5. Possible Methods for Selection of Natura 2000 sites for wide ranging mobile marine species

5.1. Possible approaches for conservation of wide ranging marine species

A number of the scientific difficulties encountered when attempting to identify sites for wide ranging marine mammals are very similar to those encountered when attempting to identify sites for wide ranging birds. In practice, areas identified for both groups are likely to overlap as they often feed on common food sources (i.e. shoals of small fish). The main difficulty in identifying potentially important areas for both groups is in applying existing site selection criteria in an environment with no or few obvious natural boundaries, and to species which are widely dispersed, highly mobile and may be difficult to observe.

As outlined in the preceding sections of this report, there are administrative differences in requirements for site selection between Habitats Directive Annex II species, and those for birds in Article 4 of the Birds Directive, which should be borne in mind. In essence these are that:

- For Habitats Directive Annex II aquatic species which range over wide areas, such sites [SACs] will be proposed only where there is a "clearly identifiable area representing the physical and biological factors essential to their life and reproduction" (EEC 1992);

- for Birds Directive Annex I species Member States: "shall classify in particular the most suitable territories in number and size as special protection areas [SPAs] for the conservation of these species, taking into account their protection requirements in the geographical sea and land area where the Directive applies" (EEC 1979), and;

- "Member States shall take similar measures for regularly occurring migratory species not listed in Annex I [to the Birds Directive], bearing in mind their need for protection in the geographical sea and land area where this Directive applies, as regards their breeding, moulting and wintering areas and staging-posts along their migration routes" (EEC 1979).

In the UK, for all of the marine birds that breed in the UK, and the two UK breeding seal species, land based breeding colony sites have already been classified as SPA for birds or designated as SAC for seals. Whilst SAC boundaries extend into sea areas, SPA boundaries are currently limited in the main to land above mean low water (or mean low water springs in Scotland). There are currently (Nov 2001) three SACs for bottlenose dolphin in UK waters (within 12 nm of the coast). There are currently no SACs identified for harbour porpoise in UK waters (see Section 6.2.4).

Numerous discussions have taken place between bird and marine mammal specialists involved in the Offshore Natura 2000 project (the Operational Technical Group of the project) on the technical possibilities and difficulties involved trying to identify areas which might be 'essential' or 'most suitable' for marine mammals and birds (see above).

During these discussions, it has become clear that different groups of birds and Annex II species will need to be dealt with in different ways, due to differences in their abundance and distribution in the marine environment, and also due to the type and availability of data on the various groups. The flow diagram in Figure 5.1 is an attempt to represent the different groups of species and also processes which are either ongoing, or need to be put in place, in order to identify areas likely to qualify as SPAs or SACs for these mobile and often wide ranging marine species. Because of the overlaps between the Offshore Natura 2000 project, and the JNCC Marine SPAs Project (briefly outlined in Section 6.3.1), some of the information relating to the latter is presented here. The groups of species are provisional at present, and are further discussed in Sections 6.2 and 6.3.2.

The contents of the flow diagram are explained more fully in the following sections of this report. In brief, starting at the top of the diagram, all the Habitats Directive Annex II species and all Birds Directive Annex I and regularly occurring migratory birds are included. Working outwards, these are progressively subdivided into groups according to, firstly, different types of data analysis (determined by the nature of available data), and subsequently, according to the type of distribution of each species or species group. Lastly, the type of process envisaged (or currently in progress) to work towards identification of areas likely to qualify as SACs or SPAs in UK inshore and offshore waters is presented. A number of these divisions are currently tentative, as they cannot be confirmed until data analysis is performed.

5.2. Published approaches to conservation of Habitats Directive Annex II species and birds

The following section of this report presents summaries of three published examples of possible approaches to selecting important areas for birds occurring in UK waters, which could also be applied to marine mammals. It also presents the approach of introducing 'special measures' for protection of harbour porpoise, which could be applied to other wide ranging marine species, and developed further in addition to identification of protected sites, or where sites cannot be identified. Further information on each approach may be obtained from the references cited. These possible methods are discussed in Section 6.2 of the report, for the various groups of Habitats Directive Annex II species and in Section 6.3 for Birds Directive Annex I and migratory birds. Options and recommendations as to methods to be tested or used are also included in Sections 6.2 and 6.3 of the report. It is likely that the examples of approaches presented here may be modified, or a mix of several of the approaches used for different groups of Annex II species or Annex I or migratory birds.

5.2.1. Approach A: sites based on generic foraging radii from breeding colonies

A report published by RSPB (RSPB 2000) outlines this approach for birds, which involves generic extensions to breeding colonies according to theoretical foraging ranges of the species present at each colony. It involves delimiting boundaries offshore from known bird breeding colonies, based on existing published data on foraging ranges for relevant breeding birds.

RSPB (2000) recommends:

- The offshore boundary should be drawn as a radius from points at the margins of the colonies (and parallel to the shoreline where the colony extends along a stretch of coast);

- the distance to the offshore boundary should be determined on the basis of generic published information on foraging range, feeding and surface use by breeding birds;
- the distance to the offshore boundary should be species-specific;
- where there is more than one breeding species using the site, the highest recommended figure should be used to set the distance to the offshore boundary;
- known and regularly used feeding areas adjacent to a recommended boundary should be incorporated within the site;
- where known and regularly used feeding areas do not lie adjacent to recommended boundaries, these locations should be considered as sites in their own right;
- where the recommended offshore boundaries of sites overlap they should be merged to form a single site for management purposes.

In order to simplify the data and arrive at the map in Figure 5.2, birds were split into three groups according to generic foraging distance from the colony (5 km, 15 km and 40 km). It is recognised in RSPB (2000) that this approach is not appropriate for some wide ranging birds (such as fulmar, Leach's petrel, storm petrel, Manx shearwater and gannet) which forage at great distances from their colonies.

