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Vulnerable concentrations of marine birds west of Britain



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Preface

This document forms part of the product of the third phase (1986-1990) of the Seabirds at Sea research programme. The purpose of this document is to make available to those concerned with planning and operation of marine oil and gas developments information on the distribution and timing of vulnerable concentrations of birds. The scientific analyses on which this is based are presented by Webb *et al.* 1990. Here we attempt to summarise these detailed results in a form which will be most easily usable by the industry and related organisations.

The Seabirds at Sea programme started in 1979 and was designed primarily to determine which parts of Britain's waters were particularly important for seabirds. Tasker & Pienkowski (1987) described the vulnerability of birds in the North Sea; this document follows the same format, to describe the key areas for birds using the waters to the west of Britain. A more detailed report on the results of the third phase of the programme and several smaller reports have been published (see Main additional sources of information). The Seabirds at Sea programme is now in its fourth phase, which will complete the general survey of Britain's waters by examining those to the south and west of England and Wales.

Acknowledgements

The Seabirds at Sea programme has spanned eleven years (1979-1990). It has received sponsorship throughout this period from both the Government and the oil industry: funds have been provided by the Department of Transport's Marine Pollution Control Unit, the Department of Energy, the Department of the Environment, the Department of the Environment for Northern Ireland, BP Petroleum Development Ltd, BP International Ltd, Esso Petroleum Company Ltd, Shell UK Ltd., Chevron UK Ltd, Hydrocarbons Great Britain Ltd, Occidental Petroleum (Caledonia) Ltd, the United Kingdom Offshore Operators Association and the Nature Conservancy Council (NCC).

The programme has been aided also by a great many companies, organisations and individuals; a full list of these may be found in Tasker *et al.* (1987) and Webb *et al.* (1990). Michael W Pienkowski chaired the steering group of the third phase of the project, and we are particularly grateful to Stuart Benn, Craig Burton, Peter G H Evans, Peter Hope Jones, Genevieve Leaper, Ivor Rees and David Steele for carrying out or organising substantial parts of the work on which this document is based.

Use has also been made of information from the Seabird Colony Register (NCC/Seabird Group), National Wildfowl Counts (Wildfowl and Wetlands Trust under contract to NCC/Department of the Environment for Northern Ireland, Birds of Estuaries Enquiry (British Trust for Ornithology/NCC/Royal Society for the Protection of Birds/Department of the Environment for Northern Ireland) and Winter Shorebird Count (Birds of Estuaries Enquiry/Wader Study Group).

Drafts were read and commented on by Philip Oswald, Ivor Rees and Oscar Merne. Any remaining errors and omissions are entirely the responsibility of the authors. Stuart Wallace drew the maps. We thank Oscar Merne and Richard Weyl for help in the production of this document.



MARINE POLLUTION
CONTROL UNIT

Department of Transport

**Department of
Energy**

**Department of the Environment
for Northern Ireland**



British Gas



Introduction

This document describes the locations of vulnerable concentrations of birds to the west of Scotland and in the Irish Sea. These two areas are contiguous but are very different. Both support very large numbers of birds. The continental shelf waters west of Scotland is exposed and heavily influenced by the winds and currents of the North Atlantic. The coastline of western Scotland is extremely long (about 5000 km) and is characterised by having many fjordic sealochs. Offshore there are many islands which shield much of the mainland from the direct effects of the Atlantic Ocean. Large areas of relatively sheltered water lie between the larger islands and the mainland. One effect of this varied coastline is to provide an extremely diverse series of marine habitats in which birds can live.

In contrast, the Irish Sea has a relatively simple coastline and is influenced much more by freshwater runoff. The eastern Irish Sea is relatively shallow, and the series of estuaries on its shores are important for birds. The tidal range in these estuaries is particularly large, varying between 6 m on neap tides and

10 m on spring tides. The western part of the Irish Sea is relatively deep; while it is influenced by water intruding from the Atlantic in the south, it is relatively sheltered from the prevailing winds which influence the seas to the west of Scotland.

Both of these areas are used by numerous internationally important populations of birds. Many of these birds nest on the islands to the west of Scotland and in the Irish Sea and feed in adjacent waters. In winter, many of seabirds migrate southwards, but others that breed further north replace them. The comparatively mild climate and good feeding conditions in the estuaries and coastal waters attract large numbers of shorebirds and waterfowl in the winter from breeding areas as far apart as arctic Canada and Siberia. The majority of the sea area forms part of the United Kingdom's continental shelf and Exclusive Economic Zone. However, in many cases, the birds using it are resident for only part of the year before moving to other states' waters or territories. The United Kingdom thus has a particular responsibility for the conservation of these birds. This responsibility is formalised under the EEC Directive on the Conservation of Wild Birds

Table 1

Numbers of seabirds breeding on Irish and western British coasts (from Lloyd, Tasker & Partridge in press). Figures are for pairs or apparently occupied sites, unless otherwise stated. The proportion of the relevant biogeographic population for each species is also indicated (see Lloyd, Tasker & Partridge in press for definitions) * = more than 3%, ** = more than 10%.

Species	West coast of Scotland	Irish Sea	Rest of Ireland	Total
Fulmar	165000	11100	26100	202200*
Manx shearwater	126000**	107000**	30500**	263500**
Storm petrel	present*	present	present**	present**
Leach's petrel	present*		present*	present*
Gannet	65500**	54300**	24000*	143800**
Cormorant	760	4100**	2100*	6960**
Shag	16200**	5200	6300	27700**
Arctic skua	210	0	0	210
Great skua	190	0	0	190
Black-headed gull	2100	27100	2300	31500
Common gull	3900	500	720	5120
Lesser black-backed gull	4000	40500**	1500	46000**
Herring gull	26200*	67000*	18200	111400**
Great black-backed gull	6800*	1900	3600*	12300*
Kittiwake	69900	33700	30200	133800*
Sandwich tern	1	4700*	1100	5801*
Roseate tern	1	540**	541**	
Common tern	3100*	3100*	1100	7300*
Arctic tern	6000	1200	2100	9300
Little tern	210	370	220	800
Guillemot ¹	308000*	154000*	44900	506900**
Razorbill ¹	65300*	32600*	14300	112200**
Black guillemot ²	14500**	1400	2100	18000**
Puffin ³	514000**	22000	27300	563300**

Notes

- 1 Counts of individuals at breeding sites in early June
- 2 Counts of individuals at breeding sites, conducted mostly in the early morning in April.
- 3 Minimum number of individuals present. Occupied burrow counts, where conducted, have been multiplied by two and individual counts at other locations added to these.

These differing counting methods for different species have been developed as the best way of obtaining consistent counts for each species. The numbers are all less than the total numbers of birds present at the colonies or in nearby offshore waters, as they do not include immatures or non-breeders.

1979 and several international conventions to which the United Kingdom Government is committed.

The Nature Conservancy Council (NCC) is statutorily required to provide advice on developments which may affect nature conservation in Great Britain. In the 1970s, the growth of the offshore oil industry raised considerable fears that oil pollution might increase, with consequent harm to wildlife. As a result, the NCC founded the Seabirds at Sea Team in 1979, with a remit to help establish whether such fears were well-founded. The team's first objective was to determine which areas of the North Sea were particularly important for seabirds. The project was funded by the Marine Pollution Control Unit, which is responsible for ameliorating the effects of any oil spill, the Department of Energy, which is responsible for licensing offshore oil and gas exploration and production, and sections of the oil and gas industry committed to careful planning of developments. After seven years of survey (1979-1986), reports were published detailing the location of birds and their vulnerability in various parts of the North Sea throughout the year.

In 1986, surveys were started in the waters to the north and west of Scotland and in the Irish Sea. This document summarises the results of these surveys to the west of Britain and also incorporates information on the birdlife in these western waters from other sources. It assesses which areas might hold birds particularly vulnerable to oil or other pollution. This information is essential for planning for any potentially hazardous operation in these waters. As with the earlier document covering the North Sea, vulnerability has been assessed wherever possible on an international basis, ignoring any political boundaries. These boundaries are not perceived by birds, and pollution knows no frontiers. In compiling this document, we have drawn on as many sources of information as possible, but apologise if we have overlooked any.

For the purposes of this document, "waters west of Britain" include all those north of 51°N, south of 62°N and west of 3°W (not including parts of the Moray Firth and the Firth of Forth) (Figure 1). Information on birds in the western, deeper, parts of this area and to the west of Ireland is scanty. However, waters over

the deep parts of the North Atlantic support relatively few birds, and these are generally not very susceptible to oil pollution. The shallower areas to the west of Ireland are likely to hold important concentrations of birds for much of the year, and is an area deserving much greater attention.

The birds

The birds using these western waters may be divided conveniently into three groups — offshore, inshore and coastal. The offshore group includes members of several families, most notably the petrels and shearwaters, gannets, gulls and auks. These birds breed on the coasts of western Britain and of Ireland, but frequently feed far offshore. In the winter, many become less attached to their nesting sites and range considerable distances in search of food. Numbers of offshore (and some inshore) seabirds that breed on the coasts of Ireland and western Britain are shown in Table 1. Some of these numbers form important sections of the world populations of these species.

Inshore birds include divers, grebes, cormorants, seaduck and terns. Some gull species and the black guillemot are also included in this group. These birds normally occur within sight of land, but may on occasion use sites further offshore. Although large numbers of some of these birds breed on western coasts, many more move into the area (particularly the Irish Sea) during winter.

The coastal bird population is composed largely of shorebirds, ducks and, in some areas, brent geese. Most of these birds feed typically on coastal mud- and sand-flats, but some feed on other intertidal areas. These habitats are comparatively rare on the western coast of Scotland, and the majority of coastal birds in these areas feed on beaches or low rocky coasts. The influence of the relatively warm Atlantic on the Irish Sea and the western coast of Scotland means that these areas rarely become frozen and are thus particularly attractive to those birds which probe or dabble in intertidal areas in their search for food. Most of these birds breed in the Arctic or Sub-Arctic, and migrate to this area to stay for the winter or move on to areas further south and west. The estuaries of the Irish

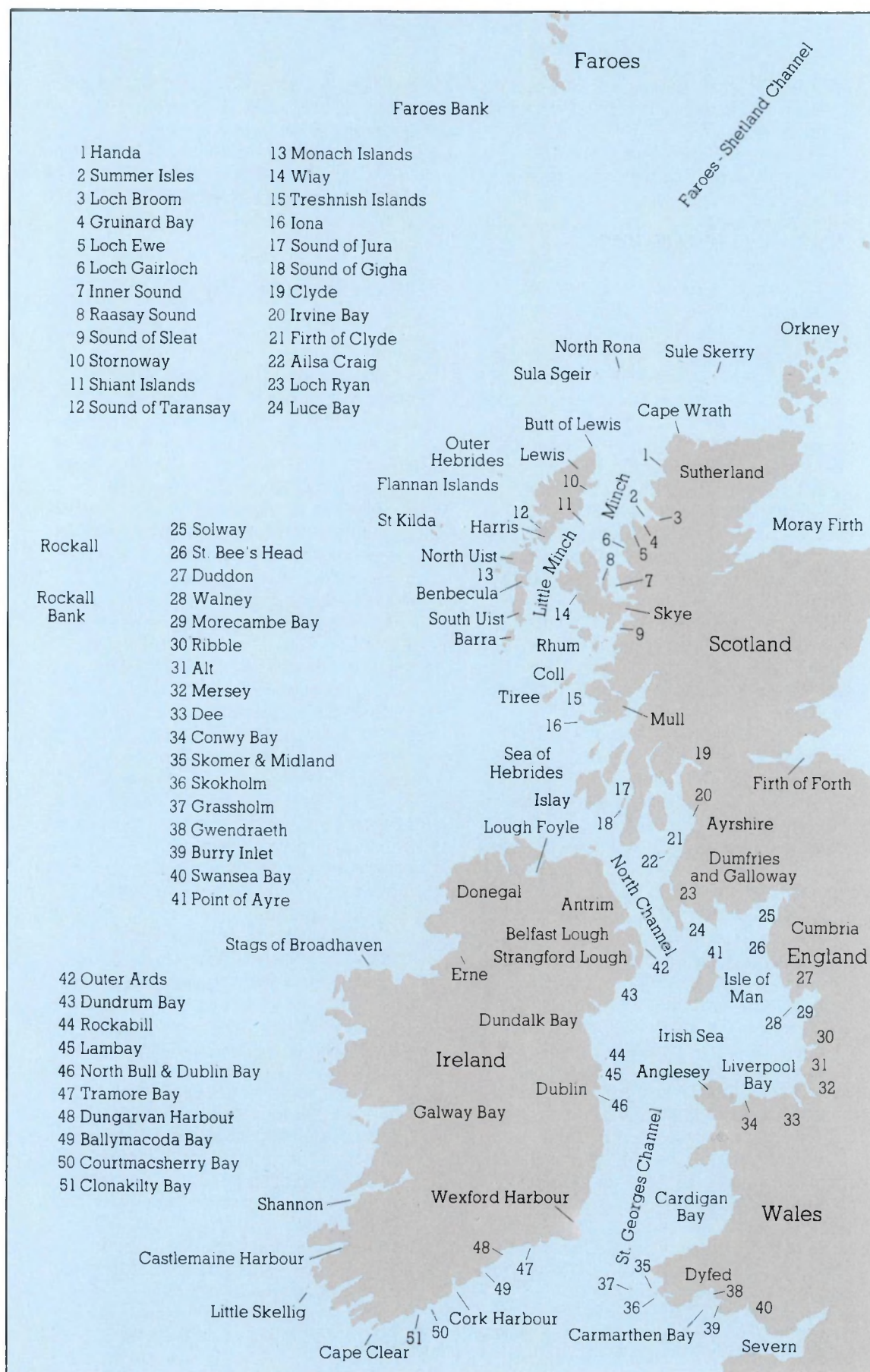


Figure 1: The waters west of Britain showing localities mentioned in the text.

Sea are particularly important for these latter in winter and during their return migration to northern breeding grounds. Some estuaries support important numbers of non-breeding birds during the summer.

Statutory conservation mechanisms

Several measures exist to conserve marine birds and their habitats in the west of Scotland and in the Irish Sea. The United Kingdom and the Republic of Ireland have both ratified or signed the Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat. Both states thus have a responsibility to protect wetlands and use them wisely. Internationally important wetlands should be designated as such. A wetland reaches this criterion if it regularly hold over 1% of the population of the individuals of one species or population, or if it supports a total of over 20,000 individuals. The qualifying levels are given in Table 2. Throughout this document the term "internationally important" refers to sites which qualify under these internationally accepted criteria. As numerical criteria alone are inadequate to identify all sites of international importance, additional criteria

exist, but the numerical criteria give sufficient indications for the purposes of the present document.

