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Exploration of the Sea

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**REPORT OF THE STUDY GROUP ON SEALS AND SMALL CETACEANS
IN EUROPEAN SEAS**

Cambridge, England, 31 March-2 April 1993

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1 INTRODUCTION

The Study Group met from 31 March to 2 April 1993 at the headquarters of the British Antarctic Survey in Cambridge, and was chaired by Dr J Harwood. The Study Group's Terms of Reference are given in Appendix 1, the agreed agenda can be found in Appendix 2, and a list of participants in Appendix 3. A list of Working Papers is provided in Appendix 4.

2 CURRENT STATUS OF POPULATIONS

The Study Group reviewed the most recent information on the size of marine mammal populations within its area and attempted to place these in a historical context. It recognized the need for a single table which summarized the best available estimates for all the marine mammal populations in its area, and which would provide an indication of the estimation method, the year(s) to which the estimate applied and the confidence limits (where available). It was not able to complete this task at this meeting, but the Study Group recommended that this should be a priority for action at its next meeting (see Section 7). For many species, there are no well-defined biological stocks and only point estimates of abundance (with no indication of precision or accuracy) are available. The Study Group also brought up to date and refined the available information on changes in abundance and potential threats for each population.

2.1 Seals

2.1.1 Harbour Seal (*Phoca vitulina*)

Within the geographical area covered by the Study Group, harbour seals occur in a number of well-defined localities (Figure 2.1.1) with clear discontinuities in distribution between these localities. At present, it is not clear whether or not there is significant exchange of genetic material between these. Analyses of individual PCB congeners in young Danish harbour seals from three different locations indicated that these seals are living in well-defined areas (Storr-Hansen and Spliid, 1993). Surveys are usually carried out during the moulting period in July/August when the largest number of animals are usually hauled out.

Norway (ICES Divisions IIa, IVa). The population was estimated to be 4,129 animals (Bjørge, 1991) from

counts made at haul-out sites between 1977 and 1988. The species is still subject to hunting in the north, although future hunting is likely to be closely monitored under proposed regulations for the management of coastal seals.

Kattegat/Skagerrak (ICES Divisions IIIa, IIIb). This area includes the Oslofjord population in Norway. Total population size in the Kattegat/Skagerrak has been estimated from three aerial surveys each year. Maximum counts for the period 1987-1992 are shown below.

| | 1987 | 1988 | 1989 | 1990 | 1991 |
|------------------------|-------|------|------|------|------|
| Kattegat/ Skagerrak | c6000 | 2901 | 3146 | 2820 | 3897 |

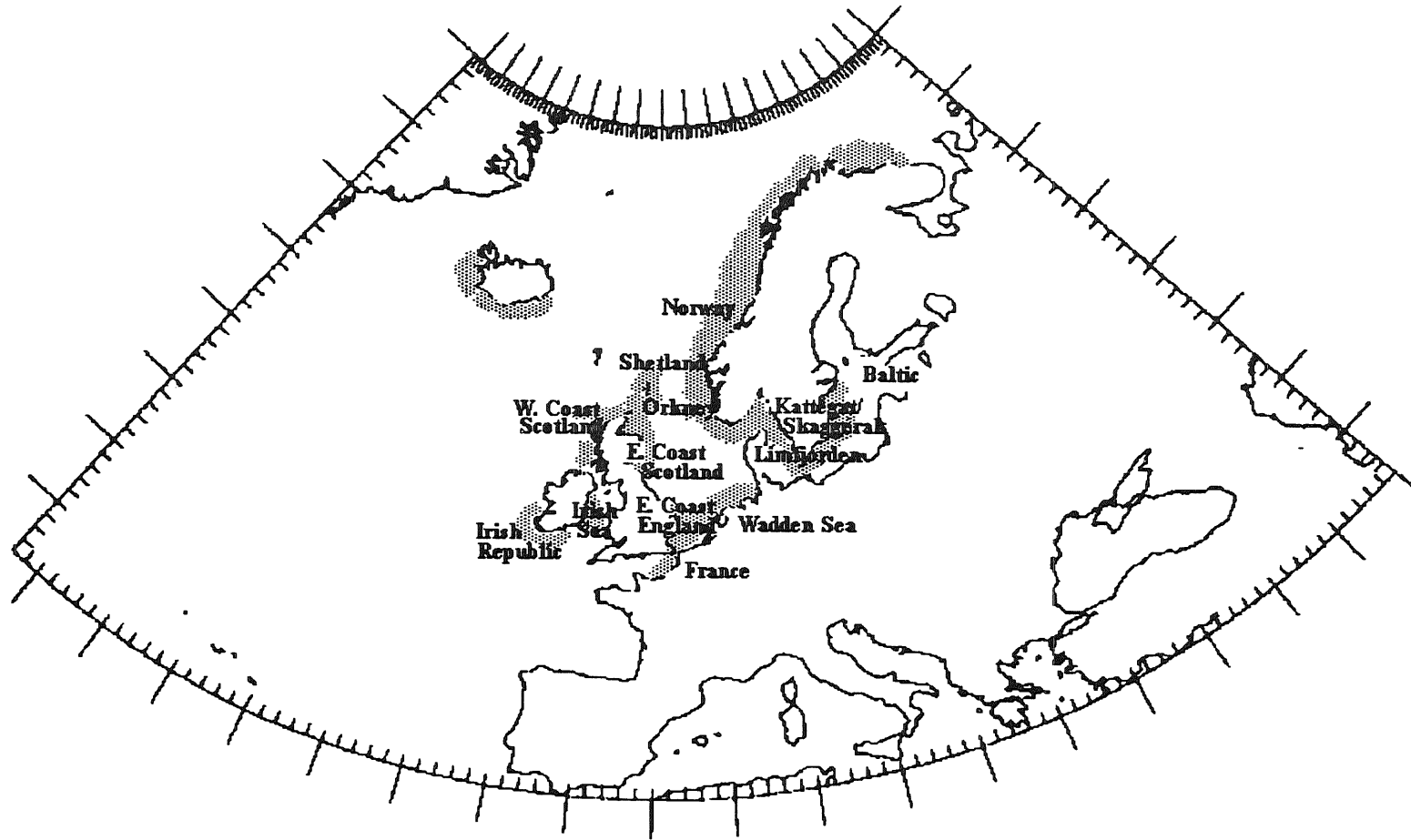
This population suffered 60% mortality in 1988 (Härkönen and Heide-Jørgensen, 1990), but it is predicted to reach its pre-1988 size by 1997 (Heide-Jørgensen *et al.*, 1992).

Baltic Sea (ICES Division IIIId). Three aerial surveys are conducted annually. Maximum counts were 191 in 1992, 214 in 1991, and 260 in 1990. High levels of organochlorine contaminants have been recorded in some individuals (Olsson *et al.*, 1992). There has been a highly significant increase in the frequency of paradontitis and alveolar exostosis since the 1930s (Mortensen *et al.*, 1992).

Limfjorden (ICES Division IVb). Three aerial surveys have been carried out annually since 1988. The maximum count was 750 in 1992 and 746 in 1991.

Wadden Sea (ICES Divisions IVb, IVc). There are annual, coordinated aerial surveys in Denmark, Germany and the Netherlands. The population suffered 60% mortality in 1988. Maximum counts in each region for the period 1987 to 1992 are shown below (see also WP2).

Figure 2.1.1 Distribution of harbour seals within the geographical area covered by the Study Group.



| | 1987 | 1989 | 1990 | 1991 | 1992 |
|--------------------|------|------|------|------|------|
| Denmark | | | 930 | 1100 | 1170 |
| Schleswig-Holstein | | | 1970 | 2320 | 2860 |
| Niedersachsen | | | 1620 | 1920 | 2255 |
| Netherlands | | | 560 | 750 | 970 |
| Total | 9000 | 4500 | 5070 | 6090 | 7255 |

High levels of organochlorine contaminants and female infertility have been recorded in animals from the Dutch Wadden Sea; the rate of increase of this part of the population was low before 1988.

East coast of England (ICES Division IVc). This is surveyed annually from the air. The population suffered

50% mortality in 1988, and counts have been constant at 1,500-1,550 since then.

