

2.8.3 Conservation issues

Coastal upwelling occurs in five major regions of the world and, while these regions together constitute only about one per cent of the total area of the ocean, their importance can be judged by the claim that they supply some 50 per cent of the world's commercial fish catches (Merritt & Haedrich, 1997). The enhancement of primary production makes them 'hotspots' for marine life and hence the targeting of these areas for fisheries.

2.8.4 Conservation actions

Upwellings are difficult environments on which to focus conservation measures because they are water column features and because of their ephemeral, although sometimes very persistent, nature. General measures to safeguard water quality where these features form will be important but there is also the possibility that they could be included in marine protected area programmes. The most significant management action must be directed at the exploitation of resources in these areas. Their rich and productive nature makes them a target for fisheries exploitation in particular, the level of which needs careful management.

2.9 SEABIRDS

Large numbers and a great variety of seabirds occur in the OSPAR maritime area. They include gannets, gulls and auks as well as fulmars and petrels which are true ocean species, coming ashore only for short periods to raise their young. The adjacent land may be used for roosting, nesting and rearing young but it is the maritime area that provides the food to sustain these populations.

Seabirds use a variety of techniques to feed. They can take food from the surface or just below it while on the wing, exploit the surface layer while swimming and pursuit diving, capture food by deep plunge-diving and swimming at depth as well as scavenging food on the surface. Shearwaters, for example, often combine plunge-diving with surface swimming. Cory's shearwater (*Calonecastris diomedea*) forage day and night often in large concentrations taking prey driven to the surface by predatory fish and sea mammals. Their main food are fish, cephalopods and crustaceans which are taken while flying close to the surface and plunge-diving. Gannets are plunge divers, perhaps penetrating up to 10m but usually remaining submerged for less than 10 seconds during which time they swallow their prey. Because of their weight and strength they can cope with powerful fish such as large mackerel.

Apart from feeding on fish, other components of seabird diet can include surface-living crustaceans, cephalopods, and jellyfish as well as offal and discards from fisheries. Birds are attracted to areas where there are rich natural concentrations of such food such as at fronts and upwellings (see sections 2.6 & 2.8) as well as to areas where food levels are enhanced by human activity such as behind fishing boats.

The isolated islands and archipelagos in the north-east Atlantic as well as coastal cliffs, headlands and sea stacks are an important base for many seabirds. The area as a whole also supports a large proportion of the global population of some seabirds. St Kilda, off the north-west coast of Scotland, is the site of the most important seabird colony in the north-eastern Atlantic. It has the largest gannetry in the world, 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 (Tasker *et al.*, 1990). The storm petrel (*Hydrobates pelagicus*) is a more widely distributed species in contrast but is virtually endemic to Europe with the largest populations in the Faroes, Iceland, Republic of Ireland and UK with the total of birds breeding in these countries probably amounting to 90 per cent of the world population (Tucker *et al.*, 1994).

2.9.1 Distribution in the OSPAR maritime area

The importance of different parts of the OSPAR maritime area for seabirds depends on the time of year because of seasonal movements to and from nesting colonies, foraging activity and migration patterns. The changing patterns of distribution are particularly well illustrated in the findings of seabird surveys of the area to the west of Britain (Tasker *et al.*, 1990). In June, most of the birds using offshore waters to the west of the British Isles are associated with breeding colonies in western Scotland. Guillemots and razorbills from St.Kilda, for example, feed over a large tract of continental shelf towards the main part of the Outer Hebrides while Leach's petrels are found beyond the edge of the continental shelf to the west (figure 32). Birds start to leave colonies from July and some, like the gannet, move south to warmer waters spending winter in waters between the Bay of Biscay and western Africa. During winter, many seabirds become less attached to their nesting sites and range considerable distances in search of food but then start to move back into the area in appreciable numbers from February. Kittiwakes, for example, are present in western waters in larger numbers than earlier in the winter and are found around trawlers near the continental shelf edge as well as off Dublin. Gannets also start to be seen in increased numbers many returning to waters near their colonies at this time of year but also feeding near the trawlers at the shelf edge. (Tasker *et al.*, 1990).

The Azores are a more remote group of islands but nevertheless important for seabirds. The status and threats to seabirds in this area are poorly known compared to other Atlantic Islands but species which regularly breed on the islands include Bulwer's petrel (*Bulweria bulwerii*) Cory's shearwater (*Calonectris diomedea borealis*), Maderian storm petrel (*Oceanodroma castro*), common tern (*Sterna hirundo*) and roseate tern (*Sterna dougallii*) (Monteiro *et al.*, 1996). There have been dramatic declines in population levels for most species and regression in breeding distributions since the 15th century to the point where most species now only breed on the small islets. The birds seem to feed opportunistically on a wide variety of shoaling fish and squid with the terns and Cory's shearwater often feeding in association with dolphins, tuna and other fish that drive potential prey to the surface.