Both the United Kingdom and the Republic of Ireland are also committed by the EEC Directive on the Conservation of Wild Birds of 1979. This directive is concerned with the conservation of vulnerable and other migratory birds and their habitats. Areas of international importance must be designated as Special Protection Areas (SPAs) and special measures have to be taken for these species also in other areas. Areas to be designated include those identified for birds under the Ramsar Convention among others. Areas holding 1% of the Community's population of seabirds (as well as some other sites, for example productive breeding areas) are regarded as internationally important in the terms of this directive. Coastal sites designated under either the Ramsar Convention or the EEC Directive are shown in Figure 2, as are those identified by the NCC, the Department of the Environment for Northern Ireland or the Irish Wildlife Service (as the relevant statutory advisers) as qualifying for designation. These marked sites are only those so far identified as being of international ornithological importance. Much of the

Table 2
Qualifying levels (i.e. 1% of the relevant population) for international importance of wetlands to waterfowl. Only those species or subspecies whose population uses intertidal areas to the west of Britain on a regular basis are included.

Mute swan	1800	Goosander	1250
Bewick's swan	170	Oystercatcher	9000
Whooper swan	170	Ringed plover	500
Pink-footed goose	1100	Golden plover	10000
Greenland white-fronted goose	220	Grey plover	1500
Barnacle goose	300	Lapwing	20000 *
Light-bellied brent goose	200	Knot	3500
Shelduck	2500	Sanderling	1000
Wigeon	7500	Purple sandpiper	500
Teal	4000	Dunlin	14000
Mallard	20000 *	Ruff	10000
Pintail	700	Snipe	10000
Shoveler	400	Black-tailed godwit	700
Pochard	3500	Bar-tailed godwit	1000
Tufted duck	7500	Whimbrel	700
Scaup	1500	Curlew	3500
Eider	20000 *	Spotted redshank	?
Long-tailed duck	20000	Redshank	1500
Common scoter	8000	Greenshank	?
Goldeneye	3000	Turnstone	700
Red-breasted merganser	1000		

* The north-west European population of each of these species exceeds two million, but a site holding more than 20,000 waterfowl qualifies as internationally important by virtue of total numbers.

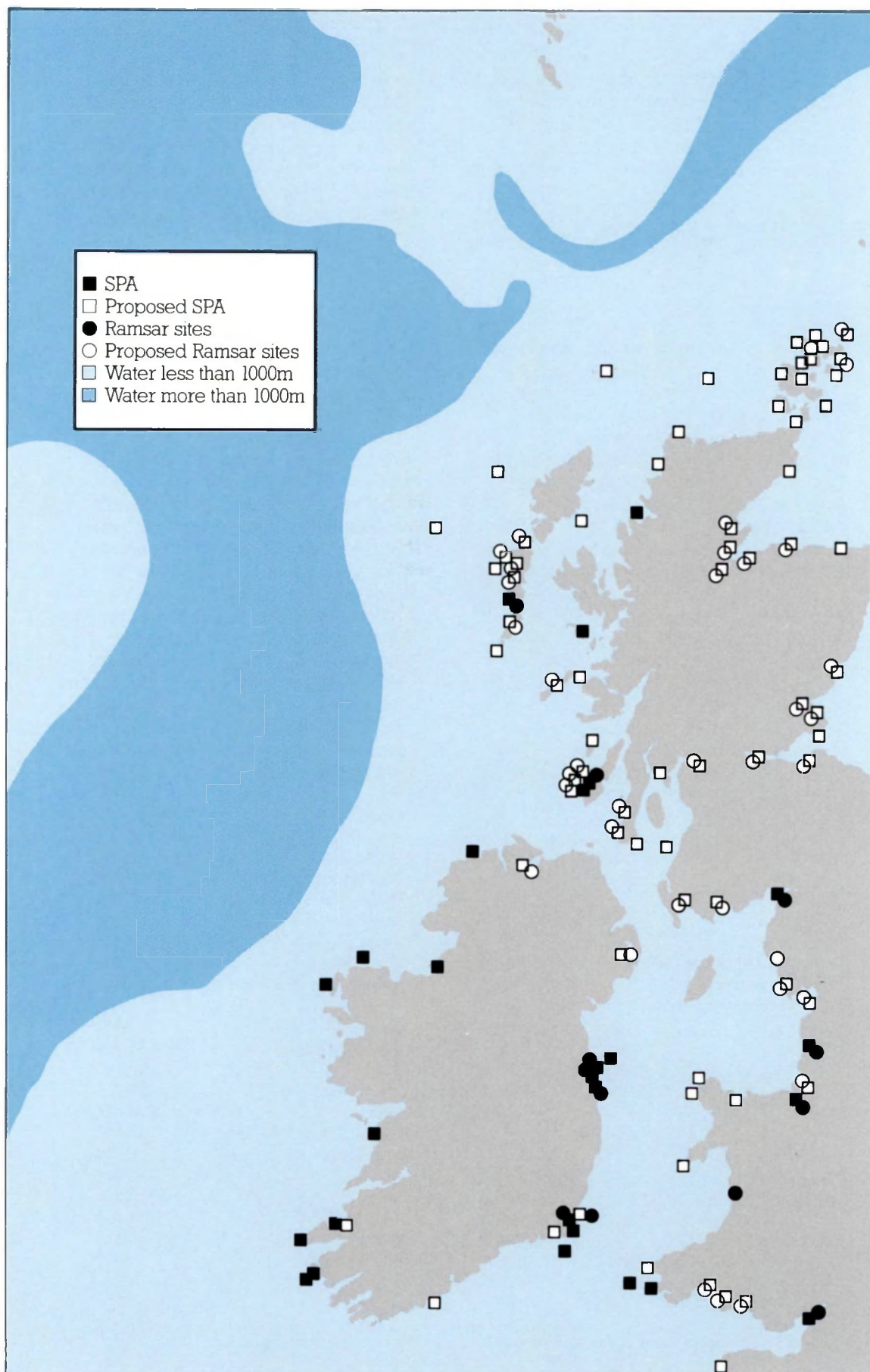


Figure 2: Locations of designated and proposed sites on coasts to the west of Britain notified under the Ramsar Convention and as Special Protection Areas under the EEC directive on the Conservation of Wild Birds 1979.

remainder of the coast and its associated wildlife is also vulnerable to oil pollution. The present document is a summary of the main areas of vulnerability at sea, with coastal areas included for completeness.

Oil pollution

Many of man's activities at sea carry an attendant risk of oil pollution. Within the area that this report covers, there is no oil extraction (although there is some of gas), but there are several oil refineries and terminals. Ships transporting oil to and from these sites have spilt oil in the past and in some cases caused considerable damage. Other oil spills have derived from commercial shipping. Such risks to birdlife continue, and the Seabirds at Sea programme was initiated partly to determine which areas hold birds particularly at risk from oil pollution and whether the risk varies through the year. This information can then be used to plan the best timing for any potentially risky activity or determine the type of response to an oil spill.

The vulnerability of seabird species to oil pollution is dependent on a variety of factors. As in the previous study of the North Sea, species have been divided into three categories of vulnerability — very high, high and moderate (Table 3). This division is based on the amount of time spent on the water and the importance of the waters west of Britain to the world population of the species. The categorisation of species is therefore slightly different between the North Sea (Tasker & Pienkowski 1987) and the waters west of Britain (present volume).

The vulnerability of many species varies through the year. Several species undergo a simultaneous total moult of their flight-feathers at some stage of the year. At these times, the birds are flightless and confined to the surface of the water. Vulnerability is thus increased in these species at this time of year. During the breeding season, much of the population of several species is confined to the vicinity of the breeding colonies by the need to incubate their egg(s) or feed their chick(s). Most seabird populations are much more concentrated when breeding; for instance, more than half of the world's Manx shearwaters will be in the vicinity of the islands off south-western Wales or of

Rhum in summer. The consequences of an oil pollution incident close to a major colony in the breeding season would be much more serious than at other times of the year. It can be seen that the size of an oil spill can be of less importance than its location and timing.

Large numbers of shorebirds use the area, particularly in winter and on migration. Shorebirds are comparatively rarely affected by oil pollution directly, the greatest effects of any spill probably being on the intertidal organisms which comprise their food. Shorebirds are thus categorised as being at moderate risk, except in areas where a large proportion of the world's population gathers during migration or where substantial numbers breed.

The type of oil involved in a given oil spill may determine its consequences. Light oils, such as most North Sea crude oil or many refined products, have a high evaporation rate and have many components which dissolve in the water. Thus, a relatively small proportion of the spill will remain on the water surface after one or two days. Heavier oils may break up much more slowly, leaving much more on the surface and for longer, hence posing a threat for a longer period. This problem may be exacerbated by the formation (by some oils) of a water/oil emulsion. This is much more difficult to disperse and stays on the water for longer.

The maps

One map has been compiled for each month of the year, to show known areas holding concentrations of birds at very high, high or moderate vulnerability to pollution. These maps are presented in sequence, from the breeding season onwards, and are each accompanied by a page of text highlighting major concentrations of birds and describing typical movements.

The maps have been compiled from a variety of sources and reports. For the United Kingdom estuaries, we analysed the results of the Birds of Estuaries Enquiry organised by the British Trust for Ornithology (and sponsored also by the NCC, the Royal Society for the Protection of Birds and the Department of the Environment for Northern Ireland), and those of the National Wildfowl Counts,

organised by the Wildfowl and Wetlands Trust (under contract to the NCC and the Department of the Environment for Northern Ireland). The results of the Winter Shorebird Count, run by the Birds of Estuaries Enquiry and the Wader Study Group, were examined to determine the importance of non-estuarine areas. For similar areas in the Republic of Ireland, all available published sources were examined. The locations and sizes of important seabird colonies in Britain and Ireland have been surveyed for the Seabird Colony Register compiled by the NCC and the Seabird Group (Lloyd, Tasker & Partridge in press).

Further offshore, the locations of vulnerable concentrations of birds was determined by analysis of work carried out by the Seabirds at Sea Team between 1980 and 1989 (but mostly from 1986 to 1989). The full results of this work, which aimed to survey waters to the west of Scotland and in the Irish Sea, are described by Webb *et al.* (1990). Standard methods were used to count birds seen from ships, aircraft and land. This enabled a mean density of seabirds to be calculated for various areas of the sea and comparisons to be made between these areas. A monthly distribution map for each species was produced and the importance of each area to the west of Britain to every species was assessed as high, medium or low.

The final maps were then drawn, by using a combination of this categorisation and the species vulnerability ratings. An area of high importance to a species of very high vulnerability is graded most at risk from pollution and given the darkest shading. An area of medium importance to a species of very high vulnerability or of high importance to a species of high vulnerability is given a lighter shade. An area of low importance to a highly vulnerable species, of medium importance to a species of high vulnerability or of high importance to a species of moderate vulnerability is shaded still more lightly. Other areas, which hold relatively few birds, receive the lightest shade.

Inevitably, some areas were not surveyed adequately in every month; these are also shown on the individual monthly maps. Three potentially very important areas have generally not been surveyed adequately. Two are in the Irish

Sea, one to the south-west of the Isle of Man and north of Dublin, and the other in the northern part of St George's Channel, south of Dublin. The third area is the continental shelf waters to the west of Ireland. Coverage of the first two of these areas should improve during the fourth phase of the Seabirds at Sea programme (1990-1994). Waters lying to the west of the continental shelf edge have not been widely surveyed, but it is unlikely that any major concentrations of vulnerable birds would be found in these areas.

Mapping limitations

The capacity for birds to move rapidly from one site to another adds to the difficulty of compiling maps of bird distribution. However, most birds are constrained to a certain extent by the location of their breeding areas and of their food resources. The benthic and intertidal food resources of inshore and coastal species are relatively predictable and static, but factors such as spat-fall of bivalve molluscs and weather conditions can affect the amount and availability of prey for some birds. For instance, the location of common scoter flocks in the eastern Irish Sea may well vary with the abundance of their invertebrate prey. Several sites, such as the outer Solway, the outer Ribble, the northern coast of Wales, the northern part of Cardigan Bay and Carmarthen Bay, have held large numbers of scoter, but never apparently all at the same time.

Further offshore, fish shoals appear to be variable in their size and location. Some patterns in the location of seabird flocks in the waters west of Britain appear to be the same each time the area is surveyed. For instance, the waters of the north-western Minch appear to be very important throughout the year, and virtually every survey of this area has found large numbers of auks. The shallow waters of the eastern Irish Sea appear to be used every winter by guillemots and razorbills, though the exact locations of flocks appear to vary slightly from year to year. Other patterns are much less predictable. The maps are based on several years of accumulated information; while some areas have been visited frequently, others have been surveyed only once. The maps are drawn

to encompass all areas where concentrations have been recorded. Owing to potential changes in distribution, these maps should not be taken as definitive, but rather should act as a warning of the potential consequences of pollution within an area.

Use of the maps

This document has been designed for those concerned with the control of oil pollution. It is intended as a summary of information on the birdlife in waters to the west of Britain and should be used when taking decisions that might affect this internationally important resource.

In the event of an oil pollution incident, the importance to birds of the affected area may be assessed rapidly by consulting the relevant monthly map(s). Oil spills from platforms on the United Kingdom's continental shelf should be reported to the NCC in accordance with the Department of Energy's Continental Shelf Operations Notice No. 7. Spills from other or unknown sources should be reported through HM Coastguard. Spills in Republic of Ireland waters should be reported to the Irish Department of the Environment and the Irish Wildlife Service.

Immediate action should be taken to deal with spills in the areas identified as being of greatest and secondary importance. We recommend that any oil pollution in these areas be contained, dispersed or removed as soon as possible. The exact style of clear-up will

vary between incidents, but in principle, physical removal of as much oil as possible is desirable. Spills in other areas should be treated on a case-by-case basis, and surveys may need to be conducted to locate any vulnerable concentrations of birds.

For new offshore operations, the information in this document should be used in compiling oil spill contingency plans. These plans should reflect the importance of an area and, if possible, potentially risky operations should be timed to occur during periods of lowest risk.

Research and survey continue in all United Kingdom waters, and this will undoubtedly improve our knowledge. Up-to-date information on the offshore distribution of birds may be obtained from the authors at:

Seabirds at Sea Team
Chief Scientist Directorate
Nature Conservancy Council
17 Rubislaw Terrace
Aberdeen AB1 1XE
Tel. 0224 642863 Fax. 0224 643347
(first point of contact)

or
Ornithology Branch
Chief Scientist Directorate
Nature Conservancy Council
Northminster House
Peterborough PE1 1UA
Tel. 0733 340345 Fax. 0733 368834
(in case of difficulty).

Table 3

Vulnerability to oil pollution of species of birds using waters to the west of Britain. W = substantial period of life spent on water surface; P = waters west of Britain important for a large proportion of the species; R = species rare on a world basis.

Very high	High	Moderate
Red-throated diver (W)	Sooty shearwater	Fulmar
Black-throated diver (W)	Gannet (P)	Storm petrel
Great northern diver (W)	Kittiwake	Leach's petrel
Manx shearwater (W, P)	Little auk (W)	Arctic skua
Cormorant (W, P)		Great skua
Shag (W, P)	Shorebirds in the	Little gull
Scaup (W)	breeding season	Black-headed gull
Eider (W)	and some species	Common gull
Common scoter (W)	on migration (P)	Lesser black-backed gull (P)
Long-tailed duck (W)		Herring gull (P)
Red-breasted merganser (W)	Estuarine	Great black-backed gull (P)
Goldeneye (W)	wildfowl (P)	Sandwich tern
Shelduck (W, P)		Arctic tern
Roseate tern (P, R)		Common tern
Guillemot (W, P)		
Razorbill (W, P)		Shorebirds in winter
Black guillemot (W, P)		
Puffin (W, P)		

June

Inshore and coastal birds

The vast majority of the birds that use the coasts of western Britain and Ireland in winter have departed for their northern breeding grounds by June. Some non-breeding common scoters remain in the Irish Sea through the summer. Eiders are in much the same areas as in May.

