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

Cromarty, Scotland, 2-5 March 1992

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

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1. INTRODUCTION

The Study Group held its second meeting from 2-5 March, 1992 in the Cromarty Centre, Cromarty, Scotland. A list of participants is given in Appendix 1 and the agreed agenda is shown in Appendix 2. The Study Group had been given new terms of reference at the 1991 Statutory Meeting of ICES. These were:

(a) assess the trends in, and current status of, seal and coastal dolphin populations (particularly those of *Phocoena phocoena* and *Tursiops truncatus*) in the North Sea, Baltic Sea, Bay of Biscay and other European seas, and provide quantitative data, including confidence limits, whenever possible;

(b) advise on appropriate methods for selecting, collecting and archiving 1) data from surveys, sightings and strandings and 2) samples from strandings of those species, including the role of ICES as a central repository for such data;

(c) evaluate available information on the by-catch of those species - extent as well as type of fisheries involved - and advise on procedures and techniques both to assess by-catch and centralize registration of data from national reporting schemes;

(d) collate information on possible techniques to prevent by-catches of marine mammals;

(e) advise on the types of management actions 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;

(f) develop preliminary plans for an ICES workshop on distribution and sources of pathogens in marine mammals with the involvement of ecologists, virologists, immunologists and epidemiologists studying diseases of man and domestic animals;

(g) review the functioning of this Study Group with regard to the continued requests to ICES for information on population developments of, and anthropogenic influences on, marine mammals in the context of other ICES Study/Working Groups;

(h) report its findings to the Marine Mammals Committee, ACMP, ACFM and the Multispecies Assessment Working Group.

The Study Group had received a letter from the Chairman of ACFM wishing it well, and looking forward in particular to guidance on terms of reference (e) (possible management actions) and (g) (requests to ICES on marine mammal issues).

2. CURRENT STATUS OF POPULATIONS

Current estimates of population size and information on changes in abundance since 1990 were reviewed.

2.1 Harbour Seal (*Phoca vitulina*)

2.1.1 Numbers and status

In general estimates of harbour seal abundance are based on counts carried out late in the pupping season or during the moult, when the largest number of animals can be observed hauled out. They therefore represent a lower bound for the size of the total population. Extended time series of such results are necessary to assess trends. In some cases (for example, surveys in the Kattegat/Skagerrak and the Wadden Sea) a number of surveys have been flown each year at the time when the maximum number of animals are hauled out. In these cases it is possible to calculate confidence limits around the survey mean which are useful for comparing survey results between years.

The British population is estimated to be at least 25500 animals (Hiby et al, 1992) with 500 in the Irish Sea, 9500 on the west coast of Scotland, 12000 in Orkney and Shetland, 1500 on the east coast of Scotland, and 2000 on the east coast of England. Although the total figure is higher than that given in last year's report (ICES CM 1991/N:19), this is because the results of new surveys of the west coast of Scotland have been included. There has been no change in numbers at reference sites in Scotland and the Wash since 1988. A new survey of Shetland was carried out in 1991 using a helicopter equipped with a thermal imager. Counts made from helicopters in other parts of Scotland have provided estimates of harbour seal numbers which were approximately twice those obtained from boat surveys. It was therefore expected that at least 9000 seals would have been counted in Shetland, compared with the 4700 counted there in a boat survey in 1984. However, the actual count was 4800, suggesting a decline in numbers or a change in haul out behaviour.

Aerial surveys of the entire Wadden Sea carried out in 1991 provided a peak count of 6090 harbour seals. The maximum number of pups was 1270, 20% of the total count. Total numbers increased by 19.6% from the 1990 count, and pup numbers increased by 17.3%. Peak counts in 1990 and 1991 were:

	1990	1991
Denmark	930	1100
Schleswig-Holstein	1970	2320
Niedersachsen	1620	1920
Netherlands	560	750
Total	**4080**	**6090**

The large increase in numbers recorded between 1989 and 1990 had been explained by increased pup production in 1990 (ICES CM 1991/N:19). However, this was not the case in 1991. Therefore the change must be the result of increased survival, immigration, or a change in behaviour with animals spending a greater proportion of time hauled out during the survey period.

