thorshane**
Stercorarius pomarinus	**Pomarine skua**	**Jói**	**Mellemk jove**
Stercorarius parasiticus	**Arctic skua**	**Kjógvi**	**Almindelig kjove**
Stercorarius skua	**Great skua**	**Skúgvur**	**Storkjove**
Larus sabini	**Sabine's gull**	**Ternumási**	**Sabinemåge**
Larus ridibundus	**Black-headed gull**	**Fransaterna**	**Hættemåge**
Larus canus	**Mew gull**	**Skatumási, Válkur, Lortumási**	**Stormmåge**
Larus fuscus	**Lesser black-backed gull**	**Likka**	**Sildemåge**
Larus argentatus	**Herring gull**	**Fiskimási**	**Sølvmåge**
Larus glaucoides	**Iceland gull**	**Lítil valmási**	**Hvidvinget måge**
Larus hyperboreus	**Glaucous gull**	**Valmási**	**Gråmåge**
Larus marinus	**Great black-backed gull**	**Svartbakur, Bakur**	**Svartbag**
Rissa tridactyla	**Black-legged kittiwake**	**Ryta**	**Ride**
Sterna hirundo	**Common tern**	**Kriterna**	**Fjordterne**
Sterna paradisaea	**Arctic tern**	**Terna**	**Havterne**
Uria aalge	**Common guillemot**	**Lomvigi, Lomviga**	**Lomvie**
Uria lomvia	**Brünnich's guillemot**	**Íslands lomvigi, Íslands lomviga, Stuttvigi**	**Polarlomvie**
Alca torda	**Razorbill**	**Álka**	**Alk**
Cepphus grylle	**Black guillemot**	**Teisti**	**Tejst**
Alle alle	**Little auk**	**Fulkubbi**	**Søkonge**
Fratercula arctica	**Atlantic puffin**	**Lundi**	**Lunde**
Cetaceans			
Balaenoptera physalus	**Fin whale**	**Nebbafiskur**	**Finhval**
Balaenoptera borealis	**Sei whale**	**Seiðhvalur**	**Sejhval**
Balaenoptera acutorostrata	**Minke whale**	**Sildreki**	**Vågehval, Sildepisker**
Megaptera novaeangliae	**Humpback whale**	**Kúlubøka**	**Pukkelhval**
Physeter macrocephalus	**Sperm whale**	**Avgustur**	**Kaskelot**
Hyperoodon ampullatus	**Northern bottlenose whale**	**Døglingur**	**Døgling**
Mesoplodon bidens	**Sowerby's beaked whale**	**Nevhvalur**	**Næbhval**
Orcinus orca	**Killer whale**	**Mastrarhvalur**	**Spækhugger**

Globicephala melas	**Long-finned pilot whale**	**Grindahvalur**	**Grindehval**
Lagenorhynchus acutus	**Atlantic white-sided dolphin**	**Skjórutur springari**	**Hvidskæving**
Lagenorhynchus albirostris	**White-beaked dolphin**	**Kjafthvítur springari**	**Hvidnæse**
Grampus griseus	**Risso's dolphin**		**Halvgrindehval**
Tursiops truncatus	**Bottlenose dolphin**	**Hvessingur**	**Øresvin**
Delphinus delphis	**Common dolphin**	**Vanligur springari**	**Alm. delfin**
Phocoena phocoena	**Harbour porpoise**	**Nísa**	**Marsvin**