5.2.2. Approach B: sites based on observed distributions at sea

A report published by BirdLife International outlines this approach to identify Important Bird Areas (IBAs) for birds in the North Sea (including the Channel and Kattegat). The approach is based on spatial analysis and modelling of observed distributions of birds at sea, to identify areas where aggregations of each species occur in different seasons, and from these, to identify and delimit Important Bird Areas. Data from the European Seabirds at Sea database were used, obtained from transect surveys of birds from 1979 to 1994 in the North Sea (Skov *et al.* 1995).

Each of the 30 species of bird used in the analysis had a population in the study region (the North Sea including the Channel and Kattegat) of at least 1% of the species' biogeographic (breeding or non-breeding) population during parts of the year. The analysis in Skov *et al.* (1995) related to the whole of the North Sea (UK and other Member State) waters, but not to western UK waters. The list of birds used in the analysis is shown in Table 5.1 below (Skov *et al.* 1995).

Table 5.1 List of bird species included in analysis by Skov *et al.* 1995

Common name	*Latin name*	*Status*
Red-throated diver	*Gavia stellata*	Ann. I
Black-throated diver	*Gavia arctica*	Ann. I
Great northern diver	*Gavia immer*	Ann. I
Great crested grebe	*Podiceps cristatus*	M
Red-necked grebe	*Podiceps griseigena*	M
Cormorant	*Phalacrocorax carbo*	M
Shag	*Phalacrocorax aristotelis*	M
Fulmar	*Fulmarus glacialis*	M
Gannet	*Morus bassanus*	M
Scaup	*Aythya marila*	M
Common eider	*Somateria mollissima*	M
Common scoter	*Melanitta nigra*	M
Velvet Scoter	*Melanitta fusca*	M
Goldeneye	*Bucephala clangula*	M
Red-breasted merganser	*Mergus serrator*	M
Goosander	*Mergus merganser*	M
Great skua	*Catharacta (Stercorarius) skua*	M
Little gull	*Larus minutus*	M
Common gull	*Larus canus*	M
Lesser black-backed gull	*Larus fuscus*	M
Herring gull	*Larus argentatus*	M
Great black-backed gull	*Larus marinus*	M
Kittiwake	*Rissa tridactyla*	M
Sandwich tern	*Sterna sandvicensis*	Ann. I
Common tern	*Sterna hirundo*	Ann. I
Guillemot	*Uria aalge*	M
Black guillemot	*Cephus grylle*	
Razorbill	*Alca torda*	M
Little auk	*Alle alle*	M
Puffin	*Fratercula arctica*	M

Note: M = regularly occurring migratory species
Ann. I = Birds Directive Annex I species

Figure 5.3, Figure 5.4 and Figure 5.5 show seasonal densities and distributions for three example bird species produced using this approach.

The selection of IBAs, determined as those holding at least 1% of the biogeographic population, was based on the assumption that the bird species concentrate in geographically limited areas. However, a number of bird species have a dispersed distribution, and accordingly only a small proportion of their total population can be covered through areas identified by the 1% criterion. Skov *et al.* (1995) therefore devised a formula (the Marine Classification Criterion or MCC) to test whether a population of international significance used a relatively larger area of sea than expected from the proportion of the total population present. Without the application of the Marine Classification Criterion almost the entire study region (North Sea) would satisfy the 1% criterion at any time (Skov *et al.* 1995).

The MCC formula incorporated the international 1% criterion for establishing areas of international importance and a simple test of proportions between the relative size of the population and the area of the site. Given a determination of a marine area supporting a minimum of 1% of a total biogeographic population it is tested whether the area of the site is disproportionate to the size of the population by the equation:

$$MCC = (p/P) \times 100/a/A$$

Where: p = estimated number of birds of the site
P = total population in the biogeographic region
a = the area of the site, and
A = 3000 km^2

A site was then classified as an IBA if the criterion exceeded 1. The parameter "A" defines the scale of sites, for example with A defined as 3000 km^2 a site holding 2% of an appropriate population should not exceed 6000 km^2 in area if it is to be identified as an

important sea area for birds. To keep the MCC as simple as possible, and to ensure that the maximum scale of an area supporting 1% was applicable in a wide range of marine environments, the maximum scale was set at 3000 km^2, using average feeding radii of key species from colonies in the region.

Final maps of the main areas of importance to each species were combined in a Geographic Information System (GIS). The total value of each area for all species was then calculated as the sum of proportions of the total populations of the species occurring in internationally important concentrations within the area (refer to Skov *et al.* (1995) for how this was done).

There are also other modelling approaches that could be applied to the ESAS data. The Skov *et al.* (1995) method utilises a data interpolation procedure that stratifies the density of birds into several density ranges, including areas of high density, areas of low density and areas of density gradients. As with Skov *et al.* (1995), the following method is based on analyses of aggregations of organisms, but for this method there is no requirement for stratification of density values.

Spatial modelling can be performed utilising a data interpolation technique called kriging, which employs variogram models to specify the spatial variability of the data (Begg & Reid 1997). The underlying principle of variogram analysis is that of spatial autocorrelation. Positive spatial autocorrelation occurs when the values of neighbouring sample sites have a higher probability of being more similar than sites situated further apart (Goodchild 1986; Legendre 1993). Kriging uses the variogram to interpolate values into a grid covering the whole of the region being investigated. It is possible to export the grids to a GIS and generate contour maps of density and use other GIS analytical procedures.

This method is currently being used as part of the JNCC Marine SPA Project to investigate small-scale (hundreds of metres) aggregations of active breeding birds around colonies. However, it can also be applied to the large-scale data (hundreds of kilometres) held in the ESAS database. Potentially, kriging could be used to interpolate bird and cetacean density values over the whole of UK waters. If concentrations of a species were found, an adaptation of the Marine Classification Criterion (Skov *et al.* 1995) could be adopted to delimit proposed SPA boundaries.

