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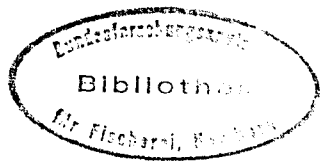

REPORT OF THE STUDY GROUP ON SEALS AND SMALL CETACEANS IN NORTHERN EUROPEAN SEAS

Texel, 12-15 March 1991

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ICES STUDY GROUP ON SEALS AND SMALL CETACEANS IN NORTHERN EUROPEAN SEAS

Texel, The Netherlands 12-14 March 1991

1. INTRODUCTION

The Study Group met from 12-14 March 1991 at the Research Institute for Nature Management in Texel, The Netherlands under the chairmanship of Dr J. Harwood. A list of participants is given in Appendix 1, and of working papers in Appendix 2. The Agenda shown in Appendix 3 was adopted.

The Study Group's terms of reference were to:

a. Assess the current and future status of seal and coastal dolphin (particularly *Phocoena phocoena* and *Tursiops truncatus*) populations in the North Sea, Baltic Sea, and other north European waters, including population size and trends, movements, and diet;

b. Evaluate the importance of environmental factors, particularly pathogens, contaminants, fishing activities and disturbance, on the status of these populations;

c. Advise on appropriate research techniques for the study of these factors and on methods for selecting, collecting and archiving data and samples;

d. Advise on the types of management action which may be necessary to ensure the continued health of populations whose status is satisfactory and improve the status of those which are considered to be vulnerable; and

e. Report its findings to the Marine Mammals Committee, ACFM, ACMP, and the Chairman of the Multispecies Assessment Working Group.

The Study Group agreed that the term "Northern European Seas" implied a wider area than that covered by the recently negotiated Draft Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas. That area is bounded in the west by longitude 5°W, and in the north by latitude 62°N, i.e., it excludes the west coast of Britain, the coasts of the Irish Republic, the Færoe Islands and some of the Norwegian coast. The Study Group agreed that "Northern European Seas" should be taken to cover the English Channel, the Baltic, North and Irish Seas; the Celtic, Hebridean and Færoes Shelves; and the coastal waters of the Norwegian mainland. That is the ICES statistical squares shown in Figure 1.

It noted that pilot whales (*Globicephala melas*) in this area were covered by the Study Group on Pilot Whales, and harp seals (*Phoca groenlandica*) and hooded seals (*Cystophora cristata*) by the joint ICES/NAFO Working Group on Harp and Hooded Seals. The effect of fishing activities on the food supply for marine mammals (see Agenda item 4.2) was a topic for the Study Group on the Ecosystem Effects of Fishing Activities. The Study Group did not, therefore, consider these species or this topic in its discussions.

2. CURRENT STATUS OF POPULATIONS

2.1 The Common Seal (*Phoca vitulina*)

2.1.1 Numbers

Current estimates of minimum population size in the different countries were reviewed.
In Britain the population is estimated to be at least 22,000. There has been no measurable increase in numbers since 1988. The population on the east coast of England was increasing at about 3½% per annum until 1988 (WP 1).

The results of surveys conducted in the Wadden Sea in July 1990 were:

Denmark	1,050
Schleswig-Holstein	1,975
Niedersachsen	1,620
The Netherlands	565
Total	5,210

These results are 15% higher than those from surveys conducted in 1989, however, the majority of this increase is due to a large recovery in pup production (which was very low in 1989). If the effect of pup production is removed, the increase from 1989 is about 5%.

Outside the Wadden Sea, the Danish population in Limfjorden was estimated to be 498 on the basis of six aerial surveys carried out in August 1990.

In the Kattegat and Skagerrak, the population was estimated to be 3,074 in 1990. This is not significantly different from the results of 1988 and 1989 surveys (WP 2). The number of seals in the Baltic proper was estimated to be 260.

Recent surveys of common seals in Norway have limited coverage. Based on a review of recent and historical records, Bjørge (in press) estimated a total population of 3,600.

The total common seal population in the area considered by the Study Group is, therefore, believed to be at least 35,000 animals.

Demographic characteristics of European common seal populations are now much better known following the analysis of material collected during the 1988 epizootic (Härkönen and Heide-Jørgensen, 1990). The Study Group agreed that it was important to monitor pup production as well as total numbers in order to measure productivity. Pups could be reliably identified in aerial surveys up to four weeks after the peak in pupping. This peak usually occurred in late June, but was known to vary seasonally and geographically.

2.1.2 Movements

Young common seals were known to disperse widely (e.g., from the Orkney islands to the Moray Firth, Shetland and Norway; and from the Wash to the Wadden Sea). Radio telemetry has indicated that adult animals were more faithful to particular haul out sites, but often travelled 10-15 km out to sea. Seals from the Wadden Sea were known to travel to the North Sea.