East coast of Scotland (ICES Sub-division IVaS). Surveyed annually from the air. The local population in the Moray Firth suffered 12% mortality in 1988. Conflicts with the declining local salmon fishery may have increased in recent years. Counts over the period 1988-1992 have been:

| | 1988 | 1989 | 1990 | 1991 | 1992 |
|-------------|------|------|------|------|------|
| Moray Firth | 1249 | 1118 | 1103 | 1166 | 1308 |
| Tay Estuary | - | - | 467 | 670 | 773 |

Orkney (ICES Sub-division IVaN). The deaths recorded in 1988 apparently had little effect on this population. Aerial surveys are carried out at approximately 5-year intervals. The last survey was in 1989 when 7,137 seals were counted.

Shetland (ICES Sub-division IVaN). This population was subject to heavy hunting in the 1960s. The results of an aerial survey in 1991, when 4,784 seals were counted, are similar to those from a boat survey in 1984, when 4,700 seals were counted. However, in other parts of Scotland counts from aerial surveys have been almost double those from boats. This therefore suggests that there may have been some decline in numbers since 1984. There was a major oil spill in Shetland in January 1993. Only a small number of seal carcasses (4) were found immediately after the spill, but the full extent of the mortality is not known.

Outer Hebrides (ICES Division VIa). This population was surveyed from the air in 1992 when 4,759 animals were counted. There is some local conflict with salmon farms and fisheries.

West coast of Scotland (ICES Division VIa). This population was apparently little affected in 1988. Several hundred carcasses were recorded in the Clyde area. The

contaminant levels in these animals suggest that they may have come from the Irish Sea. Some sites are surveyed from the air annually. The whole area was surveyed from the air between 1988 and 1991: the total count was 8,205.

Irish Sea (ICES Division VIIa). The largest numbers have been recorded in Strangford Lough, Northern Ireland. The Lough has been surveyed annually from boats and the shore by the National Trust. Since 1992 it has been surveyed each month by the National Trust and the Department of the Environment for Northern Ireland. There was 30% mortality in 1988. Some individuals have high contaminant burdens (Hall *et al.*, 1992; Mitchell and Kennedy, 1992). Counts from Strangford Lough in July for the period 1988-1992 are shown below:

| 1988 | 1989 | 1990 | 1991 | 1992 |
|------|------|------|------|------|
| 665 | 469 | 537 | 418 | 336 |

Irish Republic. The coast was last surveyed in 1989 by air and coastal observations. Approximately 1,000 animals were counted in widely separated groups along the southwest, west and northwest coasts. The popula-

tion was apparently little affected by the 1988 phocid distemper virus epidemic (only 2 cases confirmed). Surveys of local populations indicate that they are static or have shown only small increases in numbers.

France (ICES Division VIIId). Small groups totalling about 50 individuals occur in the Baie de Somme and Baie des Veys, with 1-2 pups born annually. This population is regularly monitored.

2.1.2 Ringed seal (*Phoca hispida*)

The only population within the Study Group's area is in the Baltic Sea. Animals are highly visible in spring during the moult, and aerial sample surveys of seals hauled out on the ice are usually conducted at this time. The most recent survey in the Bothnian Bay area was carried out in 1991 (Härkönen and Lynnerød, 1992) and the population was estimated to be 2,550 with 95% confidence limits of $\pm 14\%$. This is not significantly different from the results of previous surveys in 1975 and 1988 and 1989. The number of ringed seals in the Gulf of Finland has been estimated at 2,000; in the Gulf of Riga there are "a few hundred" (WP1). The total population in the Baltic Sea is therefore around 4,500-5,000. There has been a substantial decline in this population during the course of this century: it was estimated to contain c300,000 individuals in 1900 (Durant and Harwood, 1986). Initially this decline was because of overhunting (nearly 20,000 animals were taken in some years); more recently it has been because of extensive female sterility attributed to the effects of high contaminant levels. In the last four years the winters have been very mild and ice cover has been limited. As a result, pup mortality has been high and moulting animals have been more aggregated. One hundred ringed seals were found dead in the eastern Gulf of Finland during the winter of 1991/92 and the spring of 1992. The cause of death is not known (Westerling and Stenman, 1992, cited in WP1).

2.1.3 Grey Seal (*Halichoerus grypus*)

Grey seals breed during the late autumn on remote islands and sand banks where the white-coated pups are easily counted. Population size is usually estimated from these counts. It has been divided into populations by grouping geographically adjacent colonies together (Figure 2.1.3).

Murman coast and Finnmark (ICES Division IIa). Joint Norwegian/Russian surveys were carried out in the period 1986-1992. Sixty-one pups were counted at Norwegian colonies and 347 at Russian colonies in 1991 (Haug *et al.*, 1991). The population in the Troms and Finnmark districts of Norway was estimated at 500 in 1987 (Wiig, 1986), but is now believed to total 1,700

(Haug *et al.*, submitted). The Russian population is estimated to be 3,500 (Vishnevskya *et al.*, 1990).

Central Norway (ICES Division IIa). Some major breeding colonies are in protected areas, but there were culls of about 100 females between 1977 and 1985. The population is estimated at 2,600 (Wiig, 1986) by extrapolation from counts of 415 pups in 1979.

Baltic Sea (ICES Division IIIId). Pup production in 1992 was estimated at 1,400 (WP1) suggesting a total population of 5,000. High contaminant levels and high incidences of reproductive abnormalities and adrenocortical hyperplasia have been recorded. 15-20% of pups may drown annually in fishing nets (WP1).

Kattegat/Skagerrak (ICES Divisions IIIa and IIIb). Ten to fifteen animals are counted regularly, but there is no evidence that the few pups which are born ever survive.

Wadden Sea (ICES Divisions IVb and IVc). This small population has been increasing in size. Groups of up to 71 animals, with up to 9 pups have been counted in Schleswig-Holstein (Vogel and Koch, 1992). In the Netherlands up to 178 seals and 21 pups have been counted (Reijnders, 1992).

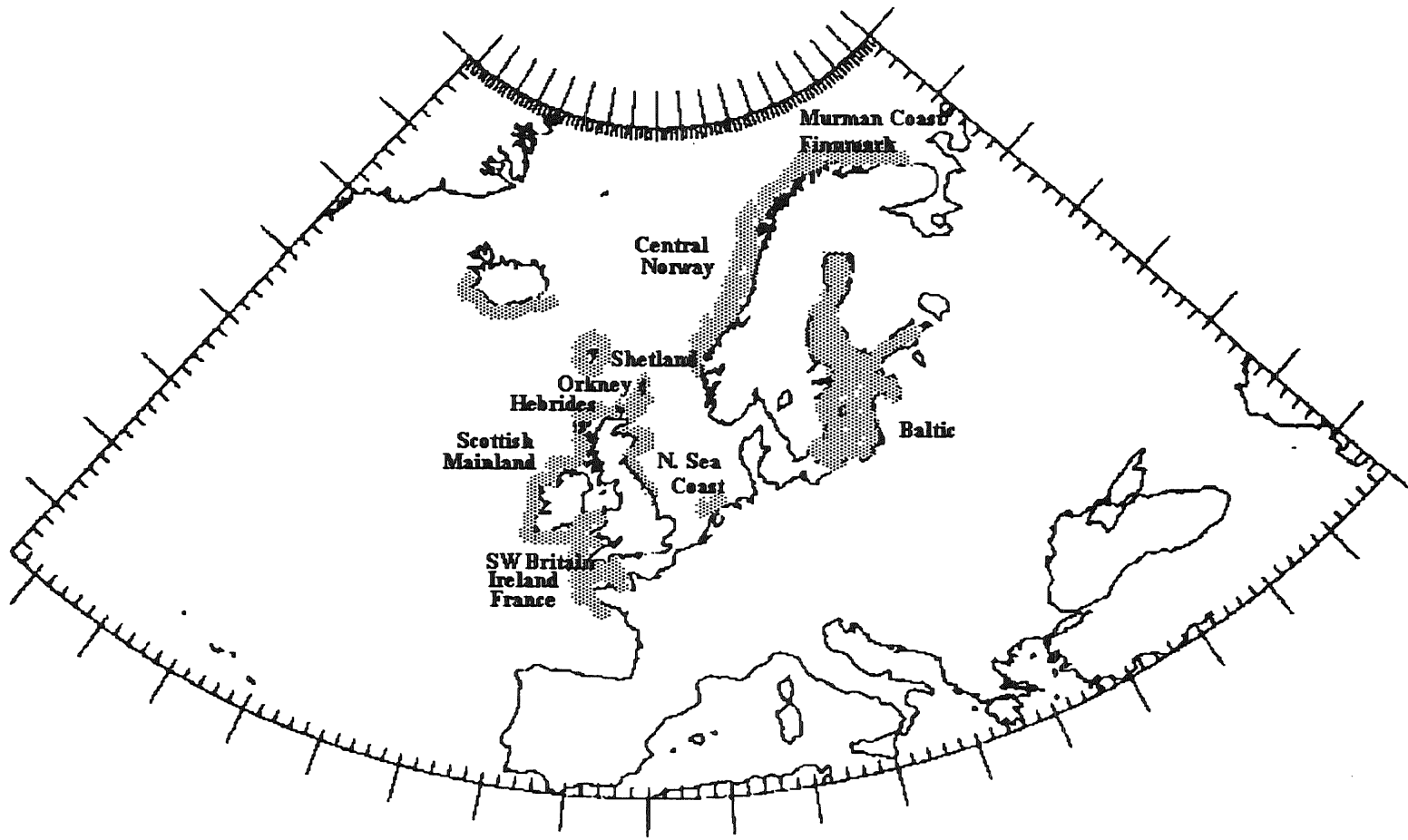
North Sea coast of Britain (ICES Divisions IVa, IVb). Pup production is monitored annually by aerial surveys and counts on the ground. More than 2,350 pups were born in 1991. The total population is estimated at 8,200 and it appears to be increasing slowly (Hiby *et al.*, 1993).