2.9.2 Conservation issues

Many of the issues that need to be tackled for effective seabird conservation relate to threats to seabirds while on land. Loss and damage to nesting and roosting habitat, predation of chicks by vermin and disturbance and capture by humans are some of the main examples. In the offshore environment, abundance, quality and availability of prey, incidental capture, and impact from pollution incidents, particularly oil spills, are the major issues. Tackling such issues is made more complicated by the fact that seabirds not only cross national boundaries but may in fact spend much of the time in international waters.

Lack of food has been implicated in the sudden and substantial declines in seabird numbers such as the common guillemot in the late 1980s when capelin stock was very low, and puffin numbers following the collapse of Norwegian spring-spawning herring stock. Reproductive

success can also be affected and prolonged periods of low prey biomass may lead to significant decreases in seabird populations size (see examples in Jennings & Kaiser, 1998). In other cases, population numbers have increased and have been linked to the greater availability of food for scavenging birds that take offal discarded from fishing boats. The number of seabirds potentially supported by fishery waste in the North Sea has been estimated to be 5.9 million individuals (Garthe *et al.*, 1996). The large gulls in particular appear to take advantage of this food source but the wholly pelagic bird species, such as the northern fulmar (*Fulmarus glacialis*), northern gannet (*Morus bassanus*) and black-legged kittiwake (*Rissa tridactyla*), do not use the fisheries waste to the same extent.

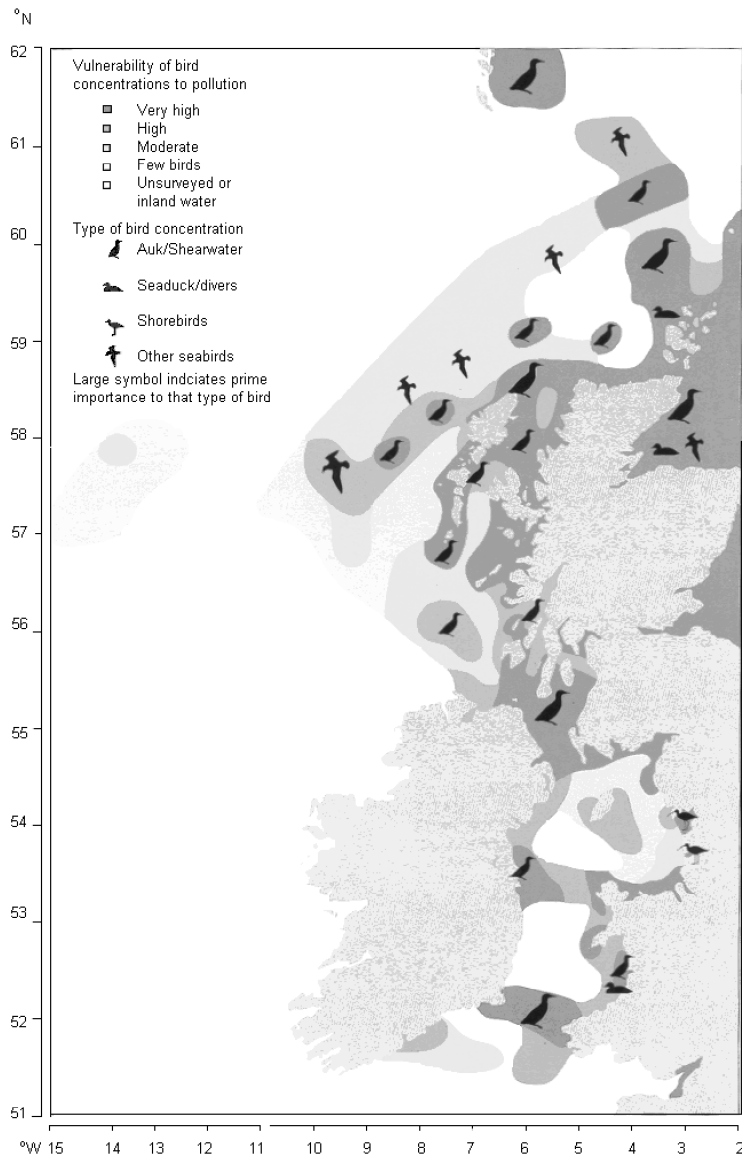
Seabird mortality can also be attributed to direct catch. Entanglement, particularly in gill nets and other set nets, is a hazard and cause of mortality to diving seabirds in inshore waters. In northern Norway, the breeding populations of guillemots at two sites were estimated to have declined by 95 per cent from the early 1960s to 1989 - a figure which could be explained entirely on gill net mortalities based on observed catch rates. In the open ocean longlining, which can involve the deployment of many thousands of baited hooks in a single operation, is known to catch northern fulmar (*Fulmar glacialis*) and possibly gannets and kittiwakes. In the OSPAR maritime area, these fisheries take place in the south-west Celtic Sea, on the upper slopes of the north-eastern Atlantic, north and west of Shetland, and round to the west of the Hebrides. (Dunn, 1997). In the southern hemisphere longlining is pushing many albatross species into chronic decline (Dunn, 1995).