2.1.3 Diet

The diet of common seals is known to vary in space and time, and appears to be influenced by prey availability. For example, common seals in the Inner Moray Firth preyed heavily on overwintering clupeoids in 1988/1989 (Thompson *et al.*, 1991). During periods of lower clupeoid abundance in 1989/1990 seals foraged further out to sea and took alternative prey, such as gadoids and sandeels. The implications of these changes in diet for the seals' condition and

survival are not known. However, an invasion of large numbers of small saithe into the Skagerrak in 1990 led to a change in common seal diet and a significant increase in the weight of 4-5 month old pups (WP 3).

2.2 Ringed seal (*P. hispida*)

2.2.1 Numbers

Aerial surveys carried out in the Bothnian Bay in 1990 provided an estimate of 2,500 basking seals in the area (Härkönen and Lunneryd, in press). The population has been stable at this level since 1975. Ringed seals are also known to pup in the Bay of Finland and the Bay of Riga. Plans for integrated surveys of the entire area are under discussion. The total ringed seal population in the Baltic is estimated to be ca. 5,000 animals. The incidence of uterine occlusions, which render animals sterile, appears to be at about the same level as has been recorded in the past, but recent sample sizes are small.

Elsewhere in the area covered by the Study Group, ringed seals only occur as vagrants.

2.2.2 Movements

Ringed seals are known to make seasonal movements within the Baltic proper, but they have not been recorded in the Kattegat. Numbers of ringed seals are sometimes found along the Norwegian coast, possibly as a result of changes in ice distribution and food availability in more northern areas. Two or three ringed seals are found on the Dutch coast each year and taken to the Seal Rehabilitation and Rescue Centre at Pieterburen.

2.2.3 Diet

The highest densities of basking ringed seals are found on ice over 70 m of water (Härkönen and Lunneryd, in press), which may be linked to foraging on benthic crustaceans. Ringed seals are also known to feed on pelagic crustaceans, herring, bullhead and cod.

2.3 Grey seal (*Halichoerus grypus*)

2.3.1 Numbers

The British population was estimated to be 86,000 animals in 1989. The Scottish component of the population has been increasing steadily by about 4.7% per annum (WP1). However, there was a drop in pup production in 1988, particularly in the Orkney islands (Harwood *et al.*, 1991).

In the Baltic, there had been an increase in sightings of grey seals in the Bothnian Bay, but a decline in sightings further south. This was believed to be the result of changes in the distribution of ice suitable for whelping. The Swedish population was estimated to be 1,700 and the Baltic population to be 3,500. Six hundred grey seal pups had been counted in the Gulf of Finland in 1989, which suggested that this latter estimate might be biassed downwards. There had been sightings of 5 grey seals and two strandings from the German Baltic coast in 1990.

One pup had been observed in 1990 amongst the small group of ca. 25 grey seals in the Kattegat.

The Norwegian population was estimated to be at least 3,100 animals (Wiig, 1987). The increase in the population of Froan appears to have slowed down.

Two groups of grey seals are regularly observed in the Wadden Sea, one of ca. 70 animals in Schleswig-Holstein, and one of ca. 90 animals in the Dutch Wadden Sea. At least 7 pups were observed in this latter group during the 1990/91 pupping season.

No new information was available on the Færoese and French grey seal populations.

2.3.2 Movements

Radio-tracking studies have shown that adult grey seals regularly travel distances of 250 km between haul out sites, and more than 50 km out to sea, apparently to feed (McConnell *et al.*, in press). There is, therefore, no simple relationship between the distribution of grey seal feeding activities and the location of their pupping and haul out sites.

2.3.3 Diet

The diet of grey seals is known to vary in space and time, presumably in relationship to the local abundance of prey. Locally, they may cause significant mortality on particular year-classes of fish.

2.4 Harbour porpoise (*Phocoena phocoena*)

2.4.1 Numbers

The only published estimates of porpoise abundance in the area covered by the Study Group are those made on the basis of sightings collected from Norwegian vessels during the Norwegian Sighting Survey of 1988, and North Atlantic Sightings Survey of 1989 (Bjørge and Øien, 1990). Although these surveys were targetted at minke whale (*Balaenoptera acutorostrata*), the analysis of the porpoise sightings used standard methodology developed by the International Whaling Commission over the last decade. Porpoise abundance in the northern North Sea was estimated to be 82,600 (coefficient of variation 0.2381); in the area from Lofoten to the Barents Sea, it was estimated at 11,000 (c.v. 0.4435). Reports of the porpoise by-catch in the Norwegian salmon driftnet fishery show a similar distribution when corrected for differences in effort.

There is anecdotal evidence of a substantial decrease in the frequency with which porpoises are sighted throughout the area covered by the Study Group.

Despite fears that the porpoise has virtually disappeared from the Baltic, there are still regular reports of stranded and bycaught animals from Sweden and Norway (Lindstedt, 1990), Germany (Benke *et al.*, 1991), and Poland (Malinga and Skóra, 1991). However, strandings in Poland have declined by 90% in the last 20 years. There is believed to be a calving aggregation of porpoises in the southwestern Belt Sea (Kinze, 1990), and this area will be covered by an aerial survey in 1991. Data on changes in sighting frequency from land (e.g., Berggren and Pettersson, 1990) must be interpreted with caution as they may be the results of changes in distribution rather than abundance.