Most inshore birds are near their breeding sites in June. Most divers have returned northwards to their inland nesting sites, although the small, but important, population of red-throated divers in Orkney, northern Scotland and north-western Ireland feeds in inshore waters. Shags tend to feed near their nest sites, often in strong tidal currents. About 47,300 pairs of shag (the nominate subspecies) breed on the western coasts of Britain and in Ireland. This represents about 22% of the world population. The largest colony is on Lambay off County Dublin, but the majority of this western population is found around the islands and coasts of the Inner Hebrides. In contrast to shags, cormorants tend to be found feeding in more estuarine locations, frequently on flatfish and other fish, caught on the seabed. These conditions are relatively rare on the western coast of Scotland, and, as a consequence, relatively few cormorants breed there. The largest cormorant colony is also found on Lambay. With over 1000 pairs, it holds 9% of the entire British and Irish population and more than a quarter of the birds breeding in the Irish Sea.

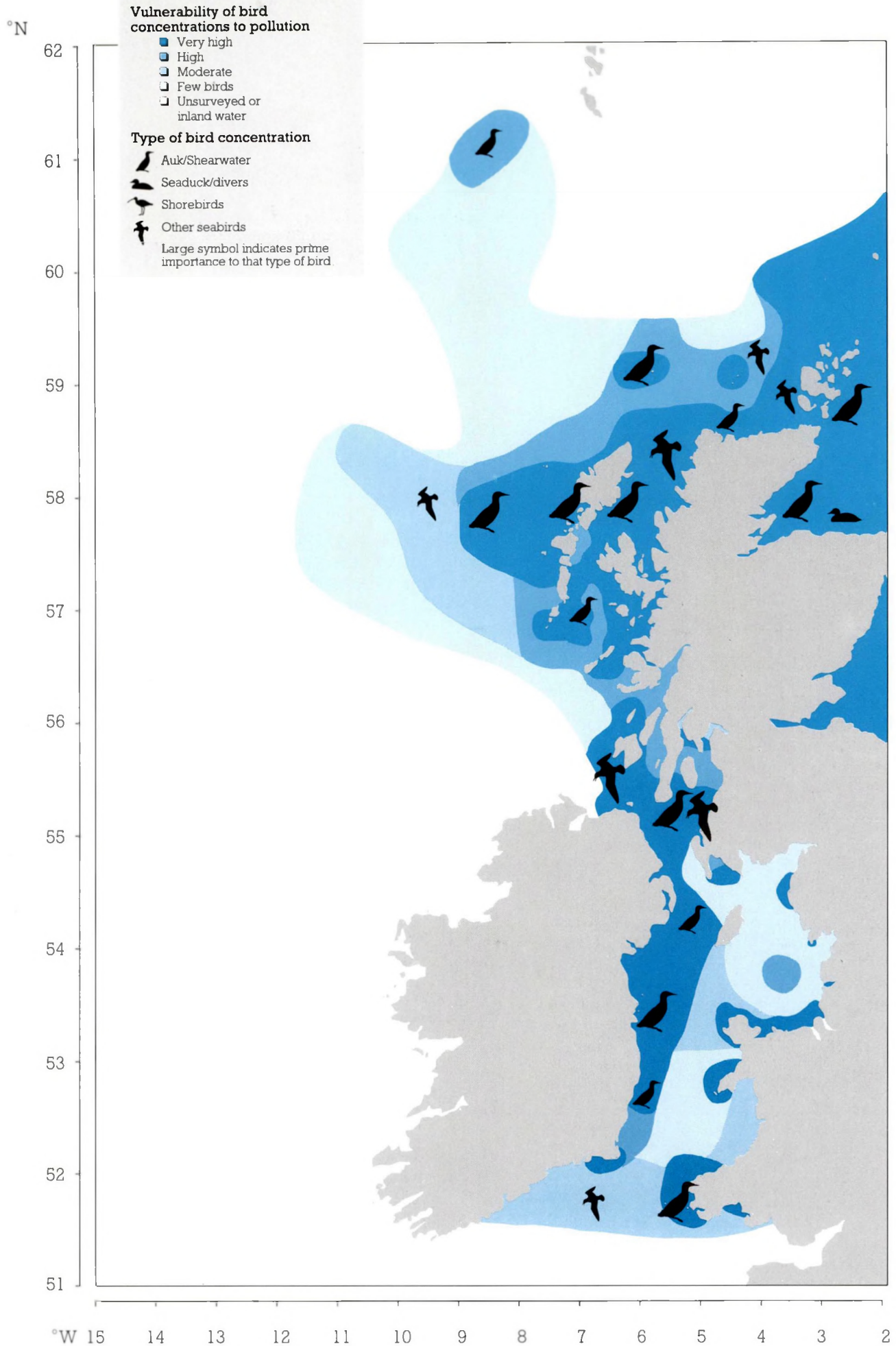
Terns feed mainly inshore. The rarest of these is the roseate tern. In 1987, 540 pairs bred in the Irish Sea, and these represented over 30% of the eastern Atlantic population of this globally endangered species. At present, the largest numbers are found on Rockabill, County Dublin, but large numbers also once occupied colonies off Anglesey and in south-eastern Ireland. The majority of the Sandwich and little terns in the western breeding populations (5800 and 800 pairs respectively) nest on the shores of the Irish Sea as well. Most of the Sandwich terns breed in Strangford Lough and at Lady's Island Lake, County Wexford. Common terns are numerous both in the Irish Sea and on the western coast of Scotland. The largest colony in Britain and Ireland is

found on a small island off Mull. Arctic terns are more common further north in the western area. Black-headed gulls are comparatively rare off the coast, with many feeding inland or on estuaries. One large colony of 20,000 pairs on the Ribble marshes accounting for about two-thirds of those breeding around these western waters.

In comparison with the winter, numbers of all waders on estuaries are very small. However, the numbers of knot and sanderling remaining on the Ribble still reach internationally important levels. Many of these are immature birds. Small populations of waders breed on saltmarshes or, in the Hebrides on coastal machair; for several species these represent important proportions of the north-west European breeding population. About 30% of redshanks breeding in Britain breed on the saltmarshes on the eastern side of the Irish Sea. Over 1800 pairs of ringed plovers are estimated to breed on the Uists and Benbecula, more than 20% of the British and Irish total. The habitats of both of these species are under threat in parts of their range, so it is particularly important that these populations are safeguarded.

Offshore seabirds

The majority of birds using offshore waters are associated with breeding colonies in western Scotland. St Kilda, 50 km west of the main islands of the Outer Hebrides, supports the most important seabird colony in the north-eastern Atlantic. It holds the largest gannetry in the world and the largest Leach's petrel and puffin colonies in the eastern Atlantic, as well as having populations of fulmar, storm petrel, kittiwake, guillemot and razorbill that are important in a European context. Guillemots and razorbills from the islands of St Kilda feed over a large tract of continental shelf towards the main part of the Outer Hebrides. Leach's petrels, which deliver food to their young at night, are found by day beyond the edge of the continental shelf to the west. Many of the other offshore islands also support large colonies of seabirds, so the areas immediately around them are liable to hold large numbers of feeding and loitering birds.



About half a million guillemots breed around these western waters, and 60% of these breed on islands off western Scotland. Britain and Ireland's largest colony (99,000 individuals or about 66,000 pairs) is on Handa, Sutherland. Over 100,000 razorbills breed in much the same areas as guillemots around these western waters. Three large puffin colonies (St Kilda, the Shiant and Sule Skerry) account for about half of the population of 560,000 pairs breeding in western Scotland, the Irish Sea or Ireland. These major colonies are sites where seabird populations become very vulnerable to oil spills.

Manx shearwaters also have an extremely clumped breeding distribution. The colonies on Rhum (about 120,000 pairs) and the south-western Welsh islands of Skokholm, Skomer and Midland (130,000 pairs) support over 90% of the population in Britain and Ireland and about 85% of the world population of the nominate subspecies. Manx shearwaters forage further away from their colonies than the auks, but gather in vast rafts close to their colonies in the evening before visiting their nesting burrows by night. Even when feeding at large distances from colonies, Manx shearwaters tend to form large flocks. The western Irish Sea and St George's Channel are particularly important areas.

The western waters of Britain and Ireland hold the vast majority of Europe's Leach's petrels. There are only seven known colonies, and these are on Sule Skerry, North Rona, Sula Sgeir, St Kilda, Flannan Islands and the Stags of Broadhaven and at two sites in Shetland. Storm petrel colonies are more widely dispersed, but virtually all are on offshore islands which are free of rats. They feed, in contrast to Leach's petrels, over much of the continental shelf west of Scotland, with the area around the Butt of Lewis being particularly important.

Apart from St Kilda, large gannetries (over 10,000 pairs) are found on Grassholm, Ailsa Craig and Little Skellig. Gannets breed also at eight other sites in these western waters. In the North Sea, breeding gannets usually remain within 120 km of their nest site when foraging (and often a lot closer). Near St Kilda, foraging birds were seen to the north of the islands in large numbers, while some were found to fly to feed in the waters near

the Butt of Lewis. Over 130,000 pairs of kittiwakes nest around these western waters, many in the same colonies as guillemots and razorbills off western Scotland.

Lesser black-backed gulls nest in particularly large numbers on the coasts of the Irish Sea, with large colonies on Skomer and Walney Island. Herring gulls are more evenly spread, but still the majority of the birds west of Britain are on Irish Sea coasts. The majority of great black-backed gulls are spread through the islands and coasts of western Scotland, with the largest colony on North Rona. Compared with other times of the year, all three species feed on or relatively close to the coast.

The eastern Irish Sea holds comparatively few concentrations of birds vulnerable to oil pollution, as do areas beyond the shelf break. Survey effort has been poor in Cardigan Bay and parts of the central Irish Sea. The southern parts of St George's Channel may hold large numbers of storm petrels and deserves further investigation.

July

Inshore and coastal birds

July marks the end of the breeding season for several species, and some seabirds and shorebirds abandon their nesting areas. Some move rapidly to their wintering areas, while others move to intermediate moulting areas. Common scoter arrive in their wintering areas within waters west of Britain and undergo a total flight feather moult. Some immatures start this process in June, adult males arrive in July and females remain on breeding sites much longer with ducklings. Moulting flocks have been seen in Carmarthen Bay and off the southern coast of Dumfries and Galloway. There have been few surveys, however, and it is impossible to tell whether these sites are used regularly or whether there are other moulting areas. Most shelduck leave British and Irish waters to join moulting flocks in the Waddensee off Germany, but a few, mostly immature, birds remain to moult on the Dee and Severn. Eider ducks remain fairly close to their breeding sites while they undergo wing-moult. Large moulting flocks may build up in some areas; in western Scottish waters these have been found off the Ayr coast (possibly the largest), in Loch Gairloch and in the Sound of Taransay. Most birds, however, probably form small flocks close to their breeding sites.

Wading birds also move to Irish Sea estuaries in July, many to undergo their moult. In their case, wing-feather moult is gradual, and the birds never become flightless. Bar-tailed godwits and curlew reach internationally important numbers in Morecambe Bay, with many commencing their primary moult from mid-July onwards. The British breeding population of ringed plover remains close to its nesting grounds and starts its moult; populations from further north swell the numbers to internationally significant levels on several estuaries, including Morecambe Bay, the Severn and the Solway, before moving on to moult at wintering sites further south. Morecambe Bay becomes internationally important for oystercatcher, sanderling, dunlin and redshank in addition to the above species. Other intertidal areas that reach international importance for at least one

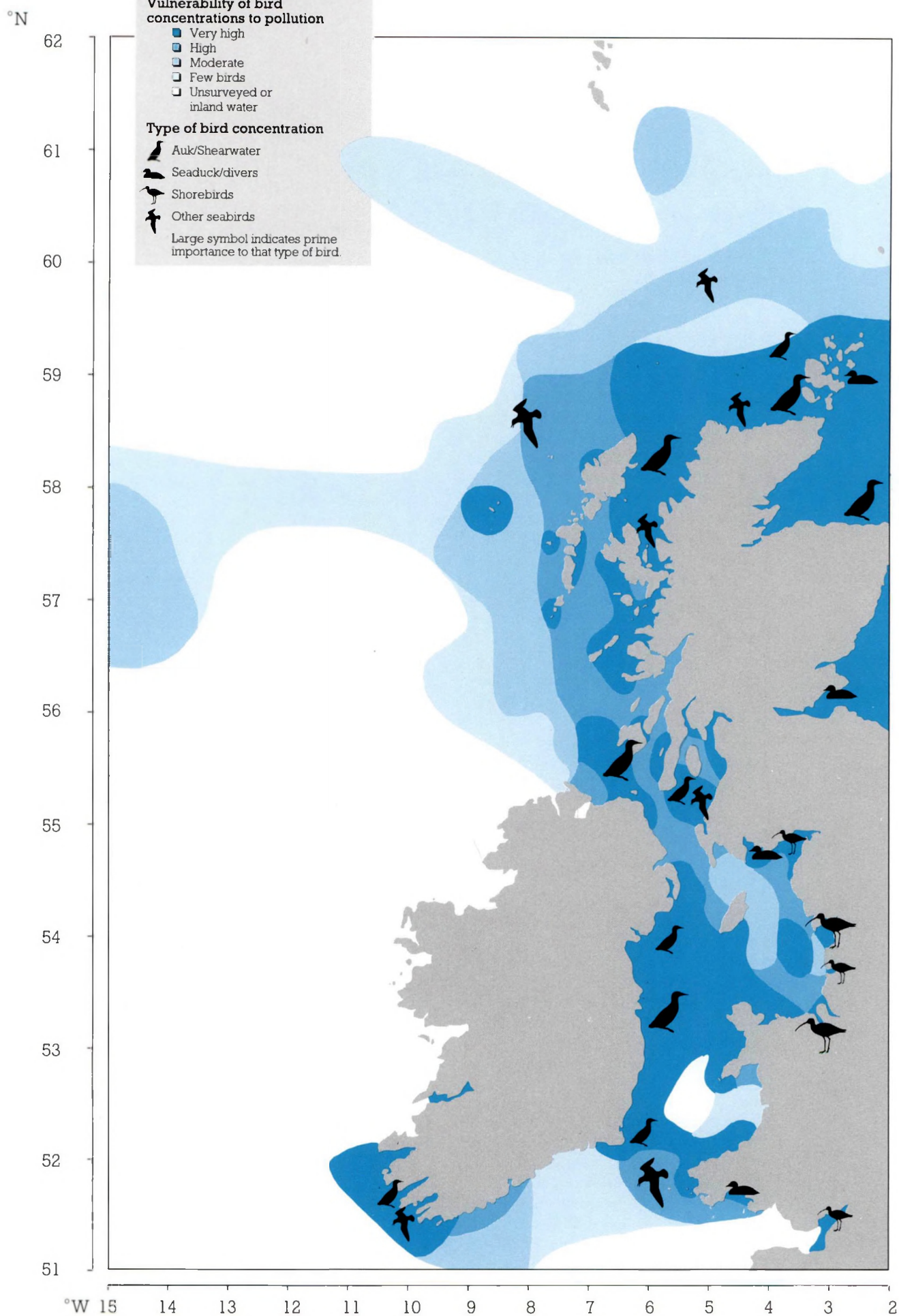
species of shorebird are Dublin Bay, the western coast of the Uists and Benbecula, Tiree, and the Shannon, Dee and Clyde estuaries.