A survey carried out in Svalbard in June 1990 had counted 349 harbour seals (Gjertz and Børset, in press), supporting previous estimates (Prestrud & Gertz, 1990) of a resident population of around 500 animals. No major new surveys had been made of harbour seals in Norway, thus the best available estimate was that of 3600 from Bjørge (1991). However, 102 animals including 26 pups had been counted in the Oslofjord, the area most effected by the 1988 phocid distemper epidemic, in June and July 1991. A decision was still awaited on a proposal to replace the current system of

complete protection in southern Norway and a limited hunting season in the north with a system of licenced hunting quotas on individual local populations.

Surveys carried out in Denmark and Sweden during 1991 had provided the following estimates with their associated 95% confidence limits (CLs):

Area	Maximum	Mean	n	Upper CL	Lower CL
Kattegat/Skagerrak	4183	3897	3	4600	3100
Limfjorden	746	628	3	910	345
Southern Baltic	214	166	3	270	62

The large increase in numbers in the Kattegat/Skagerrak had been predicted from a matrix model of the population (Heide-Jørgensen et al., in press), and was a consequence of the large changes in age-structure caused by the mortality associated with the 1988 epizootic.

2.1.2 Movements

An analysis of recoveries of seals tagged in Orkney, Scotland indicated that most recoveries, even of pups, were within 50km of the tagging site. Studies of radiotagged seals in the Wadden Sea had revealed that animals of all age classes regularly travelled outside the Wadden Sea in summer as well as in winter. Several hundred seals had been observed during aerial surveys for seabirds north of the Frisian Islands in winter. Studies of the movements of freeze-branded pups of the year in the Skagerrak had indicated that they remain within 20km of the catching site until they are at least 3-4 years of age.

2.1.3 Diet

Continuing studies of the diet of harbour seals in the Moray Firth area have indicated substantial year-to-year variations, especially in winter diet (Thompson et al., 1991). A marked increase in the importance of cephalopods in the summer diet has also been observed over the period 1988-1991.

2.2 Ringed seal (*Phoca hispida*)

Aerial surveys in the Bothnian Bay in 1991 had provided an estimate of 2550 animals hauled out on the ice with 95% CLs of $\pm$14%. The total population in the Baltic was estimated to be 4500-5000 animals. The very mild winters in the last three years had provided poor conditions for pupping of ringed seals and pup mortality had been high.

2.3 Grey seal (*Halichoerus grypus*)

2.3.1 Numbers and status

Aerial surveys of British colonies in 1990 had provided estimates of a total population of 85100 seals. Of these 41800 were associated with sites on the west coast of Scotland, 40500 with sites on the North Sea coast and 3100 with sites in the southwest (Hiby et al., 1992). The total figure was 7.3% higher than estimates for 1989. Ninety-five percent CLs extend from 35% below the estimate to 45% above it. The number of pups born at many colonies in 1988 had been substantially lower than expected. Although pup production at these sites rose in 1989 and 1990, it was still lower than expected. One explanation for this is that there was a substantial, but undetected, mortality (estimated at 12%) of grey seals as a result of infection with phocid distemper virus. All of the above figures have been calculated on this assumption.

At least 19 pups had been born in the Dutch Wadden Sea during the 1991/92 pupping season, compared with 7 in 1990/91. The maximum count in 1991 was 120. Five pups had been born to

the 30-50 grey seals which occurred in the German sector of the Wadden Sea in 1991.

In Norway, grey seal pups had been tagged at colonies in Lofoten, Troms and Finnmark. In addition, 298 pups had been tagged at colonies around the Kola Peninsula as part of a joint Norwegian/Russian project (Haug et al., 1991). The best available estimate of population size was 3100 (Wiig, 1987).

The grey seal population in the Baltic was estimated to be 2800-3000 animals (WP2). Reduced ice cover in the last five years had resulted in an altered distribution of pups with more being born in the Bay of Bothnia; reduced ice cover had also lead to increased pup mortality.

2.3.2 Movements

Satellite telemetry studies of English grey seals had indicated that some individuals remained within a very restricted area (c20km radius of the tagging site), while others ranged over the entire western North Sea.