Orkney, Hebrides and Scottish mainland. Pup production at most colonies is monitored annually by aerial surveys. 22,700 pups were born in 1991. The total population estimated to be 78,700. There has been an increase of nearly 10% since 1990 (Hiby *et al.*, 1993).

Shetland (ICES Sub-division VIaN). In this region the species breeds in caves and under cliffs. Pup production was last surveyed in 1983. The total population is estimated to be 3,500.

Southwest Britain, Ireland and France (ICES Divisions VIIa, VIIb, VIIg-j). Most pups are born in caves or on beaches under steep cliffs. The total population is estimated to be around 5,000. Annual surveys are now being carried out in Wales and France. Limited aerial and coastal surveys in Ireland in 1992 provide some indication that new pupping sites were being used. There is a high mortality of pups from storms and evidence from fishermen's organizations of a substantial by-catch in some areas.

Figure 2.1.3 Distribution of grey seals within the geographical area covered by the Study Group.



2.2 Small Cetaceans

The Study Group considered only those small cetacean species which occur regularly in the coastal waters of its area. Information on the abundance of these species is poor because there have been few surveys specifically dedicated to estimating their abundance within the Study Group's area. Some information is available from surveys directed at other target species and from land-based observers (see Section 3). There is no information on population identity.

2.2.1 Harbour porpoise (*Phocoena phocoena*)

This species occurs throughout the Study Group's area and is probably the most abundant species in inshore waters. There is anecdotal evidence that porpoises have been seen less frequently from certain UK coastal sites over the last 20 years (Evans, in prep.; Tregenza, 1992), and the species has virtually disappeared from large parts of the Baltic Sea. Estimates of abundance or density have been calculated for some areas and Figure 2.2.1 shows the location of these.

Aerial surveys of porpoise density using line transect methods have been carried out in the western Baltic Sea and a coastal area in the North Sea near the island of Sylt in 1991 and 1992 (WP3). The highest densities were recorded in the North Sea, whereas the Bay of Kiel and the Little Belt had low densities. Bjorge and Øien (1990) estimated population numbers in the northern North Sea to be 82,600 (95% confidence limits $\pm 44\%$) based on sightings collected during surveys made for minke whales in 1988 and 1989. Reijnders (1992) used estimates of by-catch to calculate that the population in the central and southern North Sea might be 17,000-41,000 animals, based on certain assumptions about the net reproductive rate of the population in the 1950s and 1980s. However, the Study Group noted that the Scientific Committee of the International Whaling Commission had devoted much time to an evaluation of estimates of stock size based on catch data: the results had always been subject to a wide variety of interpretation. Leopold *et al.*, (1992) refer to an unpublished estimate by Skov based on ship surveys that there are 16,000-30,000 porpoises in the coastal waters of western Denmark, Germany and the Netherlands. The same authors estimated that there were 19,210 (coefficient of variation 34%) porpoises on the continental shelf off southwest Ireland based on sightings of 251 animals in 1989 along a 270 km transect.

The Study Group found it difficult to assess the current health of harbour porpoise populations. Concern has been expressed about the effects of high contaminant levels, disturbance, changes in the availability of food, and the effects of by-catches, but necropsies of more than 500 harbour porpoises by-caught or stranded in Denmark from 1980-1992 did not indicate particularly high

burdens of parasites or contaminants (such as mercury and organochlorines). Most adult females were reproductively active (Clausen and Andersen, 1988).

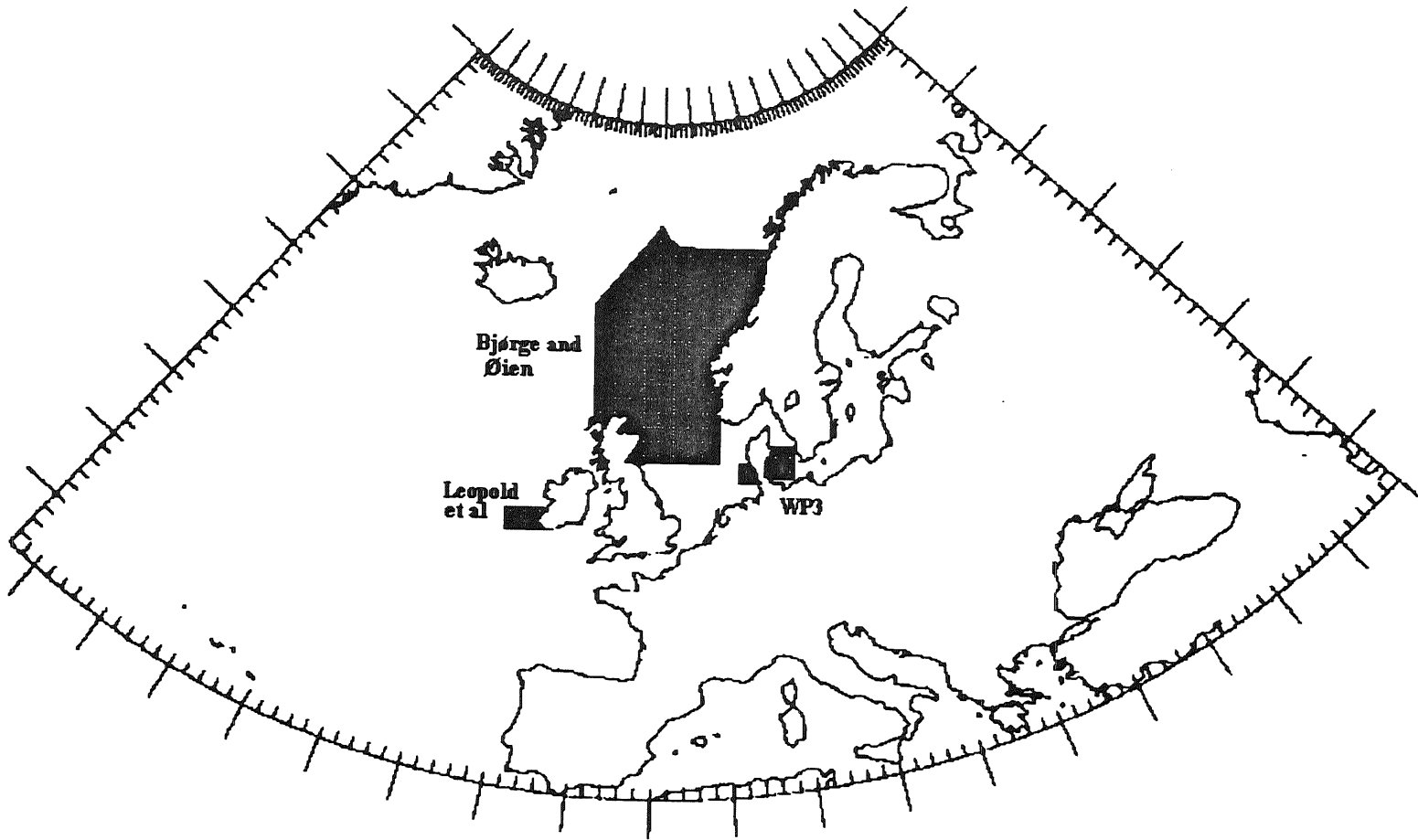
2.2.2 Bottlenose dolphin (*Tursiops truncatus*)