In the North Sea, porpoises are regularly sighted off the Netherlands coast during aerial surveys for seabirds. During 1990, porpoises were seen within the Wadden Sea for the first time in more than 20 years. Porpoises are also sighted regularly off the German island of Sylt particularly in November. There has been an apparent increase in the frequency of sightings over the last 2-3 years, but this may be the result of an increase in effort. Quantified effort surveys are now being carried out along the entire coast of the island on a regular basis. Three hundred and fifty porpoises were counted off the southwest of Ireland in 1990 during Dutch aerial surveys for seabirds (Leopold, pers. comm.).

General information suggests that the harbour porpoise is a shallow water animal, normally occurring in shelf seas. The North Sea is probably the most important area for this species in the northeast Atlantic. Although it still appears to be abundant in the central and northern North Sea, there is evidence of a marked decline in near and inshore waters.

2.4.2 Movements

Historically, large numbers of porpoises used to move into and out of the Baltic Sea via the Belt Sea, where there was a large-scale drive and net fishery for more than 400 years. The scale of this movement has been reduced dramatically in recent years. Other than this, little is known about the movements of harbour porpoises, although Evans (1990) has suggested an association between porpoise concentrations and herring spawning sites.

2.4.3 Diet

Porpoises are known to prey on a wide range of pelagic and demersal fish, and cephalopods. Recent studies (e.g.,

Martin *et al.*, 1990) have indicated that demersal and deep water fish may be more important than the published record suggests. Further studies on diet now in progress throughout the area covered by the Study Group should substantially increase knowledge of the diet of this species over the next 2 years.

2.4.4 General biology

Age at sexual maturity is estimated at 3 years for males and 3-4 years for females from by-caught animals. Life expectancy is 13-15 years, although two 18-year-old animals have been recorded in Germany. Calving is believed to occur in June, based on the presence of near-term foetuses in by-caught animals, sightings of apparently new-born animals at this time of year, and the capture of calves in the Norwegian salmon gill net fishery in June and July.

2.5 Bottlenose dolphin (*Tursiops truncatus*)

2.5.1 Numbers

Two resident populations of bottlenose dolphins in the UK are being studied using photoidentification. The population in the Moray Firth, Scotland has been estimated at a minimum of 62 animals from shore counts (Hammond and Thompson, 1991), and there are 90-95 animals in the catalogue of recognizable individuals. At least 58 individuals have been recognized in the population which inhabits Cardigan Bay, Wales (Mayer *et al.*, 1991). Resident populations of *T. truncatus* are also known to occur in Brittany and southern Ireland. There is some evidence (Treganza, in press) that bottlenose dolphins numbers and group size have declined in southwest England over the last 30 years.

T. truncatus was a common species in the Netherlands until the early 1960s, although there was a substantial decline in numbers after the 1940s. Until 1990 it was rarely seen, but 29 individuals (including 9 calves) in seven groups were observed during aerial surveys in the Dutch sector of the North Sea during 1990.

2.5.2 Movements

Elsewhere in its range, *T. truncatus* is known to occur in an offshore form, which is found in big groups which move over a wide area, and an inshore form whose groups are resident within a relatively well-defined area. It is not known whether both these forms occur in northern European seas. Bottlenose dolphins are rarely observed outside the areas occupied by the two resident populations in the UK, but this may be a consequence of lack of sightings effort in other suitable locations.

2.5.3 Diet

The diet of bottlenose dolphins is known to include salmonids, squid, herring and sprat.

2.6 Other species

Lagenorhynchus albirostris is probably the most frequently observed dolphin in the North Sea. No estimates of abundance have been calculated, although sightings made on the NASS 1989 survey could be used for this purpose. This species has been sighted more frequently in Dutch and German waters in recent years. Groups of up to 500 animals have been sighted during Dutch aerial surveys for seabirds.

Orcinus orca occurs throughout the region. Summaries of sightings in the eastern North Atlantic can be found in Hammond and Lockyer (1988); data from Norwegian catches and incidental sightings are described in Øien (1988). Studies using individual recognition at two sites in Norway have built up catalogues of 32 individuals (Bisther and Vongraven, 1991) and 200 individuals (Similä and Ugarte, 1991). Large groups are seen in the Skagerrak, especially in June and July, and 19 individuals have been photographed for individual recognition. Norwegian animals are known to feed on herring and have been observed to feed on seals.

A long-term photoidentification study of *Grampus griseus* is being carried out in the Minch area between the west coast of Scotland and the Western Isles.