Offshore seabirds

Many young guillemots and razorbills leave their colonies in a flightless state and at about a third of their full adult weight in July. They are accompanied to feeding grounds by the male parent, which rears them subsequently at sea. The female parent tends to remain near the breeding site. Immature and non-breeding birds leave to go to sea also. All of these seagoing fully grown birds undergo total flight-feather moult and become flightless at this time and, as a consequence, the population is especially at risk from any water-borne pollution at this time. Large numbers of both species are found in the western Irish Sea, in the northern North Channel/outer Firth of Clyde and in the northern Minch. Flocks of guillemots with some razorbills are found in the eastern Irish Sea, in the southern parts of St George's Channel, off south-western Ireland, to the west of Islay and off northern Scotland. Many of these latter birds are probably moving from colonies in western Scotland to waters off north-eastern Scotland, where large flocks gather in August.

The breeding season for puffins, Manx shearwaters, kittiwakes and gannets are considerably more prolonged than that of guillemots and razorbills. Young puffins and kittiwakes start to leave their colonies towards the end of the month. Before this, the distribution of feeding adults at sea is much the same as in June. The area off south-western Ireland has good numbers of kittiwakes and puffins. Immature kittiwakes are less attached to colonies than adults, and concentrations occur in the Inner Sound and well to the west of Islay. Low densities were found as far afield as the southern Rockall Bank and in the Faroes/Shetland channel.

Manx shearwaters are found in high densities around the colonies on Rhum, off southern Skye, in the western Sea of Hebrides near the coast of the Uists and Benbecula, in the North Channel and inshore in the Sound of Sleat. Many of those from the south-western Welsh islands feed in Cardigan Bay and over



many of the banks in the eastern Irish Sea, south of Dublin. Gannets are still present near their colonies, with those from St Kilda apparently flying furthest: high densities are present around the Butt of Lewis, in the north-western Minch and around trawler fleets on the continental shelf north of St Kilda.

Storm petrels are particularly common in the waters immediately west of the Outer Hebrides and off south-western Ireland. Leach's petrels are found by day beyond the continental shelf edge. The main fulmar concentrations are found on the western Scottish shelf, in the north-western Minch, in the southern Sea of Hebrides and in the central part of the western Irish Sea. Many of these birds feed around trawlers. Fulmars are present in moderate numbers over the Rockall bank; presumably most of these are immature.

Few birds were found in areas beyond the continental shelf edge; survey coverage was good to the north, but absent in eastern St George's Channel and to the west of Ireland.

August

Inshore and coastal birds

Further influxes of waders to the Irish Sea occur in August. Knot which breed in arctic North America build up to internationally important numbers on the Ribble and in Morecambe Bay. The Ribble becomes as important for sanderling, dunlin and black- and bar-tailed godwits. This estuary appears to be particularly important during this migration period; black-tailed godwit pause here to moult and feed before moving on to other estuaries further south and east later in the autumn. Morecambe Bay is also internationally important for oystercatcher, sanderling, dunlin, bar-tailed godwits, curlew and redshank. The other estuary with several internationally important populations is the Dee; oystercatcher, ringed plover, black- and bar-tailed godwit and redshank all reach the requisite levels. Further intertidal areas holding requisite numbers of one or more wader species are the Solway, the Burry Inlet, the Shannon, the Severn, Ballymacoda Bay, Clonakilty Bay, Lough Foyle and the Clyde.

The common scoter flock based in the eastern Irish Sea continues to grow in August as female birds arrive. The exact location of this flock appears to vary from year to year. Red-breasted mergansers move to the coast to moult. Known sites holding flocks include the area off the northern County Dublin coast, Dundalk Bay, the mouth of the Erne estuary in Donegal, Dundrum Bay, the Sound of Gigha, Loch Gairloch, Gruniard Bay and off the Ayrshire coast. Large numbers of mallard are present in Lough Foyle. Peak numbers of cormorants occur in estuaries in August, presumably as birds of the year leave their colonies and move to these relatively sheltered waters where they continue to be fed by their parents.

A very large flock of common terns assembles off Dublin in August. Up to 7000 birds have been counted at roost on beaches in the area. These birds feed over the offshore banks out at sea by day. Hundreds of roseate terns roost at Dalkey Island, County Dublin, prior to migration.

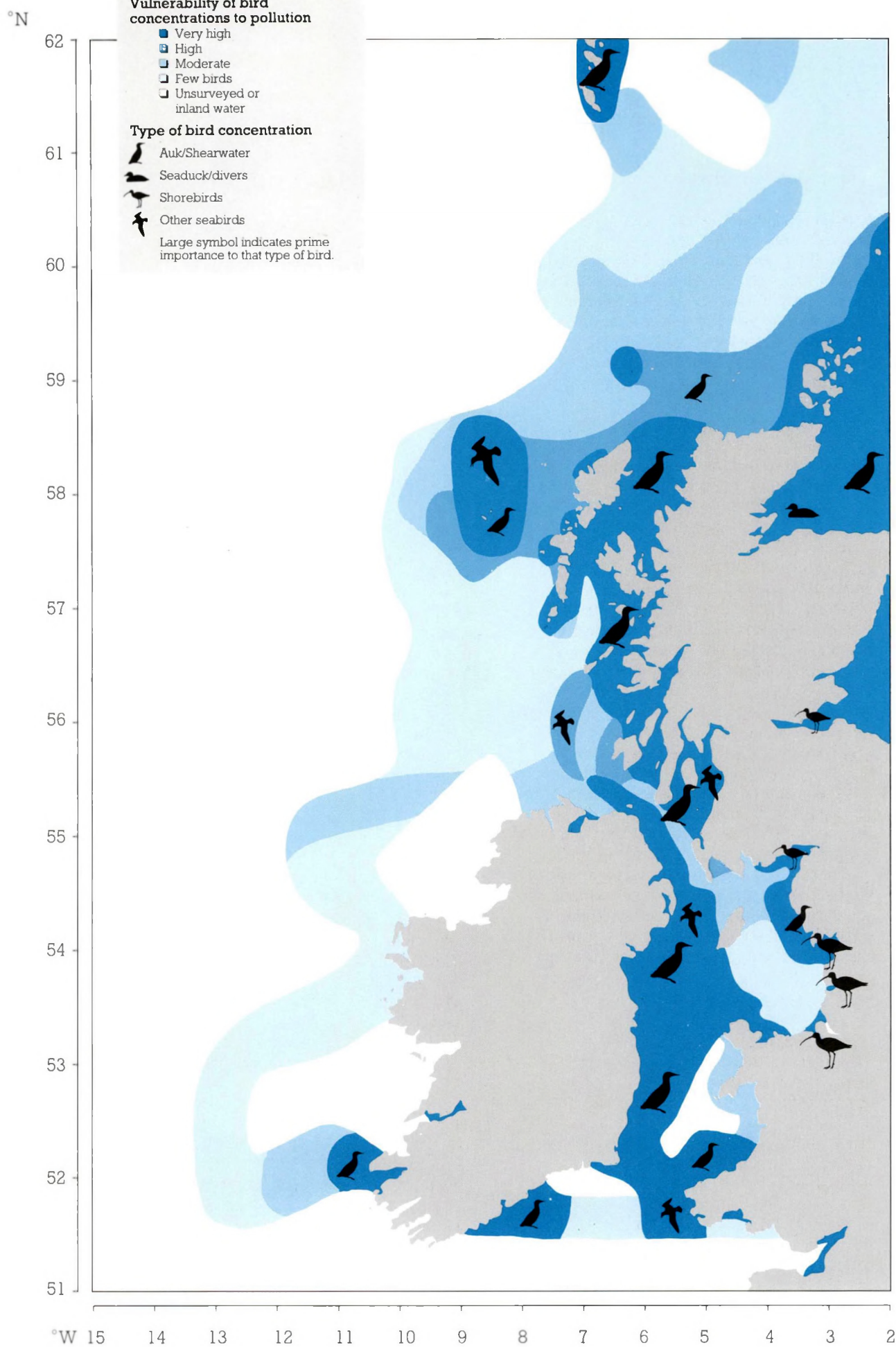
Offshore seabirds

The concentrations of moulting auks continue to form offshore during August. Many of the birds from northern Scottish waters move eastwards to join the large flocks in the northern North Sea. Other birds from these colonies and those further south move to coastal waters off western Scotland and in the western Irish Sea. Key areas for guillemots are the Minch, Inner Sound, central and eastern Sea of Hebrides, Sound of Jura, Firth of Clyde, western Irish Sea, waters off Cumbria and the south-eastern part of St George's Channel. In 1988, about 87,700 adult guillemots were estimated to be present between Cape Wrath and the North Channel. An approximate further 79,200 were present in the northern Irish Sea.

Flocks of razorbills are much more localised in their distribution. An area of the Minch south-east of a line between Cape Wrath and the Uists, including the Inner Sound, is particularly important, as are the Sound of Jura and the coastal waters of Antrim. Smaller areas holding concentrations include the eastern Sea of Hebrides, the area west of Mull, the banks off Dublin and the area just north of Anglesey. Total numbers of adult razorbills in the seas between Dublin and Cape Wrath were estimated at 38,600 in August 1988. Much of St George's Channel could not be surveyed in August and it seems likely that further important areas for auks were missed as a consequence.

Puffin chicks do not leave their burrows in large numbers until August, and the area around the colonies remains important for feeding birds. The Minch between Loch Broom, Stormoway and the Little Minch holds high densities of puffins, presumably deriving mostly from the large colony on the Shiant Islands. High densities of puffins are found along the Welsh coast near Skokholm and Skomer. Areas further from colonies that also hold puffins include the centre of the northern part of St George's Channel and much of the waters off northern Scotland.

Manx shearwaters, too, do not complete their breeding cycle until August. Important areas for these birds are all located in inshore waters, such as the western Sea of Hebrides, the waters off northern Skye, the Clyde, the Sound of



Jura, the western Irish Sea, particularly near Dublin, and off the southern coasts of Ireland. Kittiwakes are found in the same areas as the auks and shearwaters, but are generally present in much lower numbers than in June and July, as many birds leave the area and move out into the Atlantic. Other birds follow the auks eastwards into the North Sea. Few of the larger gulls are seen offshore in August; most are coastal and associated with man's fishing activities.

Young gannets start to leave their colonies towards the end of the month. Adults continue to forage in areas used throughout the summer, and highest densities are found to the north of St Kilda and off Grassholm; moderate densities are found in the north-western Irish Sea, the Firth of Clyde and parts of the Minch.

The area to the west of Islay, where water flowing north through the Irish Sea meets the more saline Atlantic water, is particularly important for storm petrels during August. Leach's petrels continue to forage beyond the continental shelf edge west of St Kilda. Sooty and Cory's shearwaters visit British and Irish waters during August. The former species tends to be seen only in Atlantic-influenced waters off the western coasts of Scotland and Ireland, while Cory's shearwaters occur in highest numbers off south-western Ireland, particularly in years when sea temperatures are higher than average.

There have been no surveys in much of the eastern part of St George's Channel, off south-western and north-western Ireland and west of the continental shelf edge. The first two areas may be important for auks.

September

Inshore and coastal birds

The peak in abundance of several wader species in Irish Sea estuaries occurs in September. These peak numbers tend to relate to those species that breed locally but whose numbers are swelled by immigrants; thus peak numbers of oystercatchers are present in Welsh and Irish sites, with Morecambe Bay, the Solway, Dundalk Bay, the Dee and the Burry inlet all holding internationally important numbers of these birds. Redshank reach their annual peak in Morecambe Bay, the Solway and the Dee, while numbers in the Clyde, Strangford Lough, Lough Foyle and Belfast Lough reach internationally important levels also. Black-tailed godwit (from Iceland) are present in the Shannon, Cork and Wexford Harbours, the Ribble, the Severn, and Ballymacoda and Clonakilty Bays in internationally important numbers. The Ribble is similarly important for knot, sanderling and bar-tailed godwit, Morecambe Bay for ringed plover, turnstone and curlew, and the Dee and the Solway also for curlew.

Three estuaries become internationally important for their duck populations during the month — the Mersey for teal and pintail, the Dee for shelduck and Lough Foyle for wigeon. The common scoter flock in the eastern Irish Sea is still of importance; flocks were recorded during recent surveys off Luce Bay and the Ribble, but they can occur anywhere between Luce Bay and Carmarthen Bay, probably requiring food resources whose location varies.

September sees the start of a passage of red-throated divers southwards off Dublin. Many are presumably Icelandic birds moving to wintering areas off the southern coasts of Ireland and England or off French coasts. Most terns move south during the month, so that few are left by the end of the month.