5.2.3. Approach C: sites based on habitats identified for feeding

This approach proposes identification of SPAs based on areas of habitat important for bird populations. RSPB (2000) suggested that habitats such as the following may be suitable for protection as SPAs:

- Sandbanks which are important for prey species of a number of bird species, such as sandeel;
- shelf areas or offshore shoals important as feeding areas;
- areas where prey tend to be concentrated, such as ocean or coastal fronts.

A number of marine areas are identified in a report by RSPB (2000) as important feeding areas for birds (see Table 5.2 below). The references cited were not specific studies designed to identify and delimit important habitats for birds for their protection. It is also worth noting that this approach could not be employed in isolation for either Annex II species or birds, as it does not involve assessment of numbers of species or birds using the habitat areas identified. Moreover fronts and areas where prey may concentrate are general areas rather than specific localities, which would make their permanent reference as a site difficult.

Table 5.1 Areas identified in RSPB 2000 as important for bird feeding

Species	*Site*	*Type*	*Reference*
Guillemot	Flamborough front	Seasonal front	Webb *et al.* 1985
	Bell Rock (inshore)		Tasker *et al.* 1987
	Wee Bankie	Sandbank	Tasker *et al.* 1987
	Whale rock bank?		Leaper *et al.* 1988
Gannet	Smalls, Hats & Barrels (inshore)		Stone *et al.* 1992
	Dogger Bank	Sandbank	Camphuysen *et al.* 1995
	Wee Bankie	Sandbank	Camphuysen *et al.* 1995
	Whale rock bank (Minch)		Leaper *et al.* 1988
Lesser black backed gull	The smalls (inshore)		Stone *et al.* 1992?
Kittiwake	Wee Bankie	Sandbank	Wanless *et al.* 1998?
	Marr Bank	Sandbank	Wanless *et al.* 1998
	Whale rock bank (shelf break)		Leaper *et al.* 1988
Razorbill	Wee Bankie	Sandbank	Wanless *et al.* 1999
	Smith Bank	Sandbank	Mudge & Crooke 1986
	Whale rock bank		Leaper *et al.* 1988
All species?	Shelf break		No references – areas noted on Map 10 of RSPB (2000) (reproduced as Figure 5.2 in this report)
	Rockall bank		
	Aberdeen front		
	Irish Sea front		
	Jura & Islay fronts		

5.2.4. Approach D: Special measures

This section describes a number of examples of possible 'special measures' which could be achieved or extended (if already implemented) under various formal agreements or International Conventions. The list is not exhaustive and will vary for the different species groups. Special measures are here taken to mean measures taken to conserve species throughout a large proportion of their range of occurrence in the UK (and elsewhere) and not solely within specific sites. They thus operate to regulate potentially widespread human activity that affects the species concerned. The following are examples of non-site based mechanisms which are already being used, or could be used to protect wide ranging marine species.

5.2.4.1. Annexes IV and V of the Habitats Directive

Article 12 of the Habitats Directive states that Member States "shall take the requisite measures to establish a system of strict protection for the animal species listed in Annex IV (a) in their natural range" (EEC 1992). In particular, it states that "Member States shall establish a system to monitor the incidental capture and killing" of these animals (relevant UK marine animals listed Table 5.3 below). "In the light of the information gathered, Member States shall take further research or conservation measures as required to ensure that incidental capture and killing does not have a significant negative impact on the species concerned".

Article 14 states *inter alia* that "if …. Member States deem it necessary, they shall take measures to ensure that the taking in the wild of specimens of species of wild fauna and flora listed in Annex V as well as their exploitation is compatible with their being maintained at a favourable conservation status" (EEC 1992). Those Annex V species relevant to UK offshore waters are listed below.

Table 5.2 Marine species found in UK offshore waters and listed on Annex IV or Annex V of the Habitats Directive.

Common name	*Latin name*	*Status*
All cetaceans	*Cetacea*	Ann. IV
Loggerhead turtle	*Caretta caretta*	Ann. IV
Green turtle	*Chelonia mydas*	Ann. IV
Kemp's ridley turtle	*Lepidochelys kempii*	Ann. IV
Hawksbill turtle	*Eretmochelys imbricata*	Ann. IV
Leatherback turtle	*Dermochelys coriacea*	Ann. IV
Seals	*Phocidae*	Ann. V

5.2.4.2. Convention on Biological Diversity

UK Biodiversity Action Plans, established under the Biodiversity Convention, refer to 'UK waters' as those out to 200 nautical miles from the baseline from which the territorial sea is measured (illustrated by the boundary to the Fisheries Act 1964 as amended). It is noted, however, that the extent of potential UK action under the plans in marine areas beyond territorial waters (12 nm) is, under the UN Convention on the Law of the Sea (UNCLOS), subject to the rights of other states. This is particularly notable in terms of regulation of impacts due to fisheries outside 12 nm as "Member States do not have the possibility of acting unilaterally beyond their territorial waters to take conservation and resource management measures which would apply to ships registered in other Member States or non-member countries", and "it is therefore up to the Member States to ask the Commission to take the regulatory measures [under the Common Fisheries Policy] so that these sites [SACs and SPAs] are protected from potentially harmful fishing activities" (EC 2001b).

'Priority Species' under the UK Biodiversity Action Plan (UK Biodiversity Group 1999) are those which are:

- Threatened endemic and globally threatened species;
- species where the UK has more than 25% of the world or appropriate biogeographical population;
- species where the number or range has declined by more than 25% in the last 25 years;
- species found in fewer than 15 ten km squares around the UK; or
- species for which the UK has international obligations or which are protected under UK legislation.

Of the marine species found in UK offshore waters, harbour porpoise, small dolphins and marine turtles are all priority species. Species Action Plans have been published for:

- Harbour porpoise (*Phocoena phocoena*).
- Small dolphins grouped plan – includes bottlenose dolphin (*Tursiops truncatus*).
- Marine turtles grouped plan - includes loggerhead turtle (*Caretta caretta*).
- Common scoter (*Melanitta nigra*).
- Red-necked phalarope (*Phalaropus lobatus*) – action plan relates exclusively to terrestrial (mostly breeding) sites.
- Roseate tern (*Sterna dougallii*) – action plan relates exclusively to terrestrial breeding sites.