2.4 Harbour porpoise (*Phocoena phocoena*)

2.4.1 Numbers and status

A Partenavia P-68 Observer aircraft had been used to conduct surveys for harbour porpoises in an area north of Fyn, Denmark and in the Bay of Kiel, Germany during 1991 (WP1). The density of pods had been estimated using line transect theory based on measurements of the perpendicular distance to sightings and fitting a hazard rate model to the observed distribution of sightings. Results indicated a significant lower density and abundance of porpoises in the Bay of Kiel. Strip census techniques were not appropriate for this kind of survey because the width of the strip where the detection probability was constant was too narrow. The authors noted that estimates of the probability of sighting a porpoise on the track line were required if these estimates were to be converted to estimates of overall abundance. Various surveys in Danish waters since 1986 have not indicated any changes in numbers of harbour porpoises observed. Regular counts from scheduled ferry services in the Danish waters are continuing.

The size of the harbour porpoise population to the southwest of Ireland had been estimated at 25000 animals on the basis of shipboard sightings made as part of Dutch seabird surveys (Leopold, in press). Sightings made during Dutch shipboard surveys for seabirds in the North Sea between 1981 and 1991 had indicated a concentration of harbour porpoises off the Frisian Islands in October and November which later moved northwest to feed off the east coast of England. There was a significant increase in the number of sightings made per hour of observation between the early 1980s and 1986-89.

Porpoise numbers in the northern North Sea were estimated to be 82600 (95% CLs $\pm$ 44%) based on sightings made during surveys made for minke whales in 1988 and 1989 (Bjørge & Øien, 1990).

2.4.2 Diet

Data on the stomach contents of by-caught and stranded harbour porpoises from the German coast (Lick, 1991) indicated that cod (Baltic Sea) and flatfish (North Sea) were important components of the diet, which included fish up to 62cm long, on the basis of otolith measurements.

2.5 Bottlenose dolphin (*Tursiops truncatus*)

No estimates of abundance were available. Continuing studies of the populations in the Moray Firth, Scotland and Cardigan Bay, Wales had confirmed the minimum estimates of 90-95 and 60 individuals respectively provided to the last meeting.

2.6 Other species and further surveys

The Study Group was informed that a proposal for a combined aerial and shipboard survey of the cetacean population of the North Sea had been submitted to the Commission of the European Community for funding under the NORSPA programme. The Study Group strongly supported this proposal which would provide the first synoptic survey of the area and would serve to identify important habitat areas for the species it was concerned with.

3. POPULATION HEALTH

The Study Group concluded that there was no set of simple criteria which could be used to judge whether a population of marine mammals was healthy or unhealthy. However, it arbitrarily divided the known distribution of each species into a number of regional populations. It then reviewed the available information on the current size, status and potential threats to all of the marine mammal populations in the geographical area it had been asked to cover. The Group recognized that further research was required to determine the discreteness of each of these assumed populations. It used this review to identify those populations where management action was most needed and those where additional information was urgently required in order to assess their status.

3.1 Population review

3.1.1 Harbour seals

Population	Comments	ICES Area
Irish Sea	Small. Substantial mortality in 1988. High contaminant levels in some animals.	VIIa
West coast Scotland	Large. Little effected in 1988. Some areas monitored annually. Some local conflicts with salmon farms.	VIa
Orkney & Shetland	Large population. No perceived threats in Orkney but apparent decline in Shetland needs investigation.	IVaN
East coast Scotland	Small population. Historical conflict with salmon fishery but this declining. Good database on effects of food availability.	IVaS
East coast England	Seriously effected in 1988. No apparent recovery. Monitored annually.	IVc
France	Very small population at edge of species range. Monitored regularly.	VIId
Wadden Sea	Substantial reduction in 1988. Now increasing. High levels of contaminants. Monitored annually.	IVc-b
Norway	Small population. No evidence of decline but still subject to hunting in north. Future hunting likely to be closely monitored.	IIIa,IVa, IIa
Kattegat/Skagerrak	Large population. Substantial reduction in 1988, recovering rapidly, no perceived threats.	IIIa, IIIb
Baltic	Small, southern groups substantially reduced in 1988. High contaminant levels.	IIId

3.1.2 Ringed seal

Population	Comments	ICES Area
Baltic	Seriously reduced by hunting and contaminants. High pup mortality in recent years.	IIId