Offshore seabirds

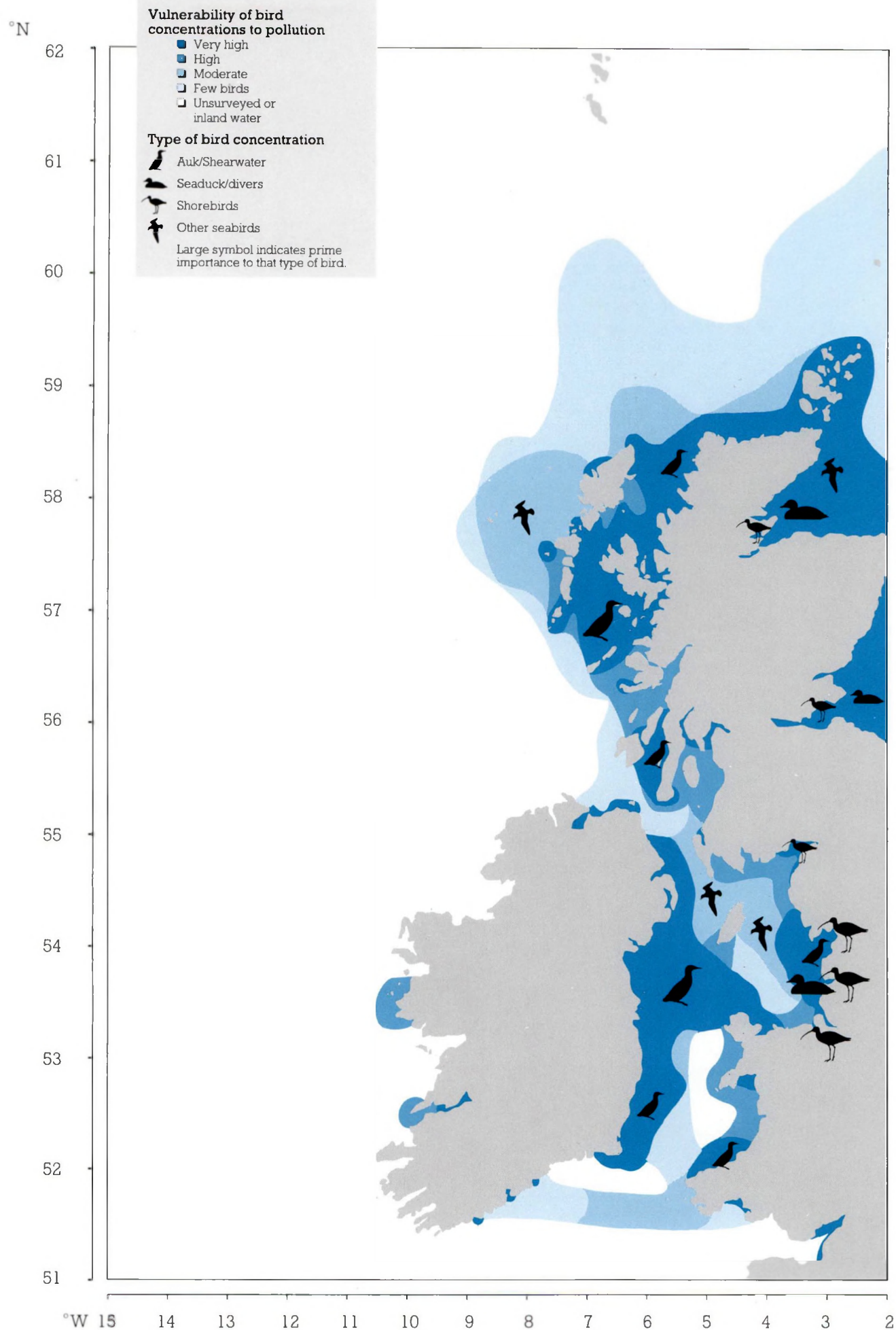
The distribution of guillemots in September is similar to that in August. The western and central Irish Sea, the Sound of Jura, the eastern Sea of Hebrides, the northern Minch and the area off southern Cumbria

all remain important. Moderately important numbers are found on each side of the southern part of St George's Channel. Few guillemots occur outside these relatively sheltered waters or the northern Irish Sea. Razorbill distribution is also similar to August's; the Sound of Jura, the western Irish Sea close to the coast and the area north of Anglesey are particularly important. Moderate numbers of razorbills are present with the guillemots on either side of the southern part of St George's Channel.

Almost all puffins move out of these western waters during the month. The only concentrations of birds found in recent surveys were in the central areas of the Irish Sea. Puffins disperse from the colonies for the winter, but there is little evidence to indicate their destination. Recoveries of ringed birds indicate that some are found in the Bay of Biscay; presumably others disperse well offshore into the Atlantic. The western and central Irish Sea, the Sound of Jura, the waters to the east of the Uists and those north of Dyfed are all important for Manx shearwaters.

Overall densities of kittiwakes remain low and the birds tend to be concentrated in much the same areas as the southern parts of the guillemot population. Thus, the central and eastern parts of the Irish Sea are important, as are the Sound of Jura and both sides of St George's Channel. Gannets are found throughout the Irish Sea, but tend to be in largest numbers near the trawling fleets. They are also present in the northern Minch and are the only birds (apart from fulmars) found in any numbers to the west of the Outer Hebrides, where again they tended to be near fishing vessels.

Like the terns, skuas migrate southwards during the month. Indeed, in many cases arctic skuas accompany tern flocks as they move. Peak numbers of great skuas are observed passing Cape Clear during the first half of the month. Storm petrels are still present in the north-western Minch during the month, but in low numbers. Leach's petrels are occasionally seen over the continental shelf and sometimes close inshore, especially during strong winds. Most gulls remain either close to land or near trawling fleets. The only gulls in any numbers offshore are great black-backed. Lesser black-backed



gulls are present in much lower densities than in August, as they too start to migrate southwards. The highest densities of fulmars are found west of Orkney, in the northern Minch and in the central Irish Sea. More fulmars occur close to shore in September and October than at any other time of year.

No surveys have been made to the west of Ireland or beyond the continental shelf edge west of Scotland. Coverage of the waters west of Islay and in the Clyde was insufficient. The eastern side of St George's Channel remains to be surveyed.

October

Inshore and coastal birds

Compared with the preceding three months and much of the winter, the Irish Sea estuaries are rather quiet in October. This is because many of the waders that arrived to moult in the area have moved on to spend the winter at other sites to the south, while birds that moult in North Sea estuaries has not yet moved in. In spite of this, some large concentrations of waders are present. Morecambe Bay is internationally important for oystercatcher, ringed plover, knot, dunlin, bar-tailed godwit, curlew and redshank. Peak numbers of black-tailed godwit are present in Ireland; the Shannon estuary, Cork, Dungarvan and Wexford Harbours and Ballymacoda, Clonakilty and Courtnasherry Bays all hold internationally important numbers of this species. Large numbers of golden plover arrive in Ireland also, but in general these are found on inland fields and only move to estuaries if disturbed or in periods of freezing weather. In addition to the estuaries mentioned above, the following areas also hold waders at levels exceeding 1% of the north-west European population— the Clyde, the Solway, the Ribble, the Alt, the Mersey, the Dee, the Burry Inlet, Swansea Bay, the Severn, Belfast and Strangford Loughs, and Dundalk Bay.

Wildfowl continue to increase in number. Shelduck return from their moulting site in the Wadden Sea and are in internationally important numbers on the Dee and in Morecambe Bay. Wigeon reach these levels in Castlemaine Harbour and Lough Foyle, while the Mersey, the Dee, the Solway and Wexford and Castlemaine Harbours are internationally important for pintail. The Mersey holds over 1% of north-west Europe's teal. The main influx of goldeneye and Brent geese to the area happens in October, and both species occur in large numbers at Strangford Lough.

Concentrations of great crested grebes are present in Belfast Lough and Conwy Bay. Although no international census has been carried out on this species, peaks of 1300 at the former and 300 at the latter site must be significant. Black-headed gulls occur inshore in some numbers off Loch

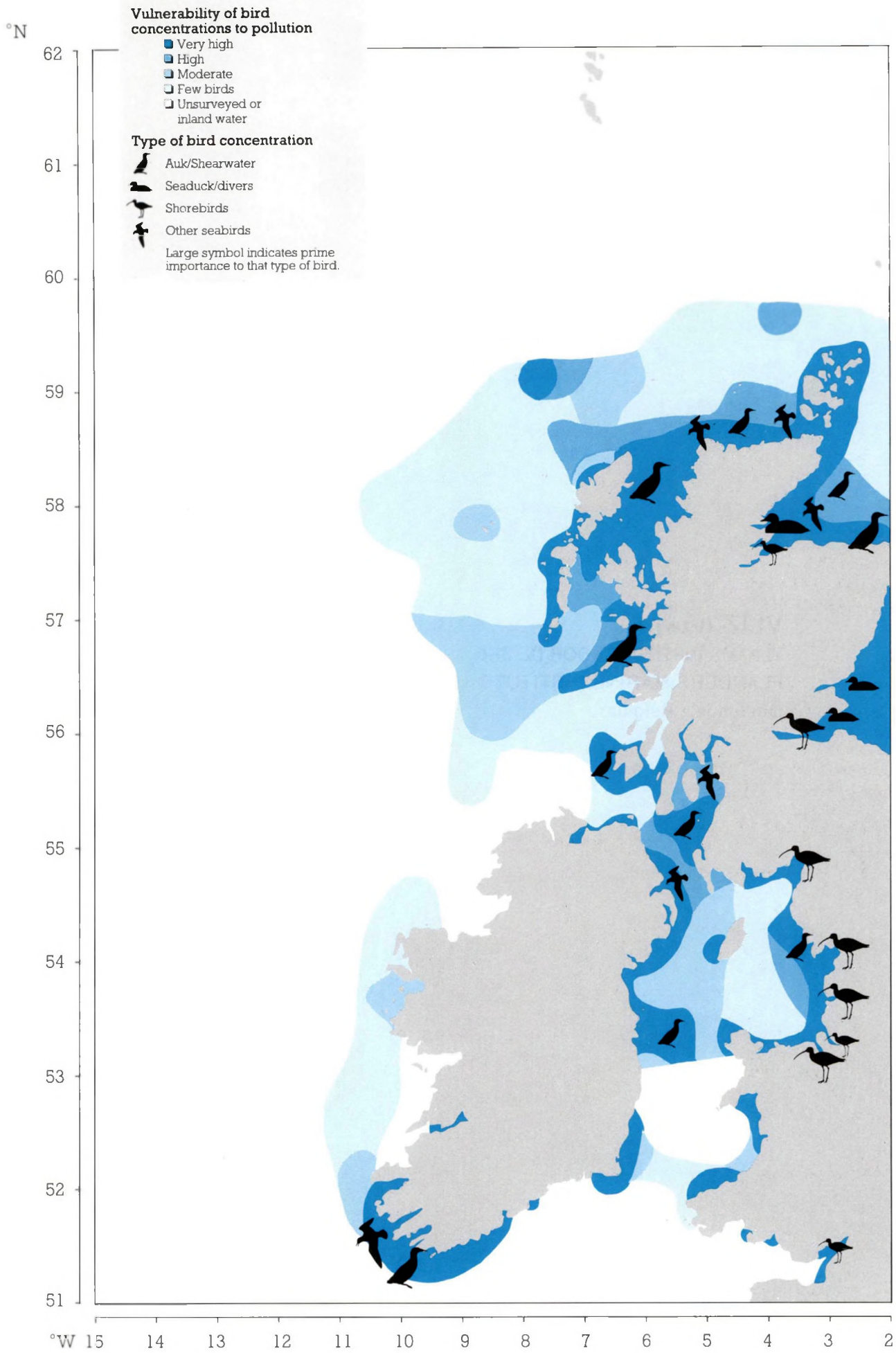
Ryan and Morecambe Bay, and they are present but have not been adequately surveyed in several other similar estuarine or nearshore areas.

Offshore seabirds

The northern Minch remains important for guillemots, with increased numbers of birds off the northern coast of Sutherland. The Little Minch, eastern Sea of Hebrides and Sound of Sleat are also important. Further south, concentrations are present to the west of Islay, in the North Channel, south-west of Cumbria and in the western Irish Sea. Low survey effort in this last area means that little is known of the extent of this concentration. The area close to the coast off south-western Ireland holds large numbers of guillemots. As in previous months, moderate densities are present close to the coast on both sides of the southern parts of St George's Channel.

Razorbills are present close to the coast off northern Sutherland, in the Little Minch and eastern Sea of Hebrides, and scattered in patches throughout much of the northern Irish Sea. Like guillemots, razorbills are also found in some numbers close to the south-western Irish coast. There are virtually no puffins or Manx shearwaters in these western waters. Kittiwakes have a very similar distribution to that of guillemots and are present in moderate to high densities off the northern coast of Scotland, in the western Minch, Loch Broom and eastern Sea of Hebrides, off Belfast Lough, off south-western Ireland, and on the eastern side of St George's Channel. Fewer gannets are present in the area than in the summer months, and most are present inshore rather than further out over the continental shelf. The Butt of Lewis and the western Minch (including the Little Minch) are important for gannets, as are the areas near the colonies at Ailsa Craig and around south-western Ireland.

Stormy conditions may bring very large numbers of Leach's petrels close inshore and particularly into the Irish Sea. The numbers involved indicate that many of these must derive from the populations that breed in North America. Virtually all storm petrels have migrated southwards by this month. October is one of the few periods when fulmars are absent from their breeding cliffs. Many of these birds remain over the shelf in autumn, and are



found particularly around fishing vessels. The gulls remain near these vessels also, but do not range far out to sea. Thus areas off Morecambe Bay and in the eastern Irish Sea hold higher densities of herring and great black-backed gulls than other areas. Few lesser black-backed gulls are seen.

Large parts of the central Irish Sea and St George's Channel remain to be surveyed. There has been no coverage of the waters to the west of the continental shelf edge or close off the coast of north-western Ireland.

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Oostende - Belgium

November

Inshore and coastal birds

Numbers of waders, particularly knot, dunlin and bar-tailed godwit, increase in the Irish Sea as they move in from the North Sea during November. Most of these birds move on to the large eastern estuaries in the Irish Sea — the Solway, Morecambe Bay, the Ribble, the Alt and the Dee, which along with the Severn, Lough Foyle, Strangford Lough, North Bull and the Shannon are internationally important for one or more of these species. Redshank are at internationally important levels on the Clyde, Morecambe Bay, the Dee, the Solway and Strangford Lough. Bar-tailed godwit are present at over 1% of the international population at Wexford and Dungarvan Harbours and Ballymacoda and Clonakilty Bays. Other estuaries or intertidal areas with internationally important numbers of waders are Dundalk Bay, the Burry Inlet, the Gwendraeth and Swansea Bay.

There is continued movement of duck to the western estuaries of Britain. Most of these move to estuaries with numbers already at international levels; these include Morecambe Bay (shelduck), the Dee (shelduck and pintail), the Mersey (teal and pintail), the Solway (pintail) and the Burry Inlet (pintail). Irish estuaries (the Shannon, Lough Foyle and Castlemaine Harbour) maintain and enhance their international importance for wigeon. The waters off the Alt and the Ribble hold large numbers of common scoter, and numbers are high in the north of Carmarthen Bay also. Large numbers of eiders are present in the Inner Sound, to the west of the Uists, around south-western Mull and near Coll and Tiree.

Great northern divers return to their wintering grounds in October and November. The most important areas found have been off North Uist and around Mull and Iona. This species, however, tends to be widely dispersed, with a few in several other locations. Moderate numbers are present off north-eastern and north-western Lewis and south-eastern Harris, off the west side of the Uists, in the Inner Sound and around the Summer Isles and off Coll and Tiree. Between 1000 and 1500 are estimated to be scattered around Ireland and 3600 off the Scottish coasts

north and west of the Firth of Clyde. Numbers at this time of year are swollen by birds moving through the area to spend the winter in other waters. Moderate numbers of divers (mostly red-throated) are found in the south-eastern Firth of Clyde and in northern Cardigan Bay.