3. ENVIRONMENTAL FACTORS

3.1 Contaminants

3.1.1 Heavy metals

Marine mammals with very high levels of trace metals (in excess of 400 mg kg^{-1} of mercury and cadmium) have been recorded (see review by Wagemann and Muir, 1984). However, such levels have been recorded from remote areas where the metals could not have an anthropogenic source. Although there have been a few cases where marine mammals have received chronically high levels of trace metals and subsequently died, the Study Group concluded that, in general, these contaminants were not a particular threat for marine mammals.

3.1.2 Organochlorines

Marine mammal tissue, particularly blubber, often contains high levels of organochlorine contaminants (OCs), some of which are known to be highly toxic. However, it has been extremely difficult to demonstrate the harmful effects of these compounds from correlative studies. The Study Group concurred with the conclusion of the Joint Meeting of the Working Group on Baltic Seals and the Study Group on the Effects of Contaminants on Marine Mammals (ICES C.M. 1990/N:14) that seals in the Baltic and some parts of the North Sea carried levels of OCs which were likely to affect their reproductive ability and possibly their resistance to disease. Additional indications of immunosuppressive effects had come from studies of bone lesions and decalcification in material from common seals in the Wadden Sea (Stede and Stede, 1990) and in seals aged >5 years from the Baltic (Olsson *et al.*, in prep.). Seals collected in the Baltic during 1988 had a significantly higher frequency of lesions than those collected between 1835 and 1935. The bone lesions were considered by pathologists to be indicative of hormonal imbalance. A high frequency of skull abnormalities has also been observed in Baltic seals (Zhakarov and Yablokov, 1990). There is thus circumstantial evidence for an effect of OCs on immune system function from experimental studies of vitamin A and thyroid functioning in captive seals fed fish with high PCB levels (Brouwer *et al.*, 1989) and from observations of a high frequency of adreno-cortical hyperplasia (Bergman and Olsson, 1985) and bone lesions in Baltic seals.

Evidence for effects from the high OC levels that are often found in small cetacean tissue is less convincing. Adrenocortical hyperplasia has recently been reported from two *P. phocoena* from the North Sea (Joiris *et al.*, 1991), but OC levels were not presented. The high incidence of tumours in belugas from the St. Lawrence River, Canada (Martineau *et al.*, 1988; but see Geraci *et al.*, 1988) has been attributed to the high levels of OCs and polycyclic aromatic hydrocarbons in their tissue and environment. However, the results are still not conclusive. The fact that some cetacean species lack enzymes for metabolizing PCBs (Tanabe *et al.*, 1988) may not make them more vulnerable to the effects of these compounds, as has sometimes been suggested, since PCB metabolites are often more toxic than the parent PCBs. There is enough consistency in analytical techniques to conclude that the total levels of PCBs and total DDT in *P. phocoena* from the North Sea analysed in the late 1960s and early 1970s are of the same order of magnitude as those recently recorded from the Danish by-catch (Clausen and Andersen, 1988). As reproduction in the latter study appeared to be normal, it cannot be concluded that reproduction in *P. phocoena* has been influenced by these compounds in a way that is analogous to that observed in common seals (Reijnders and Lankester, 1990). Nevertheless, the potential toxic effects of the high levels of OCs recorded in small cetacean tissue from around the world should not be ignored.

The Study Group noted that the most effective way of presenting information on contaminant levels in marine mammals was probably in terms of toxic equivalents (e.g., Kannan *et al.*, 1989).

3.1.3 Hydrocarbons

Available evidence suggested that phocid seals and small cetaceans were less vulnerable to the effects of oil slicks than seabirds, otariids or sea otters (Geraci and St Aubin, 1990). However, there could be chronic effects due to inhalation of toxic vapours if animals surfaced within slicks. Ingestion of oil had been proposed as a cause of intestinal ulceration in some seals (Babin *et al.*, 1990).

Major oil spills could have an important effect on habitat and prey availability for marine mammals. However, it was difficult to suggest specific action which could be taken to reduce this impact.

3.2 Fishing Activities

Fishing activities can have an impact on marine mammal populations through incidental entanglement (by-catch) of animals in nets (including lost or abandoned gear), deliberate killing of animals by fishermen, and through changes in the abundance and distribution of prey caused by fishing activities. For example, the extensive mortality of between 60,000 and 100,000 harp seals in fishing nets off the north Norway coast in 1987 (Wiig, 1988) probably had a substantial effect on the Barents Sea population of this species.

3.2.1 By-catch

Available information on by-catches in the area covered by the Study Group was reviewed.

Data from the UK were incomplete in Scotland and poor in England and Wales (WP4). A preliminary review (Northridge, 1988) had indicated that the annual by-catch might be a few hundreds of animals each year, with common and grey seals, and harbour porpoise and common dolphin the most commonly caught species.

In Norway there is a need for a consistent reporting scheme. About 100 porpoises were recorded caught in the salmon drift net fishery during part of the 1988 season. The fishery was closed after this season. Samples were obtained from these animals by paying transport costs and "compensation" of 300 NKr per animal. In Sweden, all by-caught animals belong to the Crown. Good data and samples from the by-catch have been obtained by paying transport costs and compensation of 200 SKr (Lindstedt, 1990). No new data on by-catch in Denmark was presented. Salmon drift nets in Finland are known to catch young ringed seals (ICES C.M. 1989/N:9). In Germany samples of porpoises from the small by-catch in the Baltic had been obtained by paying 50 DM compensation per animal.