3.1.3 Grey seal

Population	Comments	ICES Area
West coast Scotland	Large, increasing population. No apparent threats. Pup production regularly monitored. Changes in juvenile mortality would be difficult to detect.	VIa
North Sea coast of Britain	Large population, increasing more slowly than in west. Monitored annually.	IVa, IVb
Southwest Britain, Ireland and France	Small population, difficult to monitor. No evidence of increase. Perceived threats from contaminants, fisheries interactions and disease.	VIIa, VIIb, VIIg-j
Wadden Sea	Very small population but was large in past. Increasing slowly. No perceived threats.	IVb, IVc
Norway	Relatively small population. Probably increasing slowly in some areas. Plans to resume hunting with close monitoring.	
Baltic	Small population. Seriously affected by contaminants and former hunting. High pup mortality in recent years.	IIId
Kattegat/Skagerrak	Very small population. Most pups still- born. Probably a marginal population between Baltic and North Sea stocks.	IIIa,b

3.1.4 Harbour porpoise

Population	Comments	ICES Area
Northern North Sea	Apparently large population, but estimate based on small number of primary sightings. By-catch around Shetland and Norway. Links with southern North Sea population unclear.	IVa
Southern North Sea, Kattegat and Baltic	Unknown population size. Some evidence of a decline in sightings until recently. Considerable by-catch. May be divided into local populations (Kinze, 1991).	IVb, IIIa-d

3.1.5 Bottlenose dolphin

Population	Comments	ICES Area
Northern North Sea	Limited information except for small, isolated resident group in the Moray Firth Scotland. Status unclear.	IVa
Southern North Sea	Very limited information. Used to be abundant, now sighted much less frequently.	IVb,c
West coast Scotland	Possible resident groups around Western Isles. Status unknown.	VIa
Irish Sea and North Atlantic coasts	Regularly sighted in offshore areas. Resident groups in Cardigan Bay, Wales, around coast of southern Ireland, Normandy and Brittany. High contaminant levels in some animals. Evidence of a decline in coastal sightings. Perceived threat from by-catch in drift nets.	VIIa,b, e,g,h,j VIIIa,b

3.1.6 Other species

There is some evidence (see section 4.1.1) that significant numbers of dolphins, probably mostly *Delphinus delphis*, are caught in drift net and large pelagic trawls in the southwest approaches. However, there is limited information on the size and distribution of cetacean populations in this area. The Study Group was informed of proposals from IFREMER, France to study this problem. Whitebeaked dolphins are occasionally taken as a by-catch along the Danish west coast.

3.2 Populations whose status does not give immediate cause for concern.

The following populations were considered to fall into this category. **In all cases it was considered important that management action which is currently being taken, or considered, for these populations (particularly regular monitoring programmes and maintenance of protected areas) should be continued.**

3.2.1 Harbour seals

West coast Scotland, east coast Scotland, east coast England, Wadden Sea, France, Norway, Limfjorden, Kattegat/Skagerrak.

3.2.2 Grey seals

West coast Scotland, North Sea coast Britain, southwest Britain, Norway, Kattegat/Skagerrak.

3.3 Populations whose status is not satisfactory

The status of the following populations gave the Study Group some concern.

3.3.1 Harbour seals

Baltic: this is a small population with relative high levels of organochlorine contaminants. There has been a highly significant increase in the frequency of paradontitis and alveolar exostosis since the 1930s (Mortensen et al., 1991). An identical situation had been found among seals in the Kattegat/Skagerrak. The Study Group recommended that specimens from other populations should be checked to determine the frequency of these conditions. A number of sanctuaries have been established for the Baltic population and there is no deliberate killing. It is difficult to know what more can be done to encourage the increase of this population.

3.3.2 Ringed seals

The situation for Baltic ringed seals appears very unfavourable. The frequency of sterility in females is still high, and recent warm winters have resulted in high levels of pup mortality. Because ringed seals pup on ice, and the location of this is unpredictable, it is not possible to provide protected areas. Certainly **hunting of this population should not be resumed. Substantial numbers of young ringed seals are now drowned in salmon drift nets which are set early in the season (WP2). Consideration should be given to restricting the start of this season.**

3.3.3 Grey seals

Wadden Sea: **The recovery of this very small population could be encouraged if areas suitable for pupping were protected during the breeding season.**

Baltic: This population is small, and stable or slowly increasing. There is no hunting but it appears to have been severely affected by contaminants. Hunting has been banned and there is now a network of protected areas. **There is a need for studies of the location of pupping areas and of the interchange of animals between the west and east coasts of the Baltic.** This would involve collaboration between Sweden, Finland, Estonia, Latvia and Russia.