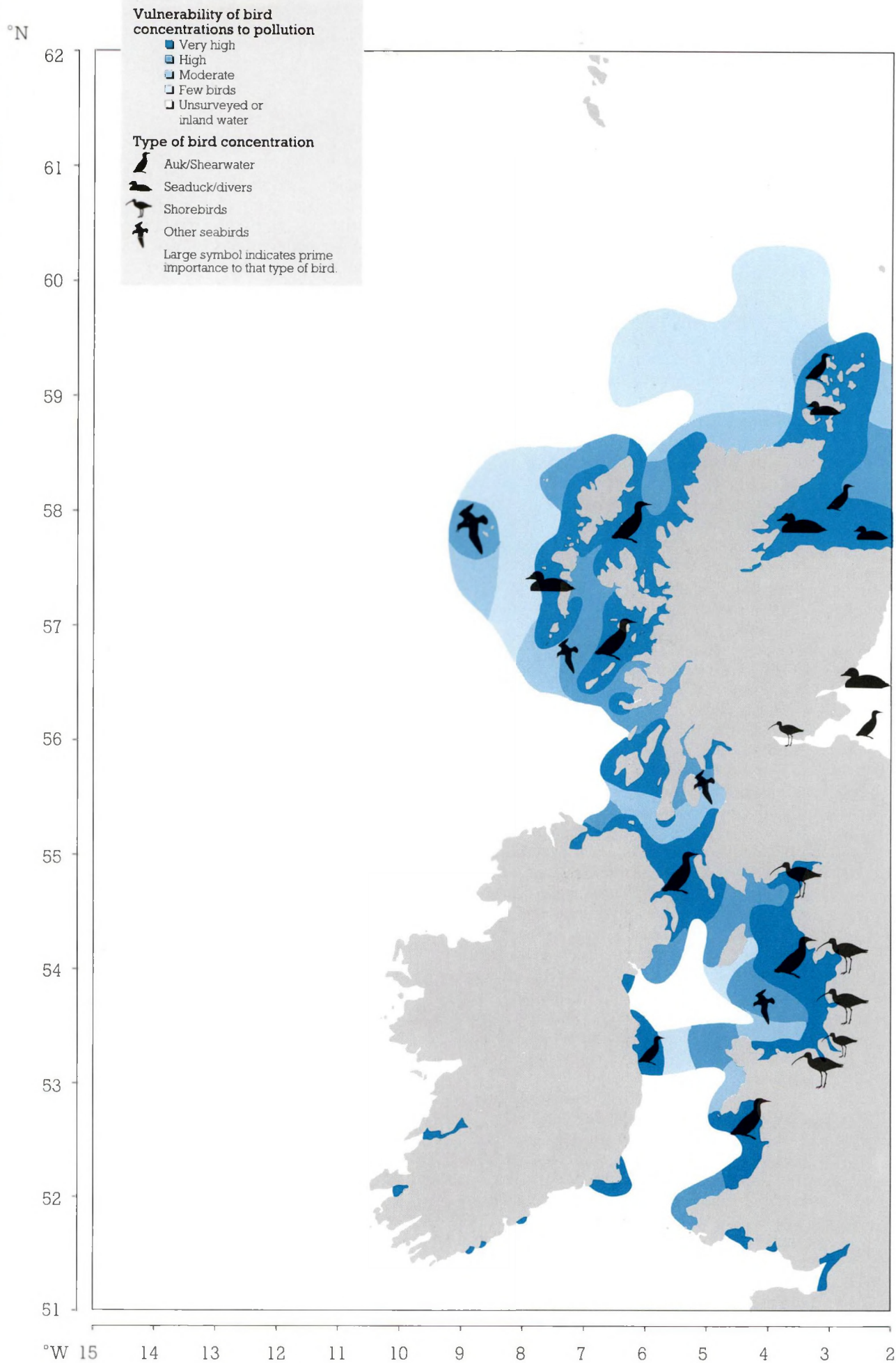
Shags are resident throughout the non-breeding season often in areas used also in the breeding season. These areas include the Sound of Islay, off the eastern side of Barra, off north-western Skye, the Inner Sound, off Loch Gairloch and Loch Ewe, and off north-eastern and western Lewis.

Offshore seabirds

Guillemots are present in high densities in the Minch, the Inner Sound and the eastern Sea of Hebrides, the North Channel, eastern parts of the Irish Sea and Cardigan Bay. Medium densities are found close to the west of Lewis and in the Little Minch. As in October, razorbills are found in scattered flocks in the northern Irish Sea. Offshore survey effort has been low in November, and much of the Sea of Hebrides and areas west of Islay, which may hold substantial numbers of auks, have not been examined adequately. A few puffins are present off northern Scotland. Kittiwakes are present in the Minch with the auk flocks, off the western side of Orkney, close to Cape Wrath, and scattered in the Irish Sea in much the same areas as razorbills. Very few gannets are left in these waters; those that are present are close to St Kilda and around the Butt of Lewis. However, there has been little survey close to other major gannet colonies.

Fulmars continue to be abundant near land in November, and are found in large numbers in the Minch, to the south of St Kilda, in the southern Sea of Hebrides, in the North Channel and scattered in the Irish Sea. Most flocks are associated with fishing vessels or fleets. Away from the shore, herring and great black-backed gulls are found predominantly around inshore fishing vessels, but some range further offshore in the Irish Sea.

Apart from the areas in the Sea of Hebrides already mentioned, no survey has been done to the west of the continental shelf edge or of Ireland. Most of St George's Channel remains to be studied, as does a large area in the western part of the central Irish Sea.



December

Inshore and coastal birds

The annual peak in numbers of knot and dunlin on the eastern Irish Sea estuaries occurs in December as more birds arrive from the North Sea. Internationally important sites for these species in Britain are Morecambe Bay, the Ribble, the Alt, the Mersey, the Dee and the Severn, with Strangford Lough, Dundalk Bay, North Bull and the Shannon reaching this level in Ireland. The annual peak in numbers of turnstone occurs on the Outer Ards and in Belfast Lough in December. Cork, Dungarvan and Wexford Harbours, Ballymacoda and Clonakilty Bays and the Shannon estuary are internationally important for black-tailed godwit. Bar-tailed godwit are found at internationally important levels in Morecambe Bay and on the Ribble, the Solway and Lough Foyle. Other estuaries or coastal areas that hold internationally important populations of waders in December are the Clyde, Castlemaine Harbour, Swansea Bay and Tramore Bay.

There is a peak in numbers of some duck species also on Irish Sea estuaries during December. A peak of over 12,000 wigeon, 10,000 pintail and 8,000 teal occurs on the north-west English estuaries, and the Solway, Ribble, Mersey and Dee are all of international importance for one or more of these species. Morecambe Bay and the Dee are internationally important for shelduck. The winter peak of red-breasted merganser occurs on Irish coasts during the month, and, although there are no flocks of international importance, the largest numbers are found at Strangford Lough, Dundrum Bay, Cork Harbour and Galway Bay.

Offshore seabirds

The Minch remains important for guillemots during December, with some flocks present also off the northern coast of Sutherland. The southern parts of the North Channel are important, as well as much of the Irish Sea between the Isle of Man and Cumbria. This latter area is probably of importance throughout the winter owing to the presence of stocks of sprat and young herring, which are one of the main foods of guillemots. Smaller

concentrations of guillemots are off south-western Wales and south-eastern Ireland. Razorbills are present in low numbers, many having migrated southwards earlier in the winter. The main areas where they remain in December are off the Butt of Lewis and Cape Wrath, in the eastern Irish Sea (with guillemots) and on the southern margins of St George's Channel. Low survey effort in the area between Mull and the southern Firth of Clyde means that some guillemot and razorbill concentrations may have been overlooked. Few puffins and no Manx shearwaters are present in the western waters.

The distribution of trawlers strongly influences the numbers of many other birds that are present in any area. Kittiwakes are present around trawlers in the western Irish Sea, but also off St Kilda, in the Minch, in the North Channel and off south-western Wales. Fulmars are present in large numbers around the trawlers off St Kilda and in the Irish Sea. Great black-backed gulls are also present near the fishing vessels off St Kilda and off Loch Broom. The latter area holds large numbers of herring gulls also. These flocks of gulls that are dependent on fishery waste often move to roost on local islands or headlands when the boats are not at sea, such as at weekends or during holiday periods.

Survey at sea in December is difficult owing to short daylight hours and poor weather conditions. Much remains to be learned about the waters west of Britain in winter. In December, in particular, no surveys have been carried out in much of St George's Channel, in the western Irish Sea, to the west of Islay and south of the Outer Hebrides, or beyond the continental shelf edge.

°N

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Vulnerability of bird concentrations to pollution

- Very high
- High
- Moderate
- Few birds
- Unsurveyed or inland water

Type of bird concentration

- Auk/Shearwater
 - Seaduck/divers
 - Shorebirds
 - Other seabirds
- Large symbol indicates prime importance to that type of bird.

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January

Inshore and coastal birds

In contrast to the North Sea, it is rare for large numbers of estuarine birds to have to leave the Irish Sea owing to freezing conditions. However, numbers present on these estuaries depend partly on the severity of the winter in the North Sea. These western estuaries may thus become even more important as refugia during cold weather. January sees maximum numbers of lapwing on these estuaries; numbers on estuaries do not reach international importance normally, owing to the large numbers that feed on inland fields. If, however, these fields become frozen, many birds retreat to estuarine and intertidal areas. Peak numbers of bar-tailed godwit occur on north-western English estuaries during January, with internationally important numbers on the Solway, Morecambe Bay, the Ribble and the Alt (as well as Lough Foyle in Ireland). The same estuaries as in December remain internationally important for dunlin and/or knot, with the addition of the Solway. Dundalk Bay, the Burry Inlet, Ballymacoda Bay, the Severn, Castlemaine Harbour, Swansea Bay, Tramore Bay, the Shannon estuary, Cork Harbour, Clonakilty Bay, Lough Foyle, Belfast Lough and the Clyde are all also of international importance for waders in January.

Shelduck remain at internationally important levels on Morecambe Bay and the Dee, as do wigeon on Strangford Lough and the Shannon. Pintail, perhaps the most estuarine of the dabbling ducks, remain above internationally important levels on the Mersey, the Solway and the Ribble. Large numbers of common scoter are found in Liverpool Bay, off the northern Welsh coasts and in northern Cardigan Bay. Eiders remain in high numbers in the Clyde area, with lower numbers near their breeding areas further north; moderate numbers are found also off the eastern coast of the Uists.

Large numbers of great northern divers are present off North Uist and the west side of Benbecula and South Uist (as in November and December). This area is characteristically shallow, with a sandy seabed. This habitat type is preferred by divers, and a similar area off eastern Denmark is used by large numbers of red-

throated divers in winter. Other, smaller, areas of this habitat are found around Coll and Tiree, in the Sound of Jura, Irvine Bay and Liverpool Bay, and in northern Cardigan Bay, and these also hold numbers of divers. Many sealochs on the north-western coast of mainland Scotland and eastern coast of Lewis and Harris hold higher densities of divers. An estimated 4200 divers occur off western Scotland and in the Irish Sea in midwinter.

Freezing weather can move other inland waterfowl to the coast. These include coots and swans. Belfast Lough can become important for great crested grebes if the inland Lough Neagh freezes.

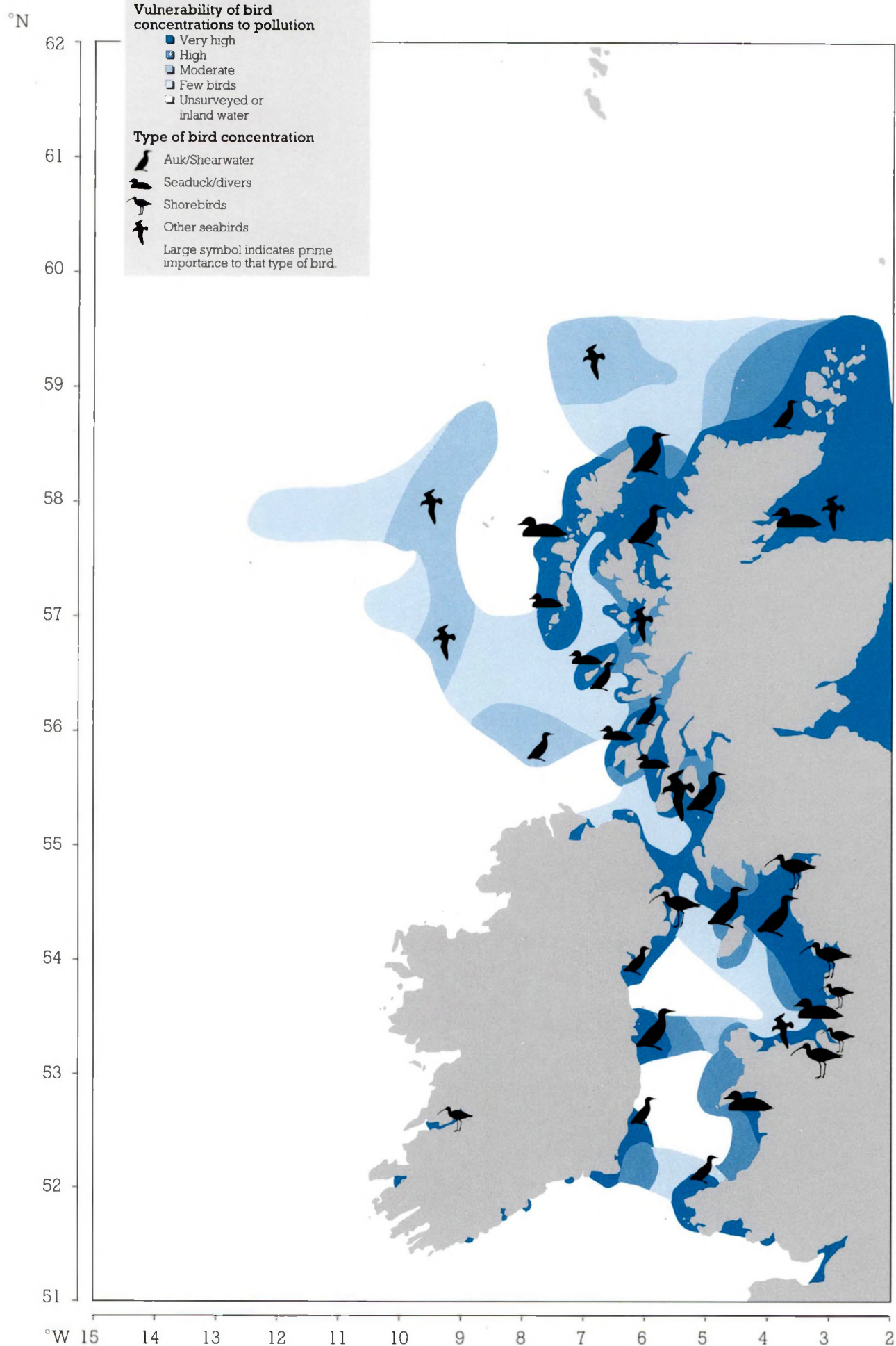
Offshore seabirds

Large numbers of guillemots spend December close inshore. The Inner Sound and Sound of Raasay, the north-western Minch, the eastern Sea of Hebrides, southern Firth of Clyde, western Irish Sea off Dublin and eastern Irish Sea off Cumbria are all important areas for guillemots. Lower densities of guillemots are present off northern Scotland, the remainder of the Minch and Clyde and the area around Islay. Razorbills are found in particularly large numbers around the Point of Ayre on the Isle of Man, as well as in the southern Clyde and central Minch. Very few puffins and no Manx shearwaters are present in these western waters.

A few gannets remain in western waters. Virtually all are adults; immatures head south to spend the winter in waters between the Bay of Biscay and western Africa. Moderate numbers are present around fishing vessels on the continental shelf edge and in the Clyde. Kittiwakes are also present around the shelf edge vessels, with fewer inshore in the same areas as the auks. Large flocks have been reported in the past following sprat shoals off southern and western Ireland.

Great black-backed gulls are present around the offshore fishing vessels near the continental shelf edge, in the north-western Minch and in Loch Broom. Liverpool Bay holds many herring gulls, as does the Firth of Clyde and the northern Minch.

Much of St George's Channel and of the western Irish Sea remain to be surveyed, as do the area off northern Ireland and many of the waters to the west of the shelf



edge. The continental shelf waters to the west of the Outer Hebrides and those north of about $59^{\circ}30'N$ remain to be surveyed also.