Actions and targets proposed for each of the above are included in the Species Action Plans (UK Biodiversity Group 1999). These broadly include for cetaceans and turtles current and future research on distribution of the species in UK waters, including research into scale and effects of bycatch, measures to reduce bycatch in fishing gear, and publication of guidelines to minimise effects of acoustic disturbance to cetaceans from seismic surveys. Proposed actions include extending the ASCOBANS treaty boundary (see below), seeking to further improve discharges of persistent toxic chemicals

(especially PCBs and organohalogens), consider wider impacts on non-target species when determining fishery management measures, consider need to monitor and control fisheries to reduce bycatch, and introduce codes of practice to reduce disturbance from whale and other cetacean-watching operations.

Species Action Plans for both red-necked phalarope and roseate tern relate exclusively to action on land, mostly at breeding sites to improve breeding success and maintain breeding populations. For common scoter, the Species Action Plan relates to marine wintering as well as terrestrial breeding and feeding areas. The principle marine actions recommended are to protect important scoter marine wintering sites, improve controls on discharge of oil (accidental or deliberate) due to the high vulnerability of this species to oil pollution, and improve shellfish harvesting and monitoring practises in important scoter wintering areas.

5.2.4.3. ASCOBANS

ASCOBANS (Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas) is a regional agreement under the Bonn Convention. Under the agreement, formulated in 1992, provision is made for protection of specific areas, monitoring, research, information exchange, pollution control and heightening of public awareness. Measures are aimed specifically at protecting dolphins and porpoises in the North and Baltic Seas, and cover the monitoring of fisheries interactions and disturbance, resolutions for the reduction of by-catches (below 2% of stock sizes), and recommendations for the establishment of specific protected areas for cetaceans.

Proposals under the Species Action Plans (UK Biodiversity Action Group 1999) for harbour porpoise and for small dolphins include that the ASCOBANS treaty boundary should be extended to include all UK waters.

5.2.4.4. Seabird oil vulnerability maps

An example of a potential set of special measures exists in relation to seabirds and oil exploration and production activities in UK waters. The ESAS database provides monthly density estimates for every seabird species in most of UK's waters. Due to their habits and biological features, each of these species has a different vulnerability to oil pollution on the surface of the sea. These features may be placed in four categories (Williams *et al.* 1994):

- Size of biogeographic population (a small biogeographic population would be more sensitive to the loss of a number of individuals than a large one);
- proportion of time spent on the surface of the sea by individuals (those species that spend a greater time on the sea's surface would be more sensitive than those spending a lesser proportion of time there);
- potential population growth rate (a species that can produce large numbers of offspring in a year would be less sensitive than those species only producing one young per year);
- reliance of the species on the marine environment (some species may use inland habitats as well as the sea for feeding, these will be less sensitive than those species entirely reliant on the sea).

Williams *et al.* 1997 and subsequent authors have scored each species using quantitative information where possible on scales relating to the above features. Each species score

has then been combined with the density map of the species to create an indication of the distribution of the vulnerability of each species to oil spills on a monthly basis. Monthly maps of overall seabird community vulnerability to oil spills may then be compiled by adding the species maps together for each month. It is then possible to determine which areas and times are of particular seabird sensitivity. These monthly sensitivity maps have been issued as a series of atlases (e.g. Tasker & Pienkowski 1987; Carter *et al.* 1993).

These sensitivity maps are in use in providing advice on several stages of oil exploration and production. Offshore oil licensing is conducted in a series of rounds during which a set of areas (blocks) are offered for leasing. The Department of Trade and Industry is responsible for this process and first consults the statutory conservation agencies for its recommendations on the round and any conditions that might apply. At this stage the maps are used to advise on particularly sensitive periods when any activity that might add to the risk of oil spill might be advised against or prohibited. This advice is usually taken. Oil companies in bidding for each block are required to put forward a programme of work that takes account of environmental interests and sensitivities. Such sensitivity may also be derived partly from the atlases.

Once licensing has occurred, companies are required to submit an environmental impact statement (or a formal request not to complete a statement) ahead of drilling or development. This again may be informed by knowledge of bird communities at risk. Many operations also require an oil spill contingency plan; these too may be informed by the vulnerability maps.

If an oil spill occurs, whether derived from shipping or from exploration/production, the scale of the response to the spill can be guided by the vulnerability of the birds in the area of the spill. In general, oil spills in highly sensitive areas should be removed from the surface of the water rapidly, while those in areas with few birds might be left to degrade naturally.

The advantage to this approach is that it has the capability of guiding measures that will help safeguard birds regardless of the area that they are located in. It is not necessary to designate sites for conservation actions to apply to the bird populations. It would be comparatively easy to translate this guidance into a more formal statutory 'special measure', especially using mechanisms such as Environmental Impact Assessments.

The same techniques as described above can be adapted to identify relative sensitivity to other pressures. Camphuysen and Leopold (1998) applied the technique to identify concentrations of birds at risk from shipping disturbance. A similar technique was used to identify concentrations of seabirds sensitive to reduction in sandeel abundance (ICES 1999). A large proportion of the areas in the north-western North Sea identified in this way were subsequently closed to sandeel fishing in order to avoid adverse effects on predators (including fish) reliant on sandeels.

5.2.4.5. Agreement on the Conservation of Albatrosses and Petrels

This agreement was signed by the UK in 2001, and is due to come into force in 2002. It seeks to achieve and maintain a favourable conservation status for albatrosses and petrels, particularly in the southern hemisphere where the majority of these species occur, and where the longline fishing results in high mortalities. Regulation of longline fisheries in the southern hemisphere has reduced albatross bycatch in regulated fisheries by 95% over the last 5 years (ACAP News Dec 2001), but the agreement seeks to reduce this figure further. However, such measures have limited relevance to petrels in UK waters they do not suffer the same rates of mortality, largely due to the relative lack of

longline fisheries in the northern hemisphere, and different feeding strategies of the northern species.