Data from the Netherlands are lacking. Attempts are being made to determine the size of the by-catch in the small pair-trawl fishery for herring. It was believed that about 10 porpoises and some other species were taken each year by this fishery.

The Study Group noted that boats registered in Spain and Portugal regularly fished in the area it was concerned with. No data were available on by-catches of marine mammals made by these boats, nor was it likely to become available.

Although there was no hard evidence that the by-catch of small cetaceans in the area covered by the Study Group had caused a decline in the abundance of these species; there was an urgent need for better data on the size of the bycatch and the abundance of the cetacean species involved.

By-caught animals are an important source of biological information. In addition, examination of these animals is useful for determining whether stranded animals have been killed incidentally by fisheries. In general, it was only possible to obtain good samples and information if fishermen were provided with adequate compensation for the time and effort involved in collecting these. In some countries, there is known to be a sizeable illegal fishery which makes use of gear, particularly monofilament drift nets, in which marine mammals were known to become entangled relatively easily. Information on the size of this by-catch was probably impossible to obtain.

3.2.2 Discarded gear

Seals entangled in pieces of discarded netting were regularly observed in the UK and were occasionally seen elsewhere. This is unlikely to be a major problem for any seal population, but it may cause considerable suffering to individuals. Full implementation of existing international agreements should reduce the scale of this problem in the longer term.

3.2.3 Deliberate killing

Deliberate killing is usually directed at seals. Seals are completely protected in Finland, Sweden, Germany, the Netherlands and the Baltic states of the USSR. In Norway, the UK and Denmark, fishermen (including owners of

marine fish farms and their employees) are permitted to shoot seals which may be damaging gear or catches. There are no good data on the scale of this killing in Norway and the UK, although attempts were being made to improve this situation. Deliberate killing was believed to be a rare event in Denmark.

3.2.4 Effects of fishing activities on food availability

The Study Group assumed that the Study Group on the Ecosystem Effects of Fishing Activities would consider these effects in more detail.

3.3 Pathogens

The death of nearly 18,000 common seals in northern Europe in 1988 as a result of infection with phocine distemper virus (PDV), a previously undescribed morbillivirus, has highlighted the vulnerability of marine mammals to epizootics. Recent findings of a wide range of viruses in many marine mammal species (Visser *et al.*, in press) indicate that they are an unexpectedly large reservoir of these agents. There also appears to be a substantial risk of interspecific transfer of these disease organisms. Theoretical studies suggest that PDV should effectively be extinct in European common seal populations (Grenfell *et al.*, in press). However, recent isolations of PDV from common seals in northwest Europe (Osterhaus *et al.*, in prep.) indicate that the virus still circulates in this area. The high prevalence of antibodies to PDV in harp seals from northern Norway (Have *et al.*, in prep) suggests that reinfection from this species could occur.

The fact that all marine mammal populations may be subject to mass mortalities occurring at irregular intervals must be taken account of in their management. Rates of population change which are measured between such incidents will overestimate the population's long-term growth rate.

The risks of such mass mortalities may have increased in recent years as marine mammals are more frequently exposed to disease organisms derived from man or his domestic animals. In addition, disease agents can act synergistically with contaminants and other stresses, such as disturbance or reduced food availability. This could increase the frequency and severity of epizootics.

3.4 Disturbance

Disturbance during the pupping season can cause widespread desertion and subsequent pup mortality in grey seals. This may also have an effect on pup production in later years if females which desert their pups are not fertilized. Disturbance to common seals during lactation may result in a lowered pup growth rate. Repeated disturbance at haul out sites may cause animals to desert particular sites, as has been observed in the Skagerrak and Wadden Sea. The establishment of sanctuary areas in the Kattegat/Skagerrak had shown that undisturbed animals hauled out for longer periods.

The effects of noise and vessel traffic are more difficult to quantify. Marine mammals are known to continue to use some areas, such as Galveston harbour in Texas, despite very high levels of boat traffic and noise. However, Davis *et al.* (1990) indicate that "there is evidence of long-term reduction in utilization of certain heavily-disturbed areas by grey whales". Collisions between boats and marine mammals may cause severe injuries even to large species (e.g., Kraus, 1990), but the significance of this for population dynamics is unclear.

There can be little doubt that marine mammals are aware of the noise and disturbance associated with seismic exploration, drilling, military testing and explosions, and dredging activities. There is no direct evidence that these have harmful effects, however, every opportunity to investigate the response of marine mammals to such disturbance should be taken.