February

Inshore and coastal birds

Numbers of some waders on Irish Sea estuaries start to fall during February. However most of the bigger estuaries continue to hold large numbers. Morecambe Bay has internationally important concentrations of oyster-catcher, knot, dunlin, bar-tailed godwit, curlew, redshank and turnstone. The Ribble holds five species at internationally important levels, the Dee four, the Alt three, the Solway, the Shannon, Wexford Harbour, Dundalk Bay and Lough Foyle two each, and one each on the Severn, the Burry Inlet, the Mersey, the Clyde, the western coasts of the Uists and Benbecula, Dublin Bay, Strangford Lough and Belfast Lough.

The peak in numbers of shelduck on Morecambe Bay occurs during the month, and this is internationally important, as are numbers on the Mersey and the Solway. These two areas are important also for pintail, and the Mersey for teal.

The distribution of divers is similar to that in January, the most important area for great northern divers being off the western side of the Uists and Benbecula.

Small numbers of little gulls must spend the winter in the Irish Sea and in Galway Bay. These birds were seen only in small numbers during the offshore surveys, but they are very regular close inshore, particularly in Liverpool Bay and off County Wicklow, during periods of bad weather. Numbers in the Irish Sea have increased in parallel with the increase in numbers on their eastern European breeding grounds.

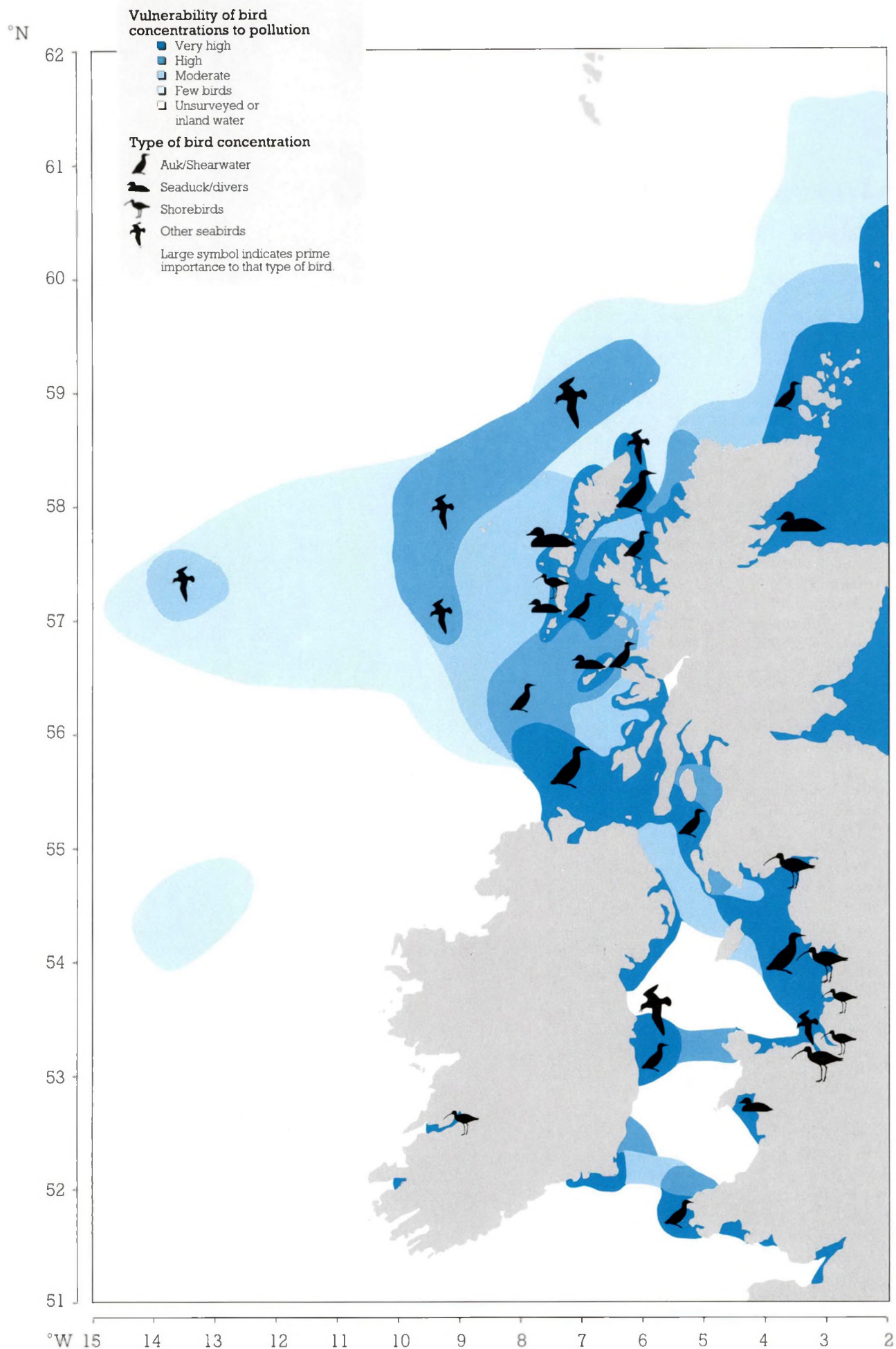
Offshore seabirds

Guillemots are present in high densities in the north-western and south-eastern Minch (including Inner and Raasay Sounds), parts of the Sea of Hebrides, particularly the southern parts to the north of Ireland and west of Islay, the southern parts of the Firth of Clyde and the eastern Irish Sea. The area to the north of Ireland holds stocks of small herrings that are probably fed on by the guillemots. Many guillemots in the colonies in the south of Ireland and western Britain start to return to their breeding ledges during February.

The area off the northern end of the Isle of Man continues to be important for razorbills, as do the southern Firth of Clyde, the eastern Little Minch and Loch Broom. Few are present in other areas, as many birds migrate south as far as the Mediterranean. Few puffins and no Manx shearwaters are present.

Kittiwakes are present in larger numbers than earlier in the winter and are found around trawlers near the continental shelf edge and in large numbers off Dublin. Gannets are back in increased numbers, many returning to waters near their colonies but also feeding near the trawlers at the shelf edge. These fishing vessels also have extremely large numbers of fulmars around them, and flocks of great black-backed gull are present there too. Fulmars are the only birds present around Rockall in any numbers. Peak numbers of glaucous and Iceland gulls are present both offshore and near the main fishing ports during February. These birds come to British and Irish waters from the Arctic for the winter. Lesser black-backed gulls increase in numbers in inshore waters, particularly near the major colonies on Walney and Skomer and in Liverpool Bay.

Survey off the western coast of Scotland has been better in February than in other winter months. This has included some survey off the continental shelf edge, as far west as Rockall. Much of the western Irish Sea and of St George's Channel remains to be surveyed.



March

Inshore and coastal birds

Northwards migration of some waders from the Irish Sea estuaries starts in March. Species that breed in Britain, such as redshank, curlew and oystercatcher, are the first to move. Towards the end of the month, numbers of redshank increase as birds from the Icelandic population pass through from southerly wintering areas. In terms of absolute numbers of redshank, the Clyde, Morecambe Bay, the Mersey, the Dee and Strangford Lough are all of international importance, but other estuaries are relied upon by similar numbers of birds that use these sites, but not all at the same time. Internationally important numbers of oystercatchers are present on the Solway, Morecambe Bay, the Dee and the Burry Inlet, and of curlew on Morecambe Bay. The Ribble holds internationally important numbers of grey plover, knot, sanderling and bar-tailed godwit. Other internationally important estuaries for waders are the Alt, the Severn, the Shannon, Wexford Harbour, Dundalk Bay, Lough Foyle and Belfast Lough.

Internationally important numbers of shelduck are found on the Solway, Morecambe Bay and the Mersey. The last estuary supports similar numbers of teal and pintail. Common scoter are present in large numbers off the Duddon and Walney Island and in Liverpool Bay. Eider flocks are still present in the Firth of Clyde and its associated sealochs, though many of these birds start to move northwards back to their breeding grounds on islands off the western coast of Scotland.

The northwards passage of red-throated divers becomes evident during the month, and large numbers build up in suitable shallow water areas in the north-eastern Irish Sea. These birds are of unknown origin, but are most likely to be returning to breeding grounds in Iceland. Black-throated divers begin a complete moult of wing feathers in March, and become flightless. The sealochs in Wester Ross, Lewis and Harris are the most important sites for moulting birds.

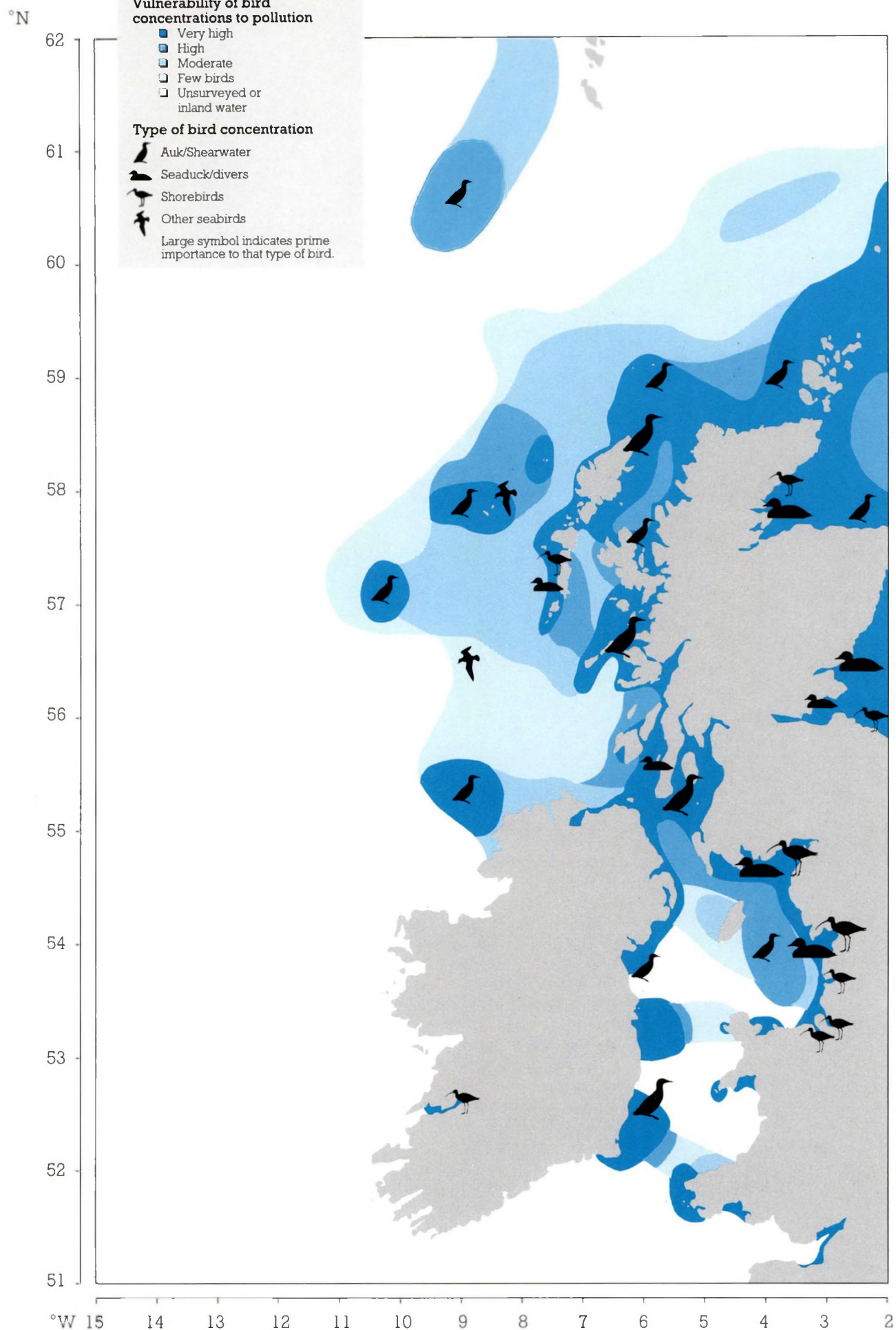
Offshore seabirds

Most guillemots of breeding age have returned to their colonies by March, but large numbers of immature or non-breeding birds may be left at sea elsewhere. The adult birds are not as tied to their nesting sites as later in the breeding season and may forage at considerable distances from the colonies. A flock was found over 100 km south-west of St Kilda, for instance, in an area where few guillemots are usually present. It is not known how regularly this area is used in the pre-breeding period. The north-western Minch holds very high densities of guillemots; many of which commute from Handa off the Sutherland coast. Many of the coastal waters off northern Sutherland hold similar densities. Considerable numbers are present around the Treshnish islands west of Mull and, perhaps more surprisingly, in the Inner Firth of Clyde. The western Irish Sea also remains important.

Razorbills are present in high densities off the northern coast of Sutherland and off the Treshnish islands. Razorbills in the north-western Minch are concentrated close to land. Moderate densities of birds are present in the Firth of Clyde and western Irish Sea. Some puffins return to the vicinity of their colonies in late March; their arrival date is earlier in the south than in the north. Prior to this, puffins have gone through total flight-feather moult and become flightless. Few of these birds are ever seen at sea and the moulting grounds of puffins are poorly known.

Manx shearwaters return from their wintering grounds in the southern hemisphere during March. They are present in high densities near their breeding grounds on Rhum and the islands off south-western Wales and are also found on the Faroes Bank in some numbers.

Gannets are present in large numbers near their breeding colonies, and, as both members of each pair can spend most of their time at sea (given they do not need to incubate an egg or brood a chick yet), particularly high densities are seen. These high densities are found to the north of St Kilda, often in association with the fishing fleets, and in the north-western Minch and the waters off the Butt of Lewis. High densities of fulmars are present over much of the continental shelf edge west of



Scotland and in the northern Minch. Adult fulmars attend their breeding sites for much of the winter, but this species is capable of flying very long distances in search of food. The Faroes Bank and the continental shelf edge hold high densities of fulmars.

The large gulls return to their colonies in March. Very few great black-backed gulls are present at the continental shelf edge, and highest numbers of this species are found in the north-western Minch, Loch Broom and the Firth of Clyde. Highest densities of herring gulls are found in the Firth of Clyde, Loch Ryan and its vicinity, near Barra and off the large breeding colony on Walney Island.

The western part of the central Irish Sea and the northern part of St George's Channel remain to be surveyed, and effort has been low immediately west of the Outer Hebrides. A survey off Donegal found large numbers of birds, perhaps an indication of the potential importance of this area for wintering birds.

April

Inshore and coastal birds

Numbers of waders present at any one time in the Irish and western British estuaries fall rapidly during April. However, the turnover of migrant birds may lead to great underestimates of the numbers depending on the site. Morecambe Bay remains numerically the most important site, with oystercatcher, ringed plover, knot, sanderling, dunlin, curlew and redshank all present in internationally important numbers. Other estuaries holding internationally important numbers of waders are the Solway, the Ribble, the Dee, the Severn, the Shannon and Wexford Harbour. The north-west English estuaries are of special importance to many species returning to their breeding grounds in Iceland, Greenland and arctic Canada. These species need to depart in the best possible condition in order to help to ensure a successful breeding season. Those redshank which breed in Iceland are the first to pass through in late March and early April, followed later in April by knot and turnstone. Numbers of ducks on estuaries have declined below internationally significant levels by April.