3.3.4 Harbour porpoise

Southern North Sea/Baltic: A considerable by-catch has been documented in this area and **there is a need for further detailed studies to determine the nature of the interaction and how it can be reduced.** Surveys along the lines described in section 2 are also needed.

3.4 Populations where more information is required to determine their status

3.4.1 Harbour seal

Irish Sea: This is a small population and some individuals carry high burdens of organochlorines and heavy metals. Although numbers at the most important site (Strangford Lough, Northern Ireland) have been recorded annually, the Study Group considered that **it was important to monitor for some of the known demographic and physiological consequences of high contaminant levels.** These include: reduced fertility or fecundity; lowered vitamin A and thyroxin levels; and compromised immune system functioning. It also considered that **a European-wide survey of contaminant levels in harbour seals**, along the lines of the analysis currently being conducted by the Institute for Forestry and Nature Research, Netherlands using samples collected in 1988, **should be carried out at 5-10 year intervals to determine the impact on marine mammals of decisions made at the Second International Conference on the Protection of the North Sea in 1987.**

Shetland: Although harbour seals in Shetland have year-round protection, they can still be shot to protect fishing gear or fish farms. **Studies are needed to determine if the apparent decline in numbers is a real one.**

3.4.2 Ringed seal

Eastern Baltic: Little is known about the distribution and abundance of ringed seals in the eastern Baltic. **The implementation of a regular monitoring programme is required for the assessment of stock size and trends.**

3.4.3 Harbour porpoise

Northern North Sea: The estimated number of harbour porpoises in this area is not, on its own, sufficient justification to be confident about the status of the population. **There is a need for an integrated survey of the North Sea, along the lines of the proposal described in section 2, and for detailed studies of the nature of the by-catch in this area.**

3.4.4 Bottlenose dolphin

For all populations, further data are required on the size and status of resident groups. Inshore groups may come into contact with localized coastal pollution: an apparently high incidence of skin lesions has been noted in the Moray Firth and the consequences of these conditions should be investigated. **Inshore groups are also subject to disturbance from commercial and leisure activities; further studies are required to assess the impact of these factors.**

4. BY-CATCHES OF MARINE MAMMALS BY FISHERIES

4.1 Information on numbers of animals taken and types of fishery involved

4.1.1 Reports from fishermen

The Study Group reviewed the results from existing schemes for monitoring by-catches of marine mammals.

In Britain a voluntary scheme for fishermen to report catches to local Fisheries Officers. This has been in place in England and Wales for a number of years but reports have been rare. Attempts are now being made to increase fishermen's awareness of the scheme. Data on by-catches are recorded on fishery research vessels and when fisheries research scientists go to sea on commercial fishing vessels. Both seals and cetaceans have been caught on these cruises, but such events have been few and far between. During the last 10 years, Scottish fisheries scientists have made more than 600 voyages on fishing vessels to investigate the extent of discarding by the demersal fishery. Not a single instance of a cetacean becoming entangled in the net was recorded. However, none of these trips involved the inshore set-net fishery.

Record of by-catches of small cetaceans in the Netherlands have been kept for the last 6-7 years. Only 10% of fishermen who were approached using a postal survey had responded. A small number of by-catches were recorded in most gear types used by Dutch vessels in the North Sea. In addition, there were reports that substantial mumbers of dolphins were caught in the large pelagic trawl fishery for mackerel southwest of Ireland which involved 13-14 boats. A maximum of 60 dolphins had been taken in one trawl. The Netherlands has been been involved in discussions with IFREMER, France about ways to reduce this by-catch. There are regular reports of seals being caught in fyke nets in Dutch coastal waters. In one area, where around 50 seals are observed, about 10 animals were drowned each year in these nets.