3.5 Other Factors

The recent series of warm winters may have had a substantial effect on the survival of ringed and grey seal pups in the Baltic. If the ice used for whelping melts before the pups are weaned large numbers of pups may die, and hundreds of pups have been washed ashore in the Gulfs of Finland and Riga in the last two years. If the trend for warmer winters continues, the Baltic Sea may become unsuitable for ice breeding seals in many years.

Commercial hunting of seals and small cetaceans has virtually ceased in the area covered by the Study Group. However, common seals may be hunted in northern Norway between 30 November and 30 April. There is no limit on the number of hunters or the number of seals which may be taken, and no catch statistics are recorded (Bjørge, in press). Such an uncontrolled hunt could have a significant effect on local population size and better documentation of the scale of this hunting is needed.

3.6 Relative Importance of Environmental Factors

The Study Group noted that it was not possible to rank these factors in order of importance. Their importance would vary from species to species and with circumstance. Thus disturbance was probably a factor of minor importance for most grey seal populations, but if a particular population were reduced to low levels by an epizootic, then disturbance could have a significant effect on the population's recovery.

The Study Group concluded that recent decisions taken at the North Sea Conference should, in the long term, reduce the threats to marine mammal populations from contaminants (by reducing or eliminating inputs of toxic compounds) and pathogens (by reducing the discharge of human-derived disease agents in untreated sewage). However, the effect of these actions was likely to be slow because many of the contaminants involved were extremely persistent and were likely to remain at high levels for many decades.

4. COLLECTION OF SAMPLES FROM DEAD AND STRANDED ANIMALS

Stranded marine mammals and those found dead in fishing gear are an important source of material for studies of basic biology, contaminant levels, disease incidence and distribution. Many countries have now established schemes for carrying out detailed studies of such animals. However, different data collection forms and sampling procedures are often used for cetaceans and seals, and in different countries. There is a standard set of information on stranded and by-caught harbour porpoises which is collected in a number of countries, but even for this species there is considerable variation from country to country.

In theory, all countries which are members of the International Whaling Commission should provide information each year on the by-catch of cetaceans, but such data have proved difficult to obtain. The Study Group recommends that all ICES member countries establish reporting schemes which cover the by-catch of all marine mammals by boats registered in their country.

A multinational scheme which collected a consistent set of information on the incidence of strandings, with an indication of the amount of effort that was directed towards finding them, could be used in combination with oceanographic and meteorological data to provide valuable information on the biology of small cetaceans in the North Sea. These data would be easier to interpret if they were collected in a standard format. The Study Group recommended that national representatives on the Marine Mammal Committee should be asked to provide a summary of the information and samples that are collected from stranded cetaceans in their country for the 1991 Statutory Meeting. These could then be summarized by the ICES Environment Officer, who could identify a core set of information which was collected by most ICES member countries. ICES could then act as a central repository for such data.

5. RESEARCH REQUIREMENTS AND TECHNIQUES

5.1 Abundance

The Study Group noted that good progress had been made on the development of standardized techniques for surveys of seals within the area it covered. However, there was a lack of recent information from the USSR, Ireland and the

Færoe Islands. During the next decade it would be particularly important to monitor changes in stock size and productivity of common seal populations following the large-scale mortality of 1988.

For small cetaceans, the only documented estimates of abundance are for some local populations of *Tursiops truncatus*, and for *P. phocoena* in the central and northwest North Sea (Bjørge and Øien, 1990). The Study Group noted that strandings schemes and observer networks could, at best, only provide an index of local densities of small cetaceans and that changes in these indices would be hard to interpret. The only way to obtain reliable estimates of small cetacean numbers in the North Sea was through a multinational survey of the whole area carried out over a short time period. It proposed that such a survey would be best carried out in June, when sea conditions were relatively good. This was also known to the calving season for *P. phocoena*, the species whose status in the North Sea had caused greatest concern. Such a survey would serve to identify critical habitat areas for this species. The Study Group recommended that the Scientific Committee of the International Whaling Commission should be approached about developing the design and coordination of such a survey at its 1992 Annual Meeting. The aim would be to present a proposal for a multinational survey in 1994 to the 1993 North Sea Conference. It was estimated that such a survey would cost in the order of £1M.

In the meantime, national studies of local density, movements (diurnal, seasonal and tidal) and surfacing rates of all small cetacean species, but particularly of *P. phocoena*, should be encouraged. These would be essential contributions to the design and analysis of the proposed survey.

5.2 Feeding and movements

The Study Group noted that there had been considerable standardization of techniques for studying the diet of marine mammals in recent years within its area. These were primarily based on the analysis of hard parts of prey items recovered from the faeces of seals, and the stomachs of seals and dolphins. Further opportunistic studies of the response of marine mammals to changes in prey abundance should be undertaken whenever possible.

Information was also needed on the distribution of feeding effort. Telemetry has proved a very effective method for studying the movements and feeding behaviour of seals. It is the only method likely to provide similar information on small cetaceans, but further development work is required before it can be widely used. In particular, it will be important to obtain precise locational information from telemetry devices used on small cetaceans. However, small satellite link transmitters and automatic direction-finding receivers for VHF transmitters should become available in the near future.