Bottlenose dolphins have been recorded at low density throughout the area covered by the Study Group (see, for example, WP5 and WP6). However, animals are observed year round at a number of sites, notably: the Moray Firth in Scotland; Cardigan Bay in Wales; on the Cornish, Dorset and Hampshire coasts in England; at a number of localities in Ireland; and at localities in Brittany, Normandy, the Bay of Biscay, northern Spain and Portugal. No estimates of the size of these local groups are available, but on-going photo-identification studies in the Moray Firth and Cardigan Bay have provided annual estimates of the minimum number of recognizable individuals. At least 78 individuals have been photographed in the Moray Firth and 84 in Cardigan Bay. Similar studies are planned or underway in Cornwall, Ireland, Portugal and France. Concern has been expressed about high levels of contaminants in some dead dolphins from Cardigan Bay (Morris *et al.*, 1989; Law *et al.*, 1992), the high incidence of skin lesions in the Moray Firth (Thompson and Hammond, 1992), and the effects of increasing boat traffic and disturbance in some areas. However, the impact of these factors on population health is unknown.

2.2.3 Common dolphin (*Delphinus delphis*) and *Lagenorhynchus* spp.

These species are largely offshore but they are sometimes sighted close inshore. Large numbers of common dolphins are known to occur in the southwestern approaches to the Channel, the Bay of Biscay and the Hebrides. WP5 provided estimates of the abundance of *L. acutus* and *L. albirostris* derived from a number of boat surveys in the northern North Sea and Norwegian waters. The population of all dolphin species in the Barents Sea, eastern Norwegian Sea, and North Sea north of 56°N was estimated to be 132,000 (coefficient of variation 27%). More than 100 common dolphins stranded on the southwest coast of England in the winter of 1991/92, many of these appeared to have been entangled in nets. Large numbers of common dolphins have also stranded on the French coast of the Bay of Biscay in 1989, 1990 and 1991. There has been a recent increase in the number of white-sided dolphins stranded on the west coast of Ireland. Some showed signs of net damage and had fresh mackerel in their stomachs, indicating that they may have been entangled in nets (Berrow and Smiddy, 1989; Berrow and Stark, 1990).

Figure 2.2.1 Areas where harbour porpoise surveys have been conducted.



2.2.4 Other species

The Study Group noted that there are a number of sites where *Grampus griseus*, *Orcinus orca* and *Globicephala melas* are sighted regularly, and often throughout the year. This may indicate that there are local populations of these species within its area of interest. There are on-going or proposed studies for some of these groups.

3 INFORMATION ON SMALL CETACEAN ABUNDANCE FROM SURVEYS

The Study Group was provided with information on the SCANS (Small Cetacean Abundance in the North Sea) project. This is a major international survey of small cetaceans in the North Sea planned for 1994 to be carried out in collaboration by Norway, Sweden, Denmark, Germany, the Netherlands, France and the UK. The Commission of the European Communities is providing 50% funding. Two of the primary objectives of this project over the next 12 months will be a review of information available from other surveys and the development of a standard protocol for the proposed surveys. The Study Group welcomed the news that this proposal, which it had strongly supported at its 1992 meeting, had been funded and noted that the activities planned for the coming year would directly address two of its terms of reference. It therefore spent only a short amount of time reviewing these items at this meeting.

3.1 Protocols for Surveys Directed at Small Cetaceans

The Study Group noted that a common methodology for conducting shipboard surveys of small cetaceans had been developed over the last five years. This approach, which is a modification of the methodology developed on sightings cruises in the Southern Ocean, has been developed in the International Whaling Commission as part of its International Decade of Cetacean Research. It was used on the NASS-87 and NASS-89 surveys in the northeast Atlantic, on surveys in Norwegian waters in 1988 and 1990, on surveys for striped dolphins in the western Mediterranean basin in 1991 and in the Ligurian Sea in 1992. It will also be used in a survey off the Bay of Biscay in 1993. All these surveys used a basic line transect approach, with the distance and angle of animals from the trackline being recorded. The vessel then closed with the observed animals to confirm identity and determine school size. A range of additional environmental variables is also recorded. As part of the documentation for the implementation of its Revised Management Procedure, the International Whaling Commission is drawing up Guidelines for Conducting Surveys and Analysis of Data (Hammond and Donovan, 1993).

The Study Group therefore concluded that a well-established and well-documented standardized protocol for conducting surveys of small cetaceans was in existence and that it was being widely used.

3.2 Information from other sources

Information on the distribution and abundance of small cetaceans is also available from a number of sources other than dedicated population surveys. These sources range from anecdotal observations by interested members of the public to systematic sightings collected as part of surveys directed at other species. The Group recognized that data collected in this way could provide reliable indices of abundance or information on temporal or spatial variation in habitat use. More work on methods for analysing such data is required.

The Study Group noted that the quality of data on cetacean sightings which were collected on surveys targeted at other species would depend on the motivation of the observers. For surveys based on visual cues, the most reliable results were likely to come from volunteers, or from surveys directed at species with similar sightings characteristics, such as seabirds. Particularly useful information was likely to come from the Seabirds at Sea teams in the UK, Denmark and the Netherlands. This information came primarily from shipboard surveys, but Denmark and the Netherlands had also conducted aerial surveys. Surveys had been conducted in every month of the year and covered a wide area. The surveys were conducted using a modified strip transect methodology and all cetacean sightings were recorded in a systematic way. The SCANS project intended to compile a summary of these results in order to design the stratification of its own surveys.

The Study Group was informed of work being funded by the International Fund for Animal Welfare to standardize and automate the collection of data on vessels which are not conducting sightings surveys and to develop techniques for surveying using acoustic cues. Some advantages of using acoustic cues are that they can be monitored automatically and that information can be collected through the day and night in a wide range of sea states. It was noted that there were plans for equipment designed to monitor harbour porpoise vocalizations to be installed on a number of the vessels participating in the SCANS surveys and that this would provide a good opportunity of calibrating the results from surveys using this approach.

The Sea Watch Foundation is also collecting information from platforms of opportunity, particularly from boats operating in the Irish Sea and off southwest Britain. Effort data were collected on the basis of distance travelled within individual ICES rectangles. Sea Watch also coordinates data collection from a network of land-

based observers around the British Isles. Some of these make observations on a systematic basis, record the number of hours they spend watching and try to spread their observational effort through the year. The Irish Whale and Dolphin Group coordinates a similar network in Ireland. The Study Group noted that these quantified-effort sites could provide valuable information on changes in the use of particular parts of the coastline. This information could be especially valuable for the implementation of the new European Commission Directive on Habitat Protection. The interpretation of data from sites where effort was not quantified was more problematic, but they could provide general information on distribution particularly for species which were relatively rare in British waters.

4 BY-CATCHES OF MARINE MAMMALS

4.1 By-catch in the Baltic Salmon Fishery

WP1 reported that information on the number of seals which died in fishing gear in the Baltic Sea was routinely provided to the Baltic Marine Environment Protection Commission. All Baltic Sea countries except Russia had provided information on by-catches during the period 1989-1991. More than 150 grey seals and 60 ringed seals were reported to have been found dead. Since these figures almost certainly underestimate the true mortality, the author of WP1 concluded that 15-20% of grey seal pups could die annually in fishing gear. However, no information on the seasonal distribution of this mortality was available to the Study Group so it was unable to amplify the suggestion it made last year that mortality might be reduced by delaying the opening of the salmon drift net fishery.