No representative from France had been nominated to the Study Group, but the Group was informed that it was estimated that 400-600 dolphins were caught by French drift-netters and trawlers during the summer of 1990 (Anon. 1991).

In Germany, fishermen receive a payment for donating by-caught animals to universities. Twenty-six by-caught porpoises had been donated from the Baltic, but only four from the North Sea in 1991.

In Norway there is no regular or systematic procedure for recording by-catches, although repeated proposal to record by-catch through Fisheries Officers have not been approved. Small cetaceans were known to be caught in some fisheries, especially the salmon drift net fishery which had now closed. In 1988, 96 porpoise carcasses had been bought from salmon-netters; about 35 had been bought from traditional fisheries in 1989 and 1990. A substantial number of returns of grey seal tags came from pups entangled in nets.

In Denmark it was known that harbour porpoises had been caught in pound nets during the 1960s, but the use of these nets had declined in recent years. Surveys conducted between 1979 and 1991, where fishermen were paid if they brought by-caught animals ashore, together with interviews, had shown that a considerable number of porpoises are still caught. A few are taken in trawls but the majority are taken in fisheries using bottom-set gill nets, particularly for cod and turbot. Exact figures for the total by-catch are not available, but it is estimated to be more than 1,000 a year, and could well be several thousands (Kinze, 1991; Clausen, 1991). About two thirds of these animals are caught to the west and north of Denmark and the rest in Danish inshore waters. Approximately 100 porpoises are recorded annually from the fishery on the Swedish west coast.

In other parts of the world, ghosts nets are known to cause mortality to marine mammals (Shomura & Yoshida, 1985). Although there was no evidence that this was a problem in the North Sea, the Study Group noted that Norway had begun a programme to collect up and dispose of ghost nets

around its coast. It recommended that a record should be kept of any marine mammal carcasses found in these nets to determine whether there was an undetected problem.

The Study Group concluded that most by-catch problems in the North Sea involved cetaceans rather than seals, but there were occasional local problems involving seals and specific fisheries. Throughout the area, cetaceans appeared to be most vulnerable to entanglement in static gear, particular large mesh gill nets set on the bottom in inshore waters. Such gear was often used by amateur and part-time fishermen and thus its use, and the associated by-catch, was difficult to document. However, it appeared that considerable numbers of animals were also sometimes caught in large pelagic trawls.

In no case for which the Study Group had information was it yet possible to estimate the additional mortality imposed on a marine mammal population by by-catches. Indeed, there were substantial problems in doing so, because of the lack of good estimates of local population size for those cases where considerable numbers of animals were known to be caught. However, it should be noted that small cetacean populations, and harbour porpoises in particular (Woodley & Read, 1991), are probably unable to sustain a large additional mortality because they have a low annual reproductive rate and high adult mortality.

Until reliable estimates of the additional mortality due to by-catches are available it is not, in general, possible to evaluate their importance relative to the other anthropogenic factors which are known to influence marine mammal populations (such as hunting, disturbance, and changes in food availability). However, in specific cases where these other effects are known to be minor, such an evaluation is possible.

4.1.2 Other sources of information

There was evidence that a substantial proportion of small cetaceans which were found dead on beaches may have died as a result of entanglement in fishing gear. A number of these animals bore signs which were most likely to be the result of entanglement in nets. Approximately half of the 20-30 harbour porpoises which stranded each year in the Moray Firth area showed evidence of traumatic injury, which is also known to occur in by-caught animals. There was also a marked difference in the ratio of stranded to by-caught animals reported from the North Sea and Baltic coasts of Germany. This difference (87 strandings and 4 by-caught animals on the North Sea coast, 13 stranding and 26 by-caught animals) implied that by-caught animals in the North Sea were disposed of at sea and not reported. After the meeting, information became available on recent strandings of common dolphins in southwest England. More than 40 confirmed reports of strandings had been received since 1 January, a significant increase compared with previous years. Post-mortems had been carried out on 33 carcasses. In one animal, the probable cause of death was suffocation due to entanglement in a fishing net. In the other animals, the cause of death has not yet been determined, although their gross postmortem appearance was not inconsistent with the same diagnosis.