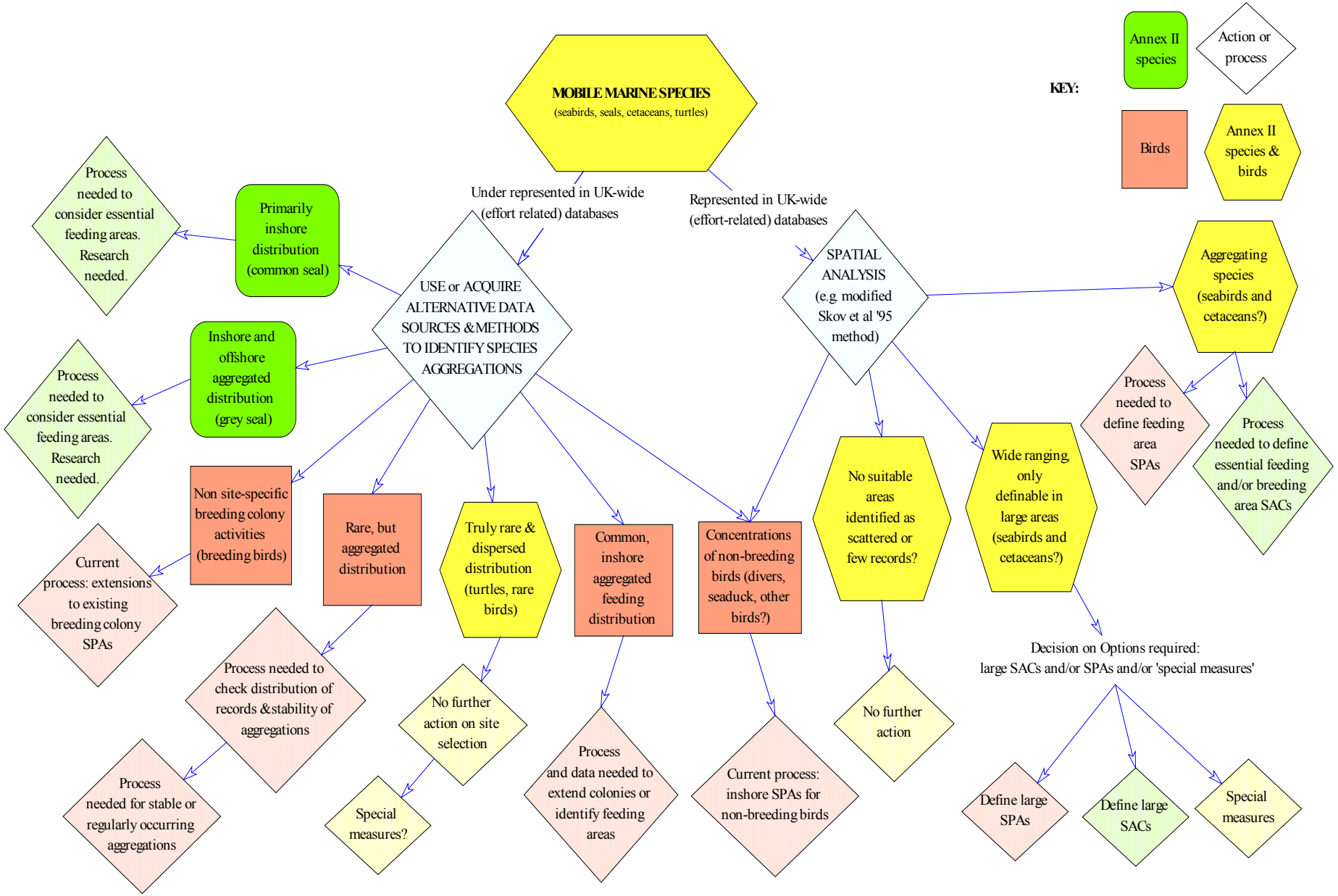


Figure 5.1 Draft data analysis and process diagram for wide ranging mobile species in UK marine waters