5.3 Contaminants

The Study Group endorsed previous recommendations that attention should be focused on the levels and biological effects of the metabolites of PCBs and DDE, and on 0 and 1-*ortho* PCB congeners. Any additional compounds identified by the Working Group on the Biological Effects of Contaminants should also be considered.
In particular, there was a need for further experimental studies on the distribution and dynamics of accumulations of these compounds in marine mammals, and on their specific effects on reproduction and disease resistance in marine mammals and related "model" species, such as mink.

5.4 Fishing Activity

Attempts to reduce the mortality caused by by-catch through technological modifications have had only limited success. The Study Group noted that the multinational surveys and telemetry studies recommended in sections 6.1 and 6.2 could be used to identify areas which were of critical importance to marine mammals at particular times of the year. The impact of incidental catches could be substantially reduced if the use of fishing gear likely to entrap small cetaceans was forbidden in such areas during these critical periods.

The Study Group anticipated that the Study Group on the Ecological Effects of Fishing Activities would make recommendations for research on the effects of changes in prey abundance caused by fisheries.

5.5 Pathogens

There is a need for more information on the distribution and sources of pathogens in marine mammals, and on the evolutionary relationship among those which had already been identified. Stranded and by-caught animals were likely to be a useful source of material for such studies. The role of contributory factors in the impact of such pathogens also needs to be investigated further.

There is also a need to have a wider involvement of ecologists, virologists, immunologists, and epidemiologists studying diseases of man and domestic animals in these studies. The Study Group suggested that a workshop to bring together scientists from these disciplines would be very useful.

5.6 Disturbance

Although there was a general feeling that the effect of disturbance on marine mammal populations was not of primary importance, all opportunities to investigate its effects should be taken. In particular, it would be useful to measure the physiological response of animals which were subject to incidental disturbance as part of other studies.

5.7 Other Factors

Climate-related changes in ice distribution and character within the Baltic Sea were likely to be of critical importance for the survival of ice-breeding seals in the Baltic. The use of remotely sensed data on ice cover and character had already proved very useful for identifying ice likely to be used for whelping by grey seals, and further research on this topic would be very useful.

6. MANAGEMENT IMPLICATIONS

The Study Group noted that the decision of the Finnish government to ban the hunting of ringed seals in the Baltic Sea, and the establishment of a trilateral agreement to develop a management plan for the Wadden Sea were significant and welcome management actions.

At this meeting, the Study Group had concentrated on compiling data and indentifying potential sources of data relevant to item a) of its terms of reference. It was not, therefore in a position to fulfil item d) of its terms of reference. The severe lack of information on the status of small cetaceans needs to be rectified before the likely effectiveness of conservation measures for these species can be evaluated. Nevertheless, the Study Group strongly supported the objectives of the Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas. It considered that the precautionary approach embodied in this agreement was the most appropriate way to improve the conservation status of these species, provided that adequate support was provided for the research objectives associated with it.

The Study Group noted that seals which were "rescued" by members of the public were more likely than wild seals to encounter pathogens from man or his domestic animals. There was a significant risk that these pathogens might be introduced into the wild populations if the rescued seals were released. The Study Group recommended that any releases of rehabilitated seals from rescue centres should comply with the recommendations of the IUCN Group of Experts on Reintroductions.

7. SUBSEQUENT MEETINGS

The Study Group recommended that it should meet again in early 1992, perhaps immediately before the next meeting of the European Seal Group. This would facilitate the participation of some invited experts in the Study Group's discussions.

8. RECOMMENDATIONS

The Study Group recommended that:

1. All ICES member countries should be encouraged to establish reporting schemes to document the by-catch of marine mammals by boats registered in their country.

2. Members of the Marine Mammal Committee should be asked to provide a summary of the information and samples that are collected from stranded and by-caught cetaceans in their country for the 1991 Statutory Meeting.

3. The ICES General Secretary should approach the International Whaling Commission about the possibility of the IWC's Scientific Committee providing advice on the design and coordination of a survey of small cetaceans in northern European seas.

4. ICES member countries should be encouraged to support national programmes on local densities, movements and behaviour of small cetaceans which would contribute to the design of the survey proposed in recommendation 3.

5. Further research should be conducted on the biological effects of the metabolites of PCBs and DDE, and on 0 and 1-*ortho* PCB congeners, on the distribution and dynamics of accumulation of these compounds in marine mammals, and on their effects on reproduction and disease resistance.

6. Further research should also be conducted on the distribution and source of pathogens in marine mammals, and on the role of contributory factors in the effect of these pathogens on population dynamics.

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APPENDIX 1

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APPENDIX 2

WORKING PAPERS

WP1 Thompson, D & Hiby, A R Monitoring trends in grey and common seal populations.

WP2 Heide-Jørgensen, M-P & Härkönen, T Long-term effects of epizootic in harbour seals.