4.1.3 Methods for reducing by-catches

Certain types of gear, for example fyke nets and possibly pound nets, can be modified to prevent marine mammals from entering them or becoming entangled. For example, Dutch sportfishermen are obliged to put wide mesh net over the openings of their fyke nets. It was recommended that, wherever possible, such modifications should be made to gear which was known to entangle marine mammals. However, for most types of gear it seems unlikely that such modifications will be possible in the near future.

The Study Group noted that a number of attempts were being made (notably by the Universities of Loughborough and Cambridge in England, and by Delft University in the Netherlands) to develop devices which deterred cetaceans from approaching fishing gear or which made the gear easier to detected. However, it was felt that, in many cases, cetaceans can already detect the gear but still approach it.

The by-catch of porpoises reported from some regions is sufficiently large that it could have a significant effect on local populations. However, the scientific information which is necessary to determine the magnitude of this effect is extensive and difficult to collect. The Study Group therefore concluded that the most urgent priority was to collect detailed data on the circumstances under which cetaceans became entangled in gear with the aim of reducing the by-catch as quickly as possible while minimizing the impact on fisheries operations. It was unlikely that such information could be collected by a voluntary scheme: it would require placing observers on selected boats. The aim of such a study would be to provide guidelines on good fishing practice rather than to close the fishery involved, and this should be explained to fishermen.

The Study Group recommended that it should draw up a detailed protocol for such studies at its next meeting, describing exactly the kinds of information which should be recorded by observers and identifying areas where by-catches were most likely to occur. In order to do this, it would be important to have information on the amount of effort devoted to different fishing activities by member states and to compile as much information as possible on the distribution of small cetaceans within the area covered by the Study Group. The first set of information was being compiled by the Study Group on the Ecosystems of Effects of Fishing Activity for its next meeting. Some information on distribution could be extracted from incidental sightings made during at-sea surveys for seabirds conducted by British and Dutch teams. Later (section 6) the Study Group recommend that such data is also reviewed at its next meeting. It will also be important that fisheries biologists with experience of the practicalities of collecting data from the industry also attend this meeting.

It is important that national authorities begin the planning that is necessary for establishing such an observer scheme as soon as possible and also consider sources of funding. If possible, pilot schemes should be launched before the Working Group's next meeting; the Danish gill net fishery for turbot could be a suitable candidate for such a study.

5. EFFECTS OF FOOD AVAILABILITY ON MARINE MAMMAL POPULATIONS

At its last meeting, the Study Group had deliberately not considered the indirect effect of fishing activity on marine mammals through its effect on fish stocks. It had assumed, incorrectly, that the Study Group on the Ecosystem Effects of Fishing Activity would do so. Fishing affects not only the abundance of the target fish stock, but its size structure and, possibly, the abundance of other competing and predatory fish species. In general, marine mammals tend to take prey species which are smaller on average than those preferred by commercial fisheries. Since fishing activity tends to result in a reduction in the mean size of fish in the population (although changes in fisheries regulations are sometimes aimed at reversing this trend) this can be beneficial to the marine mammal population. The Study Group therefore concentrated on the way in which a marine mammal predator might be effected by a reduction in the abundance of a particular prey species, for example, as a result of fishing.

5.1 Theoretical expectations

It is usually assumed that the most abundant species in a marine mammal's diet are those which provide the greatest yield for the expenditure of a given amount of energy. Any change in the availability of preferred species is likely to result in the predator switching to less preferred species where the net energy yield is less. A point may be reached where the net intake of energy, while sufficient to meet the animal's maintenance needs, is insufficient for growth or reproduction. Although reproduction may not cease, young may be smaller at birth and may grow more slowly because they receive less milk from their mothers. The energy budgets described in Härkönen and Heide-Jørgensen (1991) provide a clear picture of this. Seals must learn to forage on their own; if the abundance of the most easily caught or most energy efficient prey has been reduced by fishing, they may be unable to obtain sufficient energy for growth and maintenance before they deplete the energy reserves built up during lactation. This problem could be exacerbated if food is also in short supply for females, so that milk production is reduced. Thus the predicted consequences of reduced availability of preferred prey are: an increase in foraging effort, reduced juvenile growth rate, increased mortality during the first months of life, reduced birth and weaned weight of pups, and

(ultimately) reduced birth rates.