4.2 Problems in Documenting By-Catch

The Study Group was provided with information on a number of national programmes aimed at documenting the by-catch of small cetaceans in specific fisheries.

4.2.1 Denmark

Three major surveys have been carried out in the last 15 years (see WP8). Between 1980 and 1992 fishermen were paid to bring in the carcasses of animals which were found dead in their nets. Over 500 carcasses were collected in this way. Most animals (c90%) were caught in bottom-set gill nets in the North Sea (ICES Division IVb) or the Kattegat (ICES Division IIIc). There had been no obvious change in the age structure of the catch, in reproductive parameters, or in parasite and contaminant burden. Stranded animals found in the vicinity of the harbours used by fishermen had a similar sex and length structure to the by-caught animals and it was believed that many of these were also by-caught. It

was estimated that 1,000-2,000 porpoises might be by-caught each year. In 1993 the Danish Institute for Fisheries and Marine Research began a more detailed study of the by-catch of birds and marine mammals with financial support from the EC. An observer will participate in 15-20 fishing expeditions of 2-8 days each by selected boats using gill nets. The observer will record how long each boat spends fishing, how many porpoises have been caught and the number that were alive when the net was brought in, the type of gill net used, where the fish were caught, any problems the fishermen had with their gear, and suggestions for reducing the by-catch problem. There are good data on Danish fishing effort using gill nets by ICES rectangle. Approximately half of all the deep-water gill netting carried out by EC registered vessels is performed by Danish boats.

4.2.2 Canada

Problems with and approaches to the by-catch of marine mammals vary regionally within Canada. In Quebec, it was recognized that there was a problem with the by-catch of harbour porpoises in the Gulf of St. Lawrence. Postal surveys of fishermen had achieved a 30% response in the first year, and 17% in the second. The responses indicated a potential annual by-catch of around 2000 animals, primarily in the fisheries for cod, turbot and large flatfish using bottom-set gillnets. This was followed up with a detailed study of 20 fishermen who were paid to complete a data form each time they hauled their net (WP6). Information was recorded on net length and height, mesh size, time set, LORAN coordinates of location, water depth, target species, number of fish and number of marine mammals caught. More than 2,000 data sheets were completed. The majority of porpoises were caught in nets set for cod in water less than 100 fathoms deep; most animals were caught in nets which were set in the shallowest depth class. Stomach content analysis revealed that the majority of these animals had been eating herring and capelin, not the target species of the fishery.

4.2.3 Germany

The University of Kiel and the Meersmuseum, Stralsund pay fishermen to bring the carcasses of by-caught animals back to port, but it is known that not all by-caught animals are returned in this scheme. For the last two years, the Bundesforschungsanstalt für Fischerei has been running a project to investigate by-catches in German fisheries. It will finish in mid-1993. An interview survey of 44 fishermen and 10 fisheries officers conducted between October and December 1992 (WP4) indicated a relatively low by-catch by the German fisheries in the North Sea (30-180 animals/year), since the majority of the German fleet fishing in that area is composed of bottom trawlers. The highest by-catch was recorded for boats operating outside the German Bight.

4.2.4 Spain

For several years, there have been observers on boats in certain fisheries (notably those for tuna and industrial trawlers) who collect information for fisheries management. Some of these have been asked to collect information on by-catch, but this has not been done systematically. However, in January 1993 a project to establish a reporting scheme based on these observers has been started. A new data form (Appendix 5) has been produced and provided to the observers in different fisheries.

4.2.5 United Kingdom

A voluntary scheme for fishermen to report by-catches of small cetaceans to local fisheries officers has been in place for a number of years. New reporting forms for England and Wales have recently been issued to fisheries officers (Appendix 5). So far, the response has been very disappointing and does not reflect known levels of by-catch. Scottish records since 1956 are summarized in WP9; eight by-caught porpoises were reported in 1991 and two in 1992. A report published by the Royal Society for the Protection of Birds (Thomas, 1992) indicates that at least 10 porpoises and three seals were caught in gill and tangle nets set around the Welsh coast in 1991.

Since August 1992 the Cornwall Trust for Nature Conservation has been operating an observer scheme on Cornish gillnetters in conjunction with the local fishermen's federation and with funds from the EC. It is planned to place observers on 50 trips. The information collected is similar to that in the Canadian programme described in Section 4.2.2; declared fish catch will be recorded. Although common dolphin is the species which is most commonly sighted, most of the by-caught animals are harbour porpoises which are caught in 58-75 fathoms.

The Sea Watch Foundation has also organized a voluntary scheme with the Brixham trawler fishermen who send in reports of their own or other vessel's by-catch.

4.2.6 Ireland

There is no official scheme to record by-catch but it is recognized that one will be required. Anecdotal information from the fishing industry suggests that there is probably a substantial by-catch of seals (mostly young grey seals) in the salmon drift net and tangle net fisheries. University College, Cork is now running an observer scheme with EC funding in collaboration with the Cornwall Trust for Nature Conservation. The harbour porpoise is the only by-caught species recorded to date.

4.2.7 Netherlands

A new research programme to document by-catch has been started by the Netherlands Institute for Fisheries Research (WP10). There is some evidence that there may be a significant by-catch by the small Dutch freezer trawler fleet, which uses very large pelagic trawls, especially when they are operating off southwest Ireland and Flamborough Head. An observer has been placed on one of these vessels, but no by-catch has been recorded so far. Arrangements have been made for these vessels to land by-caught animals

4.2.8 France

Extensive studies of the by-catch of dolphins in the albacore fishery offshore from the Bay of Biscay are being conducted (WP7). This fishery has a temporary exemption from the EC restriction on the maximum length of gill nets (currently the fishery is allowed to use nets up to 5 km long so long as these are attached to the vessel and are set at least 2 m below the surface; however, these conditions are not always adhered to) which might be extended if it can be shown that there is no ecological risk.

Approximately one-quarter of all the fisheries operations were sampled. The by-catch for the whole fleet is estimated to be 1900 dolphins per year, with approximately 0.1 dolphins taken per km of net. 75% of the animals were striped dolphins (*Stenella coeruleoalba*) and the remainder were mainly common dolphins. However, common dolphin is the species which was most frequently observed. More than half the animals were less than 130 cm long, indicating that they were less than one year old.

4.2.9 General Conclusions

The reports described above indicate that it is possible to obtain detailed and reliable information on by-catches using an observer scheme. Other schemes, such as postal surveys, voluntary reporting schemes and reporting by untrained observers, are useful for identifying fisheries where there may be a problem with by-catch, but they are unlikely to provide good quantitative information.

4.3 Standardized Protocol

4.3.1 Directed surveys and observer schemes

The Study Group noted that surveys of by-catch could have two purposes: (1) to estimate the scale of the by-catch in a particular fishery; (2) to determine how by-catches might be reduced. It was clear that the schemes currently underway had evolved a similar methodology and protocol. In general, it is necessary to estimate by-catch using some kind of sampling programme. Total by-

catch is then estimated by scaling up the results of the sampling programme. Some measure of fishing effort is required for this scaling-up process and it is important that this is collected and recorded in a consistent way. Although it might well be useful for observers to collect detailed effort statistics, the Study Group recommended that one of the official effort statistics (such as number of hours at sea) which skippers normally reported to fisheries officers should be used for scaling up the survey results.

A wide range of information might be relevant for reducing by-catch. It was important to record where and how gear was set relative to tides, currents and topographic features, and the exact type of gear being used (net length, height, mesh size, material, presence of foot ropes, presence of headline flotation, length of time net fished, etc.). The relative positions of captured cetaceans and fish could also be important for determining why cetaceans became entangled.