The northwards passage of divers continues in April, and important numbers of great northern divers are still found off the west side of the Uists, in many of the north-western sealochs, in Orkney, in the Sound of Sleat, off western Mull, and on the eastern side of the Sound of Jura (the area near Gigha being particularly important). Many birds use these areas to moult, when they become flightless. The waters off the Ayrshire coast remain important for red-throated divers.

During April, all adult black guillemots gather during the early morning to display off their breeding sites. During much of the rest of the year, these birds are rather secretive, or are scattered on their nearshore feeding grounds. The species is very sedentary, however, so the breeding distribution gives a good idea of the importance of areas to this species throughout the year. Systematic surveys have been carried out during April in most of Scotland and the offshore islands north of Islay, on the Isle of Man, off the Northern Irish coast and in a few other parts of

Ireland. Approximately half of the British and Irish population is found in Orkney and Shetland. In the Hebrides, the largest concentration is of about 850 birds around the Monach Islands, whilst around Skye the largest group (about 130 birds) is off Wiay. In general, the largest numbers of birds seem to be found around rat-free offshore islets or off low, broken cliffs. As the population is very widely dispersed, almost any inshore oil spill off western Scotland will affect some birds.

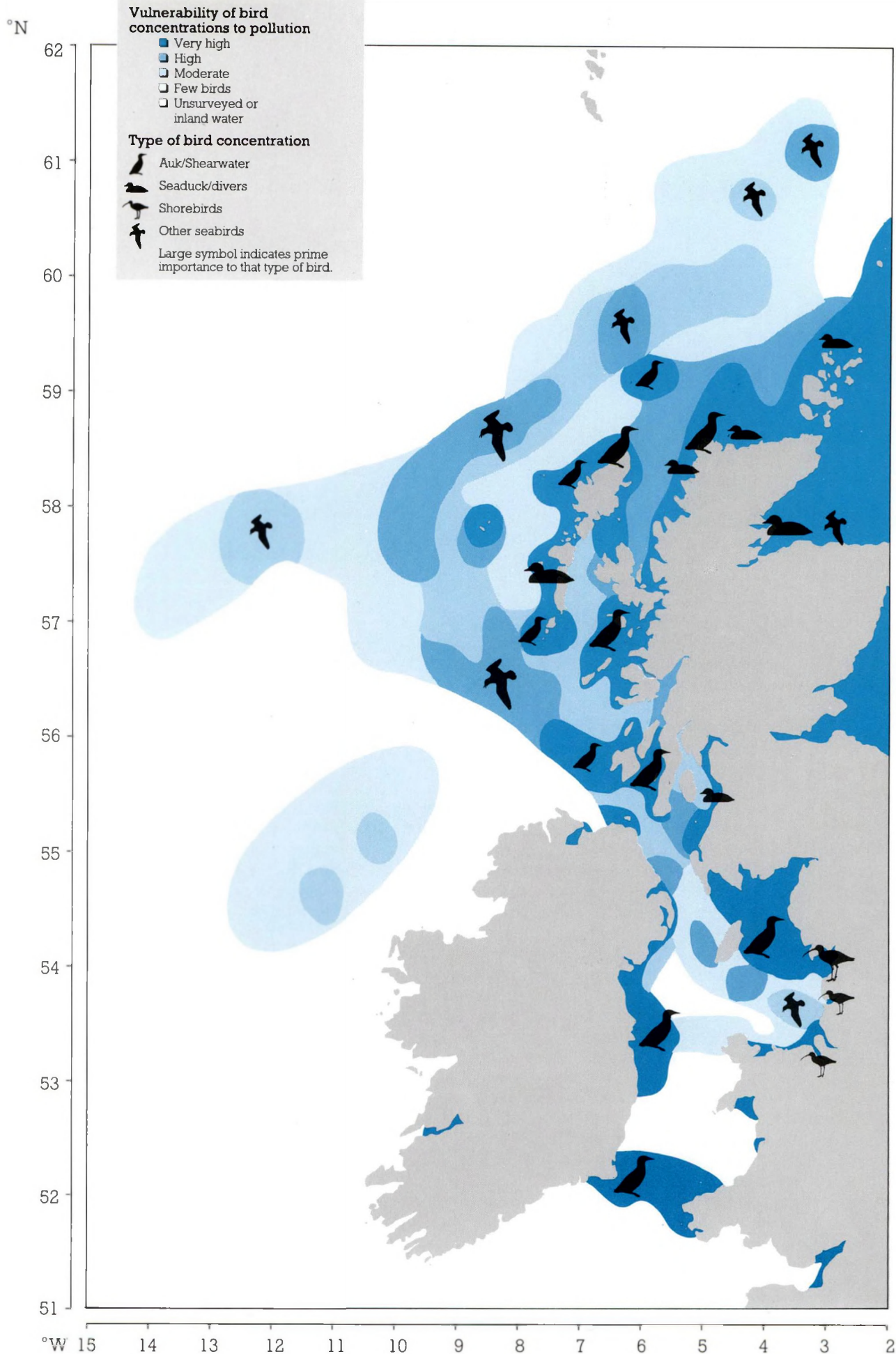
April sees the main return of Sandwich terns to their colonies; the most important sites for this species are in Strangford Lough, Lady's Island Lake and in south-western Cumbria.

Offshore seabirds

Adult guillemots are strongly associated with their breeding colonies in April, but some high densities are still present in feeding areas distant from major breeding colonies. These include southern parts of the Sea of Hebrides and the eastern Irish Sea between Cumbria and the Isle of Man. The latter area is plainly important throughout the year, with the exception of the peak of the breeding season in May and June. The area off northern Scotland assumes greater importance in April than at many other times of the year. Razorbills too are mainly found close to their breeding colonies, but some use more distant feeding areas. These include the waters around the Point of Ayre, in the north of the Isle of Man, in the Sea of Hebrides and the central southern part of St George's Channel. Very few birds of either of these two auk species are found on the continental shelf west of the Outer Hebrides, except near the outlying islands.

The return of puffins to their breeding areas becomes very obvious in April, with larger numbers present in the Minch, around the Outer Hebrides and off the northern coast of Scotland. Manx shearwaters are found near their main breeding colonies (Rhum and south-western Wales), in the western parts of the Minch, in the western Irish Sea, and in the auk's feeding areas noted above in the southern Sea of Hebrides.

Large numbers of kittiwakes remain offshore off the western coast of Scotland; most are associated with fishing fleets. Relatively few birds are found inshore,



although most colonies are attended by adults for much of the winter. Kittiwakes are evidently capable of commuting some distance to feed. Gannets are present in very large numbers at the continental shelf edge, but with many fewer than at other times of the year using the area around the Butt of Lewis. High concentrations are present around the main breeding colonies, but rather few are found in the main part of the Irish Sea.

Lesser black-backed gulls are very common in the offshore areas, with substantial numbers present on the continental shelf edge to the north and west of Scotland and to the south and west of Barra. The shelf edge is very important also for fulmars, although many of these birds may be independent of the fishing vessels in this area.

Much of St George's Channel remains to be surveyed in April, as do some of the western central parts of the Irish Sea. As at most times of year, coverage of potentially important areas to the north and west of Ireland remains poor.

May

Inshore and coastal birds

Numbers of waders present at any one time on British and Irish estuaries continue to decline during May, although the importance of these as pre-migratory fattening areas remains high. Numbers of dunlin, sanderling and ringed plover present in the estuaries of north-western England increase during the early part of the month, peak in about the third week, and then decline rapidly. Many of these birds breed in the far north, and their migration is delayed until the breeding grounds thaw and the insect population, which they rely on for food during the summer, has built up. Absolute numbers at any one time on the estuaries are therefore relatively low compared with the winter, but nevertheless, ringed plover are present in Morecambe Bay and on the Ribble in internationally important numbers, and sanderling are present at similar levels in Morecambe Bay, the Ribble and the Alt. Grey plover, which also breed in the high Arctic, are at their annual peak numbers on the Ribble at this time also. As noted in April, numbers present at any one time may greatly underestimate the numbers of migrants depending on the area.

Some common scoter remain in central Cardigan Bay and Liverpool Bay. Eiders are the only seaduck with a large population that breeds in Britain and Ireland. There has not been a full survey of numbers breeding on British and Irish coasts, but they are widespread on the western coast of Scotland and northern coasts of Ireland. An outlying colony is present on the south of Walney Island, and elsewhere flocks of non-breeding birds may remain all summer. Most eiders breed on small islands without ground predators and near mussel beds, mussels being a favoured source of food. By the end of May most females have laid their eggs and are incubating. Many great northern divers remain in the same moulting areas as April; these disperse rapidly during the month, leaving only a small population of breeding red-throated divers.

Many of the seabird species which spend the winter to the south of the area return to their breeding sites and start to nest during

May. Most common, little, arctic and roseate terns return to their colonies at this time. Other species, such as Pomarine and long-tailed skuas, may be seen passing western coasts on their way to arctic breeding grounds.

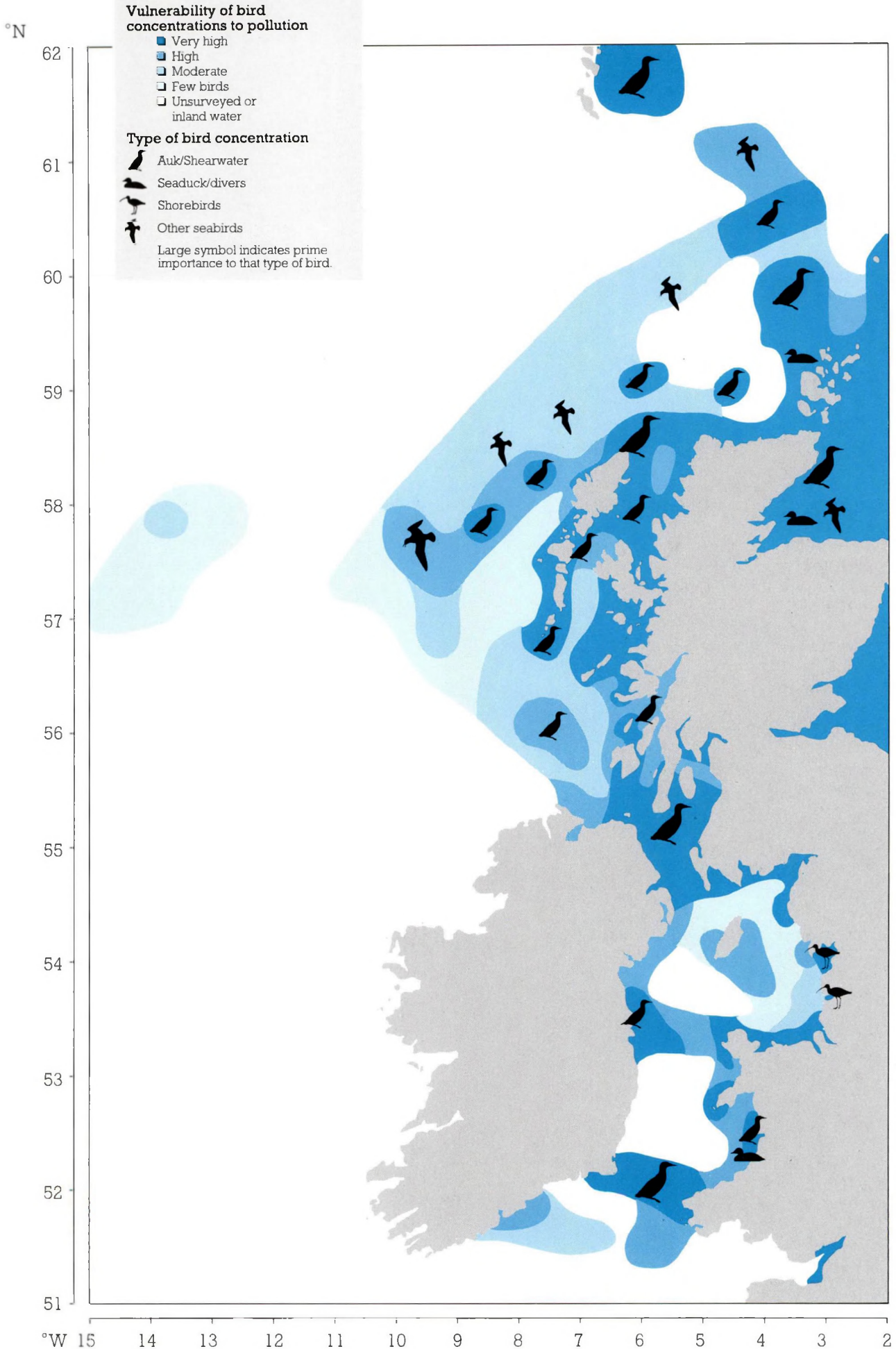
Offshore seabirds

Most seabirds lay their eggs and start to incubate during this month. This concentrates the populations of most species into areas near their colonies. Any birds present further offshore are likely to be non-breeders or immatures. High densities of guillemots are found to the north-west of Orkney, in the northern Minch, near the Treshnish islands, in the North Channel and the outer Firth of Clyde, in the western Irish Sea and in the southern parts of St George's Channel. Relatively few guillemots are found in the eastern Irish Sea, and these are confined to the area near St Bees Head, the only colony in north-western England.

Razorbills are present in large numbers in the north-western Minch and in the North Channel/outer Firth of Clyde and present in moderate densities off Dublin in the western Irish Sea and the southern parts of St George's Channel. Large concentrations of puffins are present near the Faroes and, more surprisingly, in the Faroes/Shetland Channel. Large numbers are also present around their main breeding colonies, in the Minch, close to Coll and in the southern Sea of Hebrides.

As well as in the areas around Rhum and off south-western Wales, Manx shearwaters are present in high numbers over the sandbanks off Dublin, off Belfast Lough and in the north-western Minch and the Sea of Hebrides to the west of Mull. Kittiwakes remain relatively widespread in May; most adults have started to incubate by the end of the month, but substantial numbers are still present near the continental shelf edge west of St Kilda and in the Faroes/Shetland Channel. Gannets are present mainly near their breeding sites, with rather few more than 150 km from the colonies. The northern Minch and the area around the Butt of Lewis are important feeding sites for gannets from St Kilda.

Leach's petrels and storm petrels arrive back offshore during May. Leach's petrels are found during daylight almost entirely



over deep water to the west of the continental shelf edge, while storm petrels occur mostly closer to the shore. Fulmars continue to exploit the waters over the continental shelf, particularly near the edge, with few present in the Irish Sea.

Much of St George's Channel remains to be surveyed, as does the western Irish Sea north of Dublin. An area of water north of Scotland and to the west of Orkney has not been visited either. Some survey has occurred on the Rockall Bank, but otherwise little is known of the waters beyond the shelf edge.

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The results of the National Wildfowl Counts and the Birds of Estuaries Enquiry in the United Kingdom, edited by several authors, are published each year by the Wildfowl and Wetlands Trust, Slimbridge, under its contract with the NCC.

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ISBN 0 86139 675 8

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