The vulnerability of birds to marine pollution incidents such as oil spills, depends on the species in question and whether they occur in the area at the time of an incident or while the area is likely to remain contaminated. This information has been mapped for the North Sea and sea areas to the west of Britain (Carter *et al.*, 1993; Tasker *et al.*, 1990).

2.9.3 Conservation actions

Three types of actions are generally needed for successful seabird conservation. Actions focused on the animals themselves, site-based measures to protect areas that are important to seabirds such as nesting and roosting sites, and wider measures to maintain the quality of the environments used by seabirds. Although generally viewed in a terrestrial context, all of these measures can and should be applied for seabirds at sea. Work has already been undertaken to assist the focus on species through international convention and European Union directives. Species of European Conservation Concern (SPECs) have also been identified by BirdLife International (Tucker *et al.*, 1994; BirdLife International 1999) (box 6) and those which occur in the OSPAR maritime area put forward for consideration on the lists of species requiring conservation action currently being developed by OSPAR. Activities which pose actual or potential threats to such species need to be tackled. One example of the way in which this is being done is the FAO global accord to reduce the incidental killing of seabirds in longline fisheries. This proposes that nations should assess their longline fisheries impact on birds and, if there is a problem, develop and implement a national plan of action by 2001. Modifications of equipment are also under development such as an underwater setting funnel and bird scaring lines.

Figure 32: Vulnerable concentrations of seabirds to the west of Britain in May (from Tasker et al., 1990)



Site conservation measures for seabirds have been almost exclusively focused on land to protect birds at their nesting and roosting sites. More recently there has been interest in extending such protection not only to the adjacent areas of sea where large numbers of birds may rest on the surface or feed but also sites further from land which are the focus of their feeding activity at sea (RSPB, 1997). These can be important sandbanks, frontal zones, areas of upwelling, and current swept areas where there may enhanced productivity or concentration of food.

Wider environmental measures that will benefit seabirds include those which are designed to safeguard and improve water quality, controls on substances entering the marine environment which are toxic, persistent and liable to bioaccumulate, fisheries management which takes

account of wider environmental impacts including depletion of seabird prey species and implications for ecosystem function, and actions which minimise the risk of pollution incidents at sea. All these measures are relevant to seabird conservation in the OSPAR maritime area.

2.10 DEEP SEA FISH

This section of the report is principally concerned with deep sea benthopelagic fish. These are species that are associated with, or live close to, the sea-bed and that are found in the deepest parts of the ocean, the bathyal and abyssal zones (below depths of 1,000m) where sunlight does not penetrate. Reference is also made to some mesopelagic species, that occupy a twilight zone between 150m-1,000m which extends from the edge the continental shelf to the bathyal zone (figure 33).

Box 6: Examples of marine birds occurring in the OSPAR maritime area which are species of European Conservation Concern and/or are listed on Annex I of the EU Birds Directive (from BirdLife, 1999).

Note: Species are listed in order of increasing conservation concern on SPEC ranking
 'T' indicates that a species registers for any given ranking
 EC Birds 1 = Annex 1 of EU Birds Directive
 SPEC 1-4 = Species of European Conservation Concern

Common Name	EC Birds 1	SPEC 1	SPEC 2	SPEC 3	SPEC 4
Steller's eider		T			
Fea's petrel	T	T			
Zino's petrel	T	T			
Cory's shearwater	T		T		
Manx shearwater			T		
Storm petrel	T		T		
Gannet			T		
Common gull			T		
Sandwich tern	T		T		
Black guillemot			T		
Puffin			T		
White-faced storm petrel				T	
Red-throated diver	T			T	
Black-throated diver	T			T	
Bulwer's petrel	T			T	
Little shearwater	T			T	
Leach's storm-petrel	T			T	
Madeiran storm-petrel	T			T	
Scaup				T	
Velvet scoter				T	
White-tailed eagle	T			T	
Little gull				T	
Gull-billed tern	T			T	
Caspian tern	T			T	
Roseate tern	T			T	
Little tern	T			T	
Shag					T
Great skua					T
Mediterranean gull	T				T
Lesser black-backed gull					T
Great black-backed gull					T
Razorbill					T
Great northern diver	T				
Slavonian grebe	T				
Red-necked phalarope	T				
Common tern	T				
Arctic tern	T				
Guillemot (Iberian race)	T				