4.3.2 Other surveys

The main use of such surveys is to identify fisheries where a by-catch occurs and where it might be a significant problem. It was therefore important to obtain as large a sample size as possible and to make sure that data forms were easy to fill in and required the minimum amount of work by respondents. They should therefore use terminology and units which are familiar to fishermen, and should not require the handling of animals to collect length and identification information. Simple multiple choice questions are recommended for recording identification characters, with only a rough indication of length being required. In many cases it is important that the identity of the vessel involved in the by-catch is not revealed, but it was important to record its location and the type of gear being used as precisely as possible.

Surveys of historical catches were likely to be less reliable than those that attempted to document current catches. Particular problems in the interpretation of historical information on by-catches are described by Lien *et al.* (1990).

4.4 Methods for Reducing or Avoiding By-Catch

The Study Group reiterated the belief expressed at its previous meeting that there was an urgent need to develop methods for reducing by-catch while minimizing the impact on fisheries operations. The studies described in Section 4.2 had indicated that it was possible to collect detailed and reliable statistics on by-catch in certain fisheries using an observer scheme.

The Study Group noted that the International Whaling Commission (IWC) had organized a Workshop on Mortality of Cetaceans in Passive Fishing Nets and Traps

in October 1990. At this Workshop there had been an extensive review of the methods which were available to reduce or avoid by-catch, and the effectiveness of these methods. The Study Group restricted itself to an analysis of the progress which had been made in the Northeast Atlantic.

The basic problem is to reduce the probability that marine mammals will come into direct contact with fishing nets. This can be achieved by modifying gear so that it is more easily detected by marine mammals, or by modifying the way that gear is deployed so that it is not used at times or in localities where there is a high risk of a by-catch. The collection of the information described in Section 4.3 would help to identify areas and times where by-catches were most likely to occur and could be used to provide advice on ways to reduce by-catch. The IWC Workshop had concluded that the fisheries management techniques for dealing with the incidental take of cetaceans which were most promising at that time were time/area restrictions and area closures.

Some progress has been made in the development of modifications which would make gear easier to detect by small cetaceans (Klinowska *et al.*, 1992). Passive acoustic reflectors which could be detected at a range of 70-80 m had been attached to vertical ropes and suspended on a route which was regularly used by bottlenose dolphins in the Moray Firth. In general, animals had avoided these ropes. The Study Group noted that there were plans to carry out a critical test of this approach, comparing by-catches of animals in nets with and without reflectors, in the well-studied French albacore fishery (see Section 4.2.8) during the 1993 season, but funds had not been found for this. There had also been a proposal to develop active acoustic and visual techniques to reduce the by-catch of small cetaceans in the Dutch pelagic trawl fishery.

5 PURPOSE AND TIMING OF FUTURE MEETINGS

The Study Group recommended that it should meet again in Cambridge in the week of 28 February-4 March 1994 to:

1. Carry out a comprehensive review of the current and historical size of marine mammal populations within its area, and the methods used to estimate them, and to develop a standardized format for presenting this information.
2. Assess the relative importance of factors (such as disturbance, pollution, disease, food availability, by-catches and strandings) which were believed to have an effect upon survival and reproduction in marine mammal

populations, and to identify what research was necessary to clarify and quantify these effects.

6 RECOMMENDATIONS

The Study Group recommended that:

1. The observer schemes to document by-catches which were described in Section 4.2 should be continued and that similar methods should be used to document the by-catch in specific fisheries using actively fished gear. These fisheries could be identified using the approach described in Section 4.3.
2. The area to be considered by the Study Group should be extended to cover all of the coastal waters of the Northeast Atlantic and the ICES Fishing Areas where there were likely to be by-catches which could affect these coastal populations. In practice, this would mean including the following ICES Areas: VIb; VIIc and k; VIIIc, d and e; IXa and b; and the coasts of the Azores archipelago.

7 ANY OTHER BUSINESS

The Study Group expressed its thanks to the Director of the British Antarctic Survey for allowing the meeting to make use of the Survey's conference facilities.

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APPENDIX 1

ICES STUDY GROUP ON SEALS AND SMALL CETACEANS IN EUROPEAN SEAS

Cambridge, England, 31-2 April 1993

TERMS OF REFERENCE

- C.Res.1992/2:32 The Study Group on Seals and Small Cetaceans in European Seas (Chairman: Dr J. Harwood, UK) will meet in Cambridge, England, UK from 29 March-2 April 1993 to:
- a) collate survey and sighting data and update information on the status of seals and small cetaceans in its area of responsibility;
 - b) identify the problems related to obtaining reliable by-catch statistics for marine mammals from different fisheries and develop relevant standard protocols with associated reporting formats for use in these fisheries;
 - c) provide information on the by-catches of marine mammals in the Baltic salmon drift-net fishery in the Baltic Sea;
 - d) review information on small cetacean abundance from surveys directed at other target species, and develop a protocol for the systematic collection of cetacean sightings on such surveys;
 - e) study the means of reducing or avoiding the capture of small cetaceans in fishing nets.

Fish capture specialists are invited to participate in this meeting.

APPENDIX 2

ICES STUDY GROUP ON SEALS AND SMALL CETACEANS IN EUROPEAN SEAS

Cambridge, England, 31 March-2 April 1993

AGENDA

1. Introductory remarks.
2. Current status of European seal stocks.
3. Current status of European cetacean stocks.
4. Information on small cetacean abundance from surveys.
 - 4.1 Information from surveys with other target species.
 - 4.2 Survey protocol.
5. By-catches of marine mammals.
 - 5.1 By-catch in the Baltic salmon fishery.
 - 5.2 Problems in documenting by-catch.
 - 5.3 Standardised protocol.
 - 5.4 Methods for reducing or avoiding by-catch.
6. Any other business.
7. Adoption of report.

APPENDIX 3

STUDY GROUP ON SEALS AND SMALL CETACEANS IN EUROPEAN SEAS

Cambridge, England, 31 March-2 April 1993

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APPENDIX 4

STUDY GROUP ON SEALS AND SMALL CETACEANS IN EUROPEAN SEAS

Cambridge, England, 31 March-2 April 1993

WORKING PAPERS SUBMITTED TO THE MEETING

- WP1** HELLE, E. Population size and by-catches of the grey and ringed seal in the Baltic sea.
- WP2** ANON. Joint conservation and management plan for the Wadden Sea seal population.
- WP3** HEIDE-JØRGENSEN, M-P, J. TEILMANN, H. BENKE and J. WULF Abundance and distribution of harbour porpoises (*Phocoena phocoena*) in selected areas of the western Baltic and the North Sea.
- WP4** MORENO, P. A first approach to the interactions of the German fisheries with small cetaceans in the North Sea.
- WP5** ØIEN, N. A note on *Lagenorhynchus* species in Norwegian waters.
- WP6** LARRIVEE, M-L., M.C.S. KINGSLEY and C. BARRETTE Les prises accidentelles du marsouin commun dans le Golfe St-Laurent par rapport au type de pêche, l'effort de pêche, et la profondeur.
- WP7** COLLET, A., M. GOUJON and L. ANTOINE 1992 GERDAU report: program report on the French tuna fishery in the northeast Atlantic.
- WP8** CLAUSEN, B. and E. HOFFMANN, Danish activities concerning by-catch of harbour porpoises.
- WP9** HISLOP, J. Incidental catches of cetaceans by Scottish fisheries.
- WP10** HEESSEN, H. and P.J. H. REIJNDERS By-catch of marine mammals by the Dutch fleet.