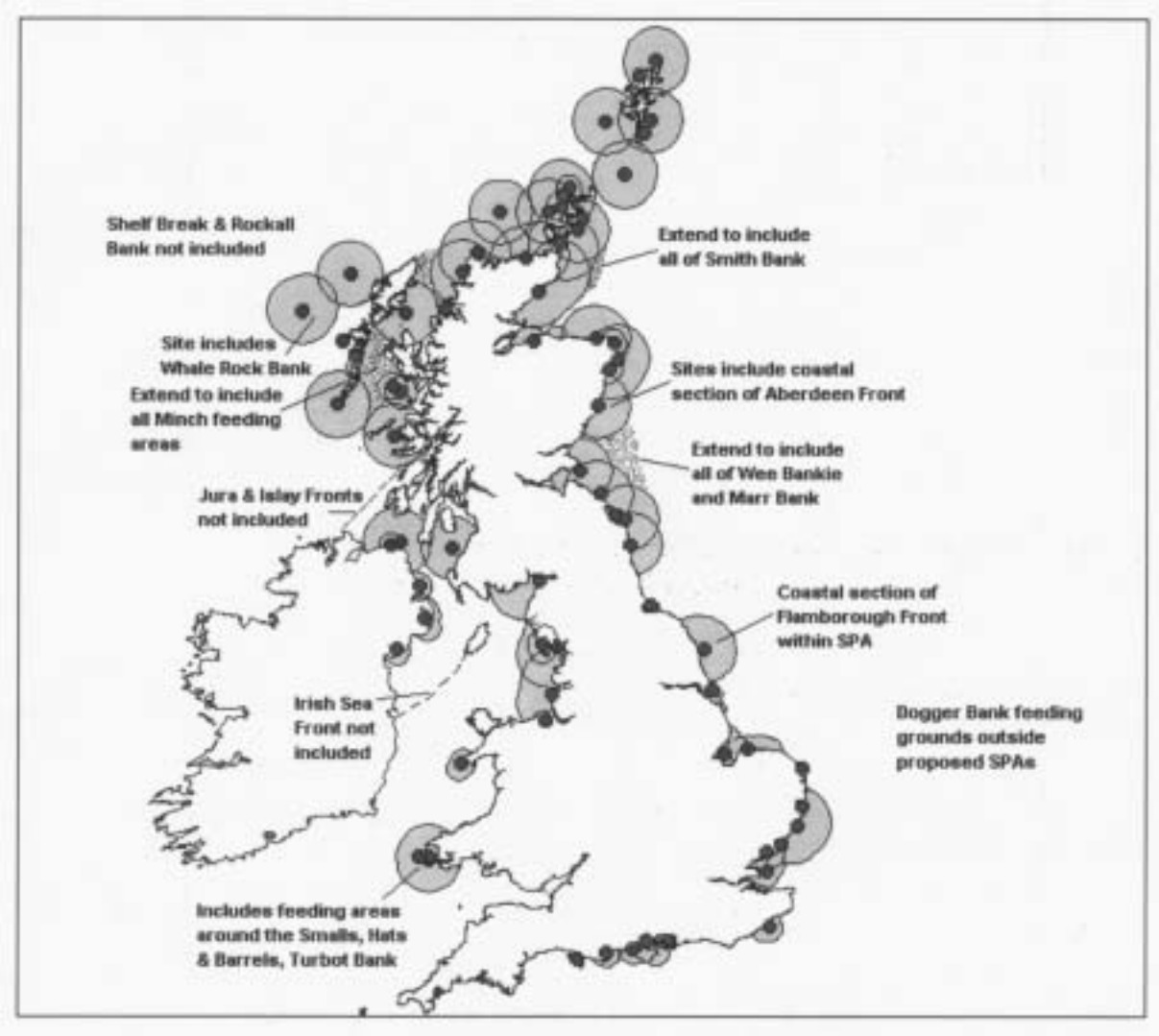
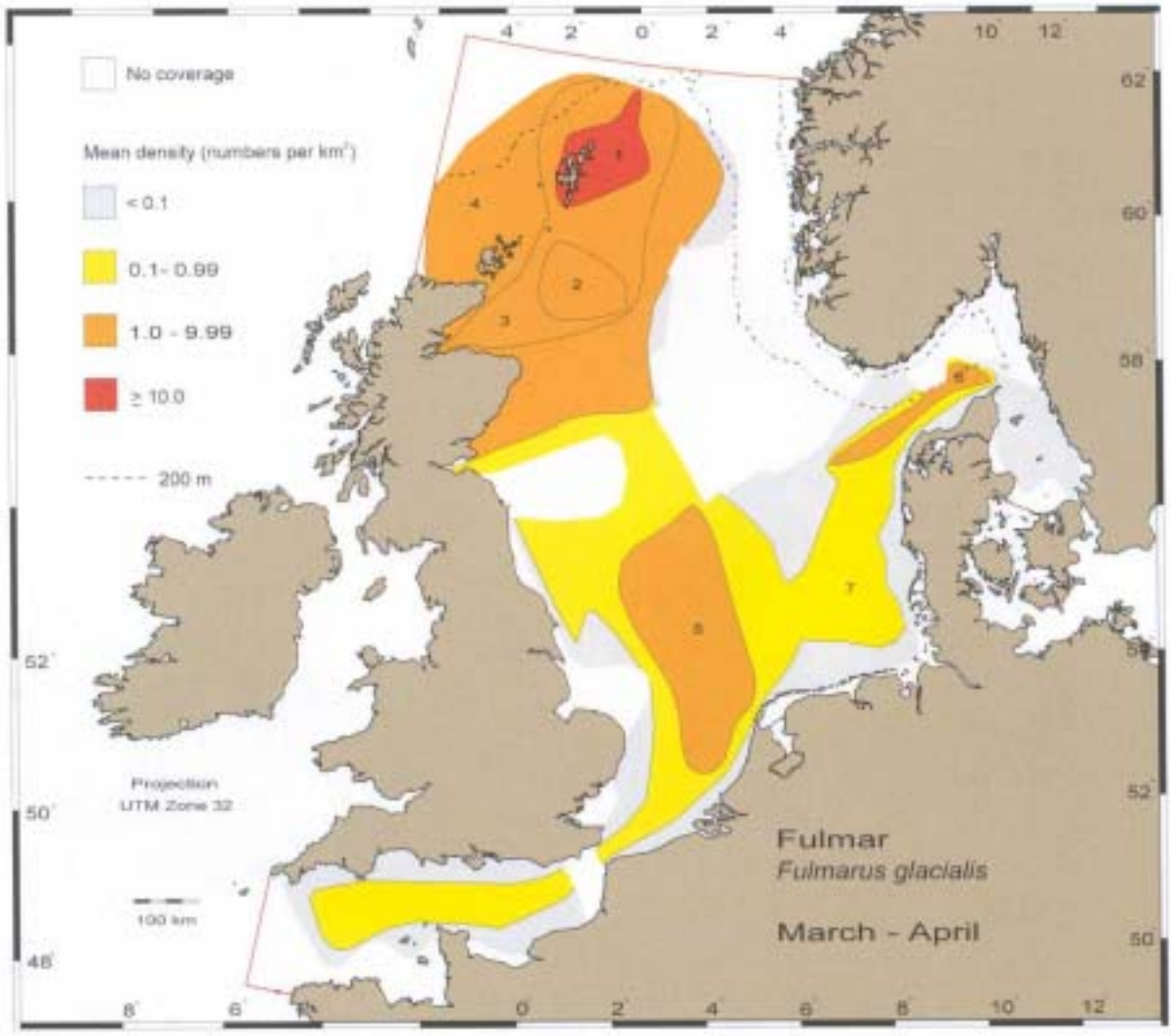