WP3 Härkönen, T & Heide-Jørgensen, M-P Implications of feeding in harbour seals (*Phoca vitulina*).

WP4 Kuiken, T, Sheldrick, M, Northridge, S & Harwood, J Investigations on seals and cetaceans found dead around England and Wales.

APPENDIX 3

AGENDA

1. Opening of meeting.

2. Definition of "Northern European Seas"

3. Current status of populations
   - 3.1 *Phoca vitulina*
   - 3.2 *P. hispida*
   - 3.3 *Halichoerus grypus*
   - 3.4 *P. phocoena*
   - 3.5 *Tursiops truncatus*
   - 3.6 Other species

4. Relative importance of environmental factors
   - 4.1 Contaminants
   - 4.2 Fishing activities
   - 4.3 Pathogens
   - 4.4 Disturbance
   - 4.5 Other factors

5. Collection and analysis of samples from dead and stranded animals.

6. Research techniques

7. Recommendations for management

8. Date of next meeting

9. Any other business.

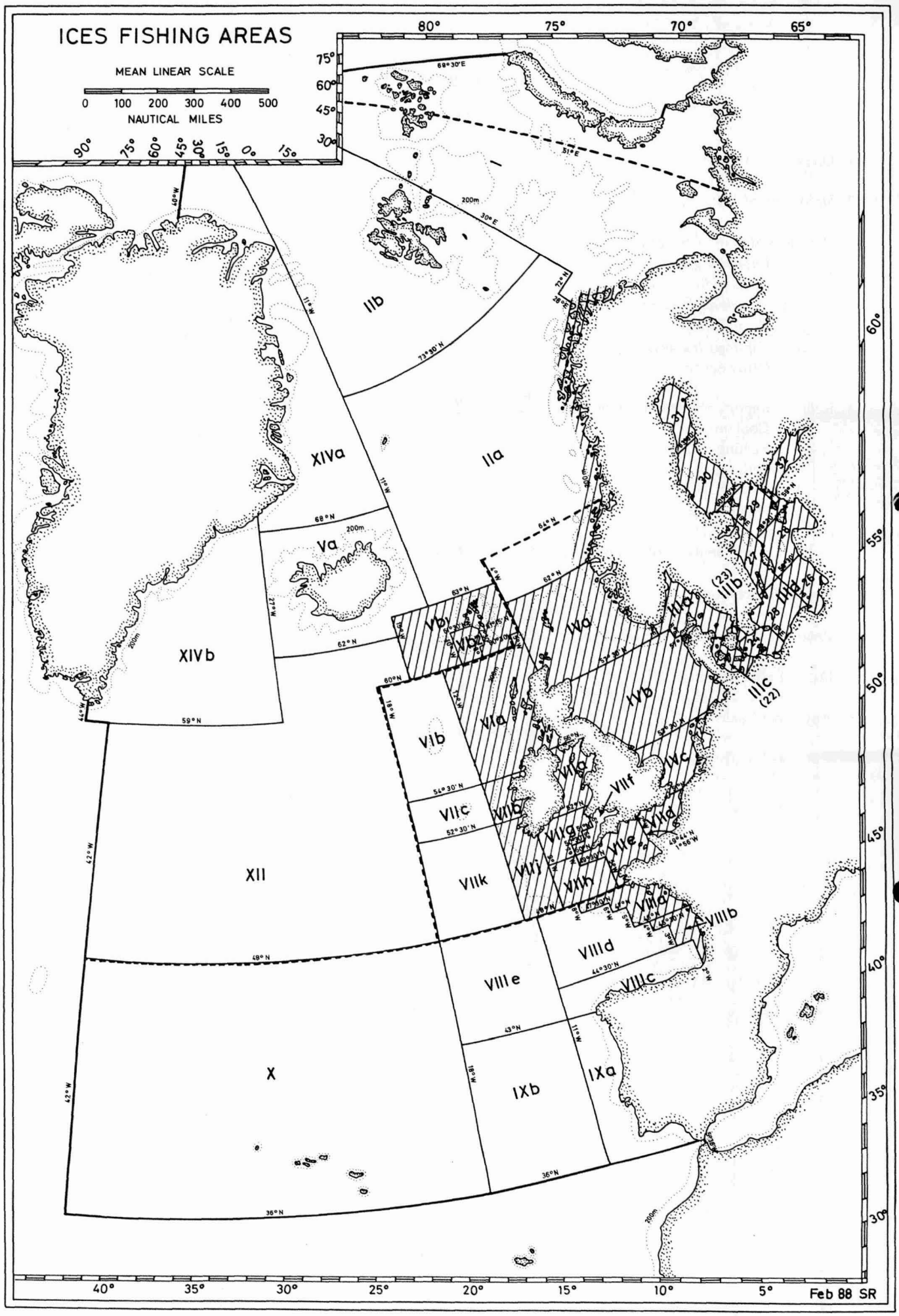

Figure 1. Geographical area covered by the study (hatched).