APPENDIX 5

FORMS USED FOR DOCUMENTING BY-CATCHES IN FRANCE, SPAIN AND THE UK

INFORMATIONS SUR LA MAREE

Information on the trip

| | | | | |
|------------------|-------|-----------------------------------|--------|------------|
| MAREE N° | _____ | NOM DE L'OBSERVATEUR SCIENTIFIQUE | | _____ |
| | | Nom | Prénom | |
| NOM DU BATEAU | _____ | PAYS | _____ | TYPE _____ |
| NOM DU CAPITAINE | _____ | _____ | | |
| | | Nom | Prénom | |

INFORMATIONS SUR LE NAVIRE

| | | | | | |
|-----------------------------|--------------------------|-------------|--------------------------|-----|--------------------------|
| EQUIPAGE | _____ | | | | |
| PUISSANCE DU MOTEUR (en kW) | _____ | | | | |
| CAPACITE TOTALE | _____ | NETTE | _____ | | |
| SYSTEME DE NAVIGATION | _____ | | | | |
| SONAR | <input type="checkbox"/> | THERMOMETRE | <input type="checkbox"/> | FAX | <input type="checkbox"/> |
| OBSERVATIONS | _____ | | | | |
| | _____ | | | | |

INFORMATIONS SUR LE FILET

| | | | | |
|-----------------------------|-------|--------------------------|-----------|--------------------------|
| TYPE DE FILAMENT | multi | <input type="checkbox"/> | multimono | <input type="checkbox"/> |
| TAILLE DES MAILLES (en mm) | _____ | | | |
| COULEUR(S) DU FILET | _____ | | | |
| NOMBRE DE LIGNES TRAINANTES | _____ | | | |

Global information on total captures for each operation

CRO

Marée n° _____

Opération n° _____

Date: _____

Filage: Début _____ Fin _____ Durée _____

Problèmes _____

Virage: Début _____ Fin _____ Durée _____

Problèmes _____

| Captures de thons : | |
|---------------------|---------------------|
| Germons | gardés: rejetés: |
| Thons rouges | |
| Listaos | |
| Autres thons | |

| Captures accessoires (sauf cétacés) : | |
|---------------------------------------|--|
| Hirondelles | |
| Cerniers | |
| Espadons | |
| Poissons lunes | |
| Balistes | |
| Poissons pilotes | |
| Orphies | |
| Calmars | |
| Autres | |

| Captures de requins : | |
|-----------------------|--|
| R P B ♂ | |
| R P B ♀ | |
| TAU | |
| Autres requins | |

| Captures de cétacés : | | | | | | | | | | | |
|-----------------------|-------|--------|--------|----|------|--------|-------|--------|--------|----|------|
| Marque | Heure | RID n° | Espèce | L1 | avec | Marque | Heure | RID n° | Espèce | L1 | avec |
| | _____ | ____ | | | | | _____ | ____ | | | |
| | _____ | ____ | | | | | _____ | ____ | | | |
| | _____ | ____ | | | | | _____ | ____ | | | |
| | _____ | ____ | | | | | _____ | ____ | | | |
| | _____ | ____ | | | | | _____ | ____ | | | |

Données vérifiées

information en tout dauphin capturé

RID

Marée n° _____

Opération n° _____

Relevé n° _____

Etat du dauphin:

vivant
mort

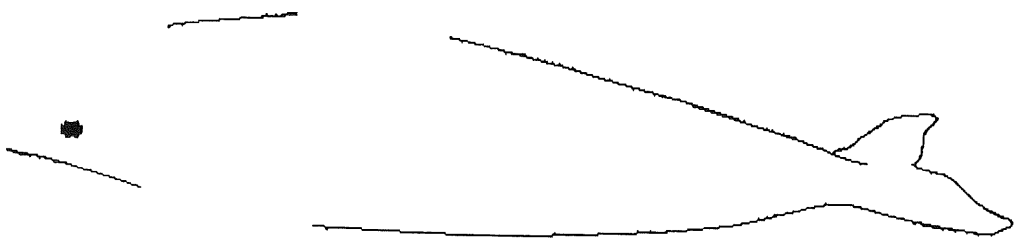
blessures
morsures
nécroses

Description de l'état du dauphin: _____

Associé avec: _____

Remarques, photo: _____

Caractéristiques / identification :



Sexe male
femelle
?

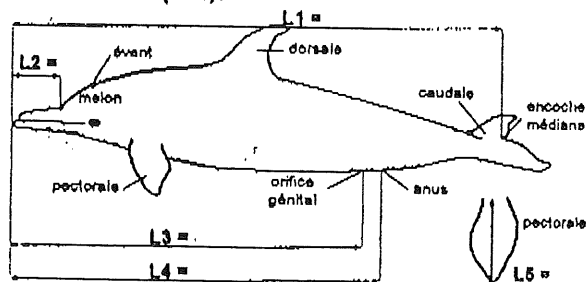
gestante
lactante
normale

taille du fœtus (en cm) _____

Espèce _____

Trait(s) caractéristique(s) utilisé(s) pour l'identification: _____

Dimensions (cm):



Prélèvements

N° 9,3

n° marée n° RID

Dents formol D

Ovaires formol OD

OG

Testicules formol TD

L = _____

TG

L = _____

Estomac congelé S

Peau alcool P

Parasites alcool R

Données vérifiées:



information on fact witness sighting

FOC

Marée n° _____

Observation n° _____

Conditions d'observation:

Date _____ Heure _____ Beaufort _____ Couverture nuageuse _____

Position du navire lat _____ lon _____

Durée de l'observation (min) _____ Distance minimale d'observation (mètres) _____

Structure de groupe:

Individu isolé

en groupe compact

dispersé

Effectif:

Estimation du nombre d'individus

minimal

1ère espèce

2ème espèce

maximal

Jeunes: présents

meilleur

absents

?

Espèce:

Espèce(s) _____

Critères de reconnaissance _____

Comportement:

Stationnaire

Nage lente

Nage rapide

Direction suivie _____

Sautant hors de l'eau

Jouant à l'étrave

Se nourrissant

Autre comportement

Observations sur le comportement _____

Observations complémentaires:

Autres espèces présentes _____

Divers _____

Données vérifiées:

information on tuna measured

REG

Marée n° _____

Opération n° _____

Nombre total capturés _____

Nombre total mesurés _____

Distribution des tailles :

| 40 | 70 | 100 |
|----|----|-----|
| .1 | .1 | .1 |
| .2 | .2 | .2 |
| .3 | .3 | .3 |
| .4 | .4 | .4 |
| .5 | .5 | .5 |
| .6 | .6 | .6 |
| .7 | .7 | .7 |
| .8 | .8 | .8 |
| .9 | .9 | .9 |
| 60 | 80 | 110 |
| .1 | .1 | .1 |
| .2 | .2 | .2 |
| .3 | .3 | .3 |
| .4 | .4 | .4 |
| .5 | .5 | .5 |
| .6 | .6 | .6 |
| .7 | .7 | .7 |
| .8 | .8 | .8 |
| .9 | .9 | .9 |
| 60 | 90 | 120 |
| .1 | .1 | .. |
| .2 | .2 | .. |
| .3 | .3 | .. |
| .4 | .4 | .. |
| .5 | .5 | .. |
| .6 | .6 | .. |
| .7 | .7 | .. |
| .8 | .8 | .. |
| .9 | .9 | .. |

Données vérifiées :

Données saisies par

Information on "Cerniers & espadons" measured

REP

**Récapitulatif de marée
Cerniers et espadons**

Marée n° _____

| | | | |
|-----------------------------|----------------------------|--------------------|-------------------|
| Cerniers : | Opération n° | Nb capturés | Nb mesurés |
| Nombre total capturés _____ | | | |
| Nombre total mesurés _____ | | | |
| Espadons | | | |
| Nombre total capturés _____ | Nombre total mesurés _____ | | |

| Distribution des tailles : | | Cerniers | Espadons |
|----------------------------|----|----------|----------|
| | 50 | | |
| | .1 | | |
| | .2 | | |
| | .3 | | |
| | .4 | | |
| 35 | .5 | | |
| .6 | .6 | | |
| .7 | .7 | | |
| .8 | .8 | | |
| .9 | .9 | | |
| 40 | 60 | | |
| .1 | | | |
| .2 | | | |
| .3 | | | |
| .4 | | | |
| .5 | | | |
| .6 | | | |
| .7 | | | |
| .8 | | | |
| .9 | | | |

REGISTRO DE CAPTURAS ACCIDENTALES

BARCO _____ PESQUERIA _____
 OBSERVADOR _____ FECHA _____ N° DE LANCE _____

DATOS DE LOS CETACEOS CAPTURADOS

| Especie | N° Ejemp. | Vivos | Muertos | Liberados | En putref. |
|---------|-----------|-------|---------|-----------|------------|
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |

DATOS DE OTRAS ESPECIES (FOCAS, AVES, TORTUGAS)

| Especie | N° Ejemp. | Vivos | Heridos | Muertos | Liberados |
|---------|-----------|-------|---------|---------|-----------|
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |