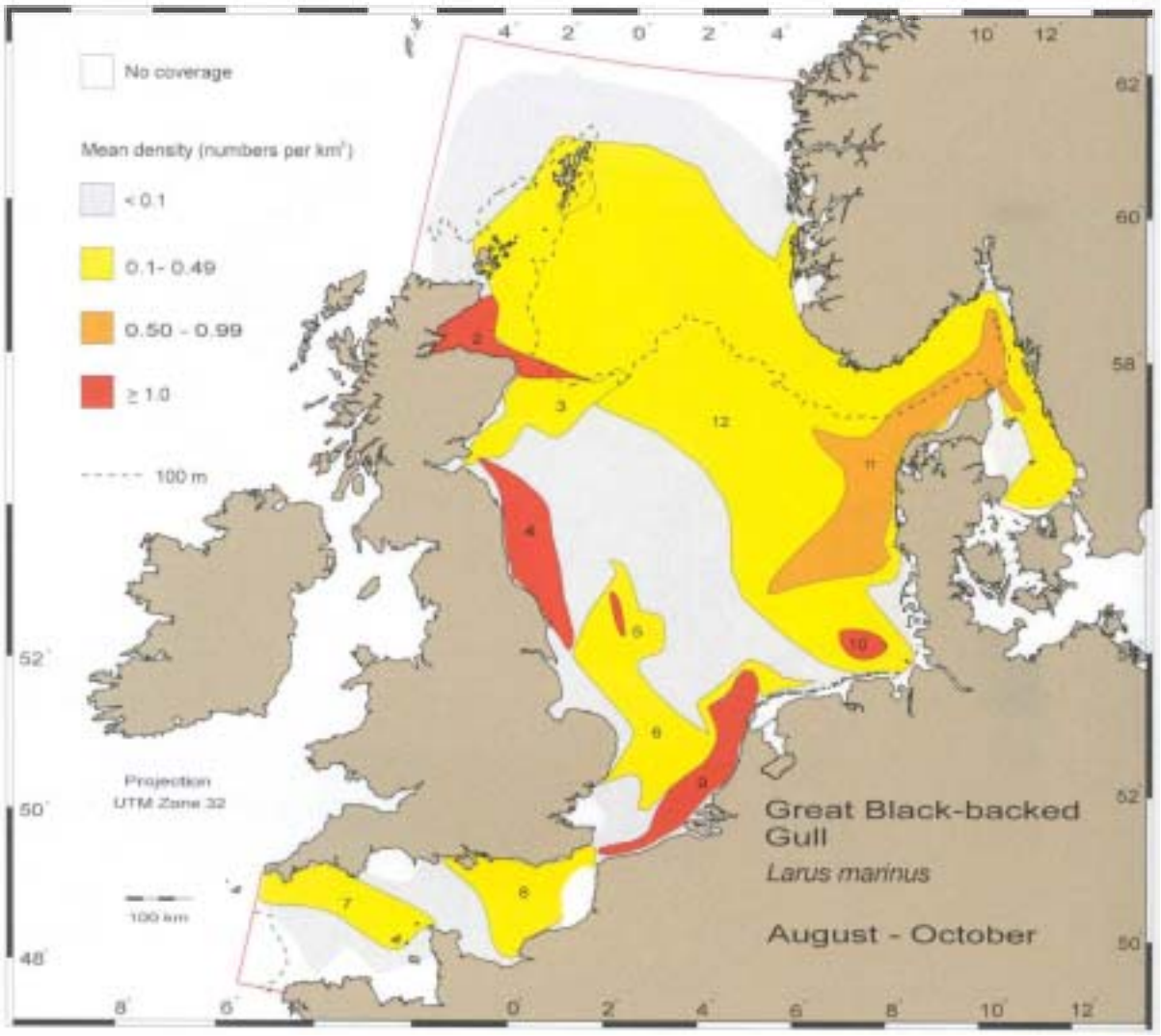
Figure 5.2 RSPB proposals for marine extensions to breeding bird SPAs in the UK, including feeding areas (RSPB 2000)



The average numbers of Fulmar *Fulmarus glacialis* in key areas from March to April 1980-1994. Areas marked with bold are of international importance (MCC criteria).

	Locality	Density	Km²	Estimate	%
1	Shetland	25.66	18640	478000	46.75
2	Little Halibut Bank	9.30	15500	144000	14.09
3	Northern North Sea, medium	1.76	43860	7700	7.55
4	Northern North Sea, low	1.06	123600	131000	12.81
5	Brown Ridge - Dogger Bank	1.63	58880	96000	9.38
6	Little Fisher Bank - Skagerrak	1.35	10500	14000	1.39
7	North Sea - Channel	0.29	280000	81000	7.94
Residual				1000	0.10
Total				**1023000**	**100.00**