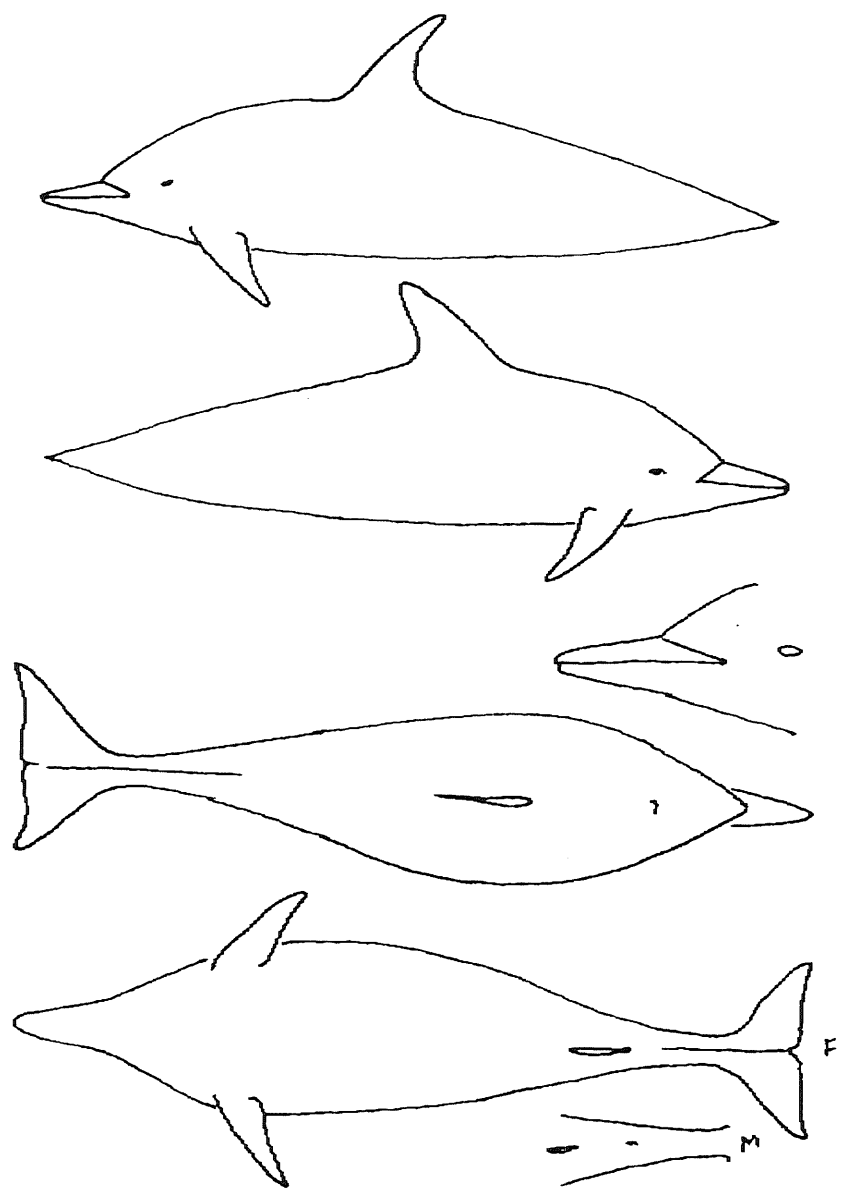
LONGITUD Y SEXO _____ / _____ / _____ BIOMETRIA N° _____
 FOTOS _____ N° CARRETE _____ N° FOTOS _____

OBSERVACIONES (Cómo se produjo la captura y la suelta, si tuvo lugar)

CFPO - CTNC DOLPHIN OBSERVER PROGRAMME - CETACEAN BY-CATCH RECORD

T: 0736 753467

From: DOCTORS BUCKRIGG HEALTH CENTRE HAYLE



The drawings are for the wrong species because the programme was set up in response to Delphinus deaths.

| | |
|---|--------------|
| DATE | HAUL TIME |
| LAT | LONG |
| DEPTH | |
| SPECIES | DEAD? |
| SEX | LENGTH |
| NET MESH | SET ON WRECK |
| POSITION IN NET & DETAILS OF ENTANGLEMENT | |
| DROPOUT? | SHAKEOUT? |
| FLOATER? | |
| PHOTOS | |
| RIGHT DORSAL | LEFT VENTRAL |
| RETAINED? | TAG NUMBER |
| FLOATED AFTER DISCARDING? | |
| NOTES - | |

DATE DAWN AT DUSK AT BOAT OBSERVER

SEASTATE

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|----|----|------|---|---|---|---|---|---|---|---|---|----|--|
| | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | noon | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |

SEAWATCH SPEED

| | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |

LAT.(N)
LONG.(W)

SHOOTING
HAILING

x

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|----|----|------|---|---|---|---|---|---|---|---|---|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | noon | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|----|----|------|---|---|---|---|---|---|---|---|---|----|

LENGTH
SHOT

MESH

TYPE

HEADING

CET. CODE

| | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |

NOTES CATCH * BY-CATCH * BIRDS * PROXIMITY OF OTHER BOATS * REPORTS FROM OTHER BOATS

- Cornish team for hauling

Data required for cetacean by-catch assessment by observer programmes.

These are roughly prioritised under each heading and mainly refer to gillnet fisheries.

Fishing data

~ days at sea, days fishing, dates.

for the nets -

~ location, depth (can be added later).

~ net length, height, mesh size, material (mono/multifilament etc.) presence of false foot rope and length of legs, presence of headline flotation (used, but not reported, in tangle nets in the Canadian study, but not used in Irish or Cornish tangle nets and potentially very significant)

~ time, soak time, date.

~ orientation of net in relation to tide (usually parallel for our fishery)

Boat data

~ length (but gross registered tonnage sounds like the thing we should be using)

By-catch data - this will always be incomplete due to high drop-out rates. The presence and position of the observer throughout the haul needs to be assessed.

~ number, location, date of cetaceans caught.

~ dead or alive.

~ time of haul.

~ species, size, sex.

We are also trying to record

~ patterns of injury (to help interpret strandings)

~ whether they float or not.

~ other by-caught species.

Catch data

~ target species

~ declared or official catch (This may be obtained later. Locations are no problem for our gill netters as they are not subject to any zonal restrictions. Mackerel trawlers invading the mackerel box could be identified from the declared catch and might wish to distort positions that could be associated with them through this identifier. Refusal to give positions seems unlikely as it is tantamount to admitting illegality.)

~ (actual catch - interesting, but not useful for scaling. Explosive in daylight. Unwise to try for this one!)



Ministry of Agriculture, Fisheries and Food
 Fisheries Division III, Branch C, Nobel House,
 17 Smith Square, London SW1P 3JR
 Enquiries: 071-238 5923. Switchboard: 071-238 3000

IMPORTANT
 Please return the completed
 form to your:
LOCAL FISHERIES OFFICE.

MAFF Voluntary Scheme:

Incidental catches of marine mammals

1. Date of capture and time

2. Species taken:

| Species | No. caught | Approximate size | No. drowned | No. alive | No. returned to sea | No. retained on board |
|-----------------------|------------|------------------|-------------|-----------|---------------------|-----------------------|
| Common dolphin | | | | | | |
| Bottle-nosed dolphin | | | | | | |
| Common porpoise | | | | | | |
| White-sided dolphin | | | | | | |
| White-beaked dolphin | | | | | | |
| Risso's dolphin | | | | | | |
| Euphosyne dolphin | | | | | | |
| Other (specify) _____ | | | | | | |
| _____ | | | | | | |
| _____ | | | | | | |
| _____ | | | | | | |
| Common seal | | | | | | |
| Grey seal | | | | | | |

For MAFF
Use Only

3. Type of gear: Tick appropriate box(es)

- fixed netting: gill nets - monofilament gill nets - multifilament trammel/tangle nets
- drift nets
- purse seines
- trawls: bottom/demersal mid-water/pelagic

4. Location of capture (specify either co-ordinates or ICES rectangle)

5. Climatic conditions

6. (a) Name of vessel

(b) Registration number