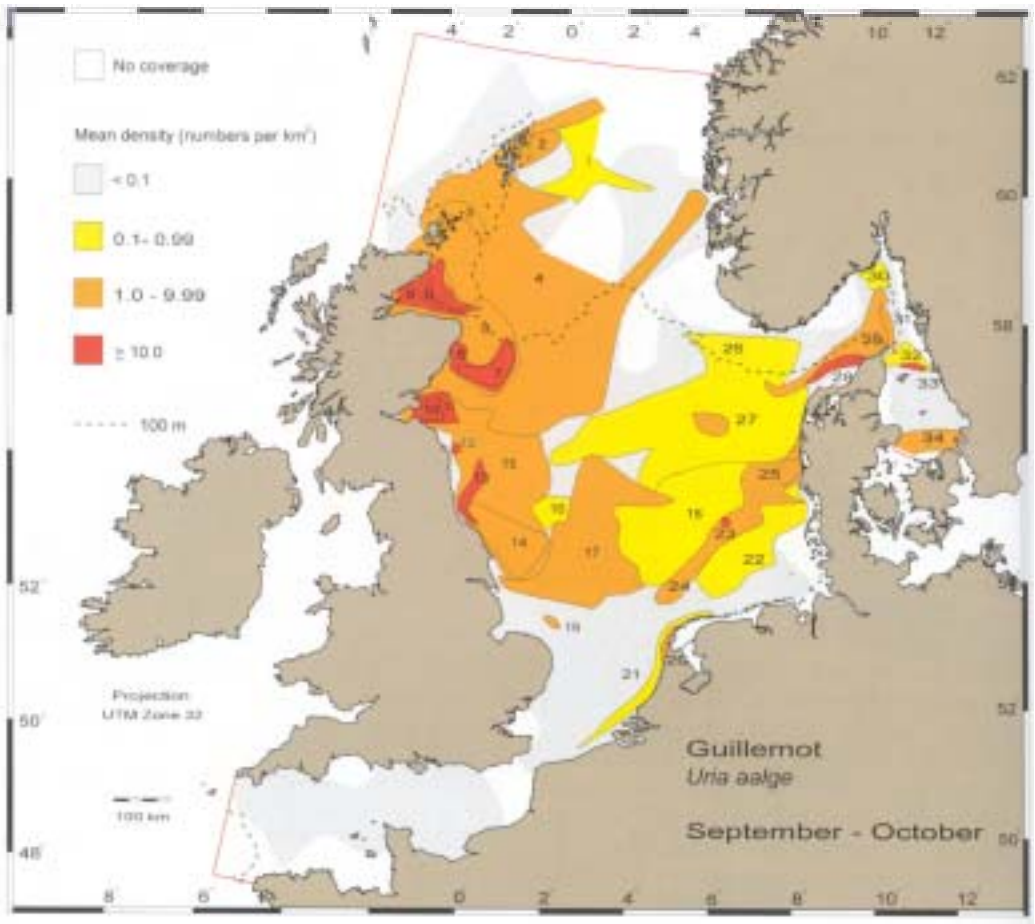
Figure 5.3 Distribution and density of fulmar (*Fulmarus glacialis*) in the North Sea during March to April (Skov *et al.* 1995)



The average numbers of Great Black-backed Gull *Larus marinus* in key areas from August to October 1980-1994. Areas marked with bold are of international importance (MCC criteria).

	Locality	Density	Km²	Estimate	%
1	Eastern Shetland	0.30	4000	1200	0.76
2	**Moray Firth**	**2.16**	**9950**	**22000**	**14.01**
3	Aberdeen Bank	0.20	14550	2900	1.85
4	Barmade Bank - North East Bank	1.50	15500	23000	14.65
5	**Outer Silver Pit**	**4.66**	**1450**	**6750**	**4.30**
6	Lemon Bank - Brown Ridge	0.18	37280	6700	4.27
7	Western Channel	0.25	21350	5350	3.41
8	Eastern Channel	0.21	19840	4200	2.68
9	Dutch - Belgium coast	1.21	15435	20000	12.74
10	Helgoland	1.37	3725	5000	3.18
11	Skagerrak - Danish Westcoast	0.54	48800	26400	16.82
12	Northeast North Sea, low	0.12	265725	32000	20.38
Residual				1500	0.96
Total				**157000**	**100.00**

Figure 5.4 Distribution and density of great back-backed gull (*Larus marinus*) in the North Sea during August to October (Skov *et al.* 1995)



The average numbers of Guillemot *Uria aalge* in key areas from September to October 1980-1994. Areas marked with bold are of international importance (MCC criteria).

	Locality	Density	Km²	Estimate	%
1	Northern North Sea, Low	0.80	10430	8000	0.56
2	Shetland, east	3.18	3040	10000	0.70
3	North Orkney	6.77	2690	18000	1.26
4	Northern North Sea	2.77	112335	311000	21.81
5	Moray Firth, central	31.16	1025	32000	2.24
6	**Moray Firth**	**15.91**	**5250**	**84000**	**5.89**
7	**Aberdeen Bank, core**	**28.17**	**3475**	**98000**	**6.87**
8	Aberdeen Bank, periphery	13.04	3045	40000	2.80
9	Northeast Scotland, high	7.97	11430	91000	6.38
10	**Inner Firth of Forth**	**42.18**	**1370**	**58000**	**4.07**
11	Wee Bankie	11.95	1960	23000	1.61
12	Farne Deeps	18.29	250	5000	0.35
13	**Tees Bay - Barmade Bank**	**34.71**	**2300**	**80000**	**5.61**
14	Flamborough Head - Barmade Bank	7.04	8820	62000	4.35
15	North East Bank	5.60	28340	160000	11.22
16	Dogger North Ground	0.40	2000	800	0.06
17	Dogger Bank	3.89	33300	130000	9.12
18	Kvitbanken	0.97	23500	23000	1.16
19	Leman Bank	6.42	450	3000	0.21
20	Texel coast	2.53	650	1500	0.11
21	Dutch - Belgian coast	0.41	250	2000	0.14
22	German Bight	0.61	12550	8000	0.56
23	Weisse Bank	18.02	150	2800	0.20
24	Horns Rev - Weisse Bank, medium	2.18	12950	28200	1.98
25	Northern Horns Rev	8.26	1380	11400	0.80
26	Great Fisher Bank - Klondyke	0.60	56550	34000	2.38
27	Little Fisher Bank	7.31	1950	14000	0.98
28	Western Skagerrak, high	11.50	1760	20000	1.40
29	Skagerrak, medium	2.46	6950	17000	1.19
30	Eastern Skagerrak, low	0.56	1175	700	0.05
31	Eastern Skagerrak, high	9.73	1050	10000	0.70
32	Northern Kattegat	0.70	1720	1200	0.08
33	Kummel Banke	8.94	500	9500	0.67
34	Southern Kattegat	4.71	4200	20000	1.40
Residual				9000	0.63
Total				**1426100**	**100.00**

Figure 5.5 Distribution and density of guillemot (*Uria aalge)* in the North Sea during September to October (Skov *et al.* 1995)