5.2 Available evidence

The best evidence for these effects comes from studies of otariid seals, where females forage during lactation and are thus sensitive to changes in the local availability of preferred prey species. However, Härkönen and Heide-Jørgensen (1991) present evidence of the effects of an increase in the availability of small fish in the Kattegat/Skagerrak on the growth rates of yearling harbour seals, and Thompson et al. (1991) have documented changes in the foraging behaviour of harbour seals in the Moray Firth following a reduction in inshore abundance of overwintering clupeids.

5.3 Predicted changes

The species composition of fish stocks in the North Sea is currently changing, with a recovery of herring stocks and a decline in some gadoid stocks. This should result in an improved situation for marine mammals which are believed to prey preferentially on herring, such as the harbour porpoise. However, there is no evidence that the condition or fecundity of harbour porpoises declined during the period when herring stocks were low (Clausen, 1991). If grey seals switch from feeding on demersal fish to feeding on herring this might result in a significant reduction in the numbers of the nematode parasite *Pseudoterranova decipiens*, which seals acquire from demersal species, in the stomachs of seals in coastal waters. Monitoring the parasite burden in seal stomachs could therefore provide an indirect indication of changes in seal diet.

5.4 Requirements for research

The Study Group identified some populations which were likely to provide good evidence of the effects of changes in prey abundance on the population dynamics of marine mammals. These included populations where foraging behaviour had already been monitored for some time (such as harbour seals in the Moray Firth and Kattegat/Skagerrak), those in enclosed areas of water (such as the Wadden Sea) where abundance of some potential prey species is monitored on a regular basis, and those whose size is likely to change rapidly in the near future (such as the harbour seal population of the Kattegat/Skagerrak).

The difficulty in interpreting retrospective studies, which are initiated after a major change in the abundance of one or two prey species, was illustrated by recent changes in the East Ice harp seal population. There has recently been a substantial change in the age-structure of seals shot on moulting patches. Large numbers of seals in poor condition invaded northern Norwegian waters in 1986, 1987 and 1988. This coincided with a major decline in the abundance of capelin and cod in the Barents Sea. However, it was not clear to what extent the changes in harp seal age-structure are due to changes in food availability, large scale mortality in fishing nets (which was also recorded in 1986, 1987 and 1988, and had occurred at a lower level for some years before this), the release of toxic chemicals into the White Sea (which occurred in 1990), or some other factors.

6. METHODS FOR SELECTING, COLLECTING AND ARCHIVING DATA

6.1 Surveys and sightings

The Study Group noted that a detailed protocol for the design, execution and analysis of boat or aerial surveys of cetaceans based on line transect theory had been developed by the Scientific Committee of the International Whaling Commission (see Hiby & Hammond, 1989). It recommended that this protocol should be adopted wherever possible for surveys conducted within the area for which it was responsible. The Study Group noted that estimates of abundance from large scale surveys are likely to have wide confidence limits, and are therefore not suitable for monitoring population trends. However, they are very useful for identifying areas of local abundance where monitoring schemes may be operated.

Standardized techniques had also been developed for surveys of harbour, ringed and grey seals. These surveys are normally carried out by national or international programmes which have their

own arrangements for data selection and archiving. The Study Group saw no advantage in a central archive for such data, although it considered that its own meetings provided a useful opportunity for documenting these surveys and for collating their results into a single document.

Dedicated surveys for marine mammals are the most useful source of information on abundance and distribution. However, the Study Group had already made considerable use of information collected on shipboard and aerial surveys for seabirds conducted by the Netherlands and Britain. It noted that if such surveys were well designed and if data on marine mammal sightings were collected in a systematic way they could provide useful additional information. It might be possible to collect similar data by placing trained observers on research vessels involved in coordinated surveys of fish stocks now being conducted under the ICES umbrella. In addition, sightings of small cetaceans had been collected as part of the NASS87 and NASS89 surveys for large cetaceans conducted by Iceland, Norway, Denmark, the Faroes, Spain, the UK and the USA with the participation of the IWC. However, estimates of abundance had yet to be extracted for species other than harbour porpoise and pilot whale.

The Study Group therefore recommended that scientists involved in the collection of these datasets should be invited to its next meeting and that an attempt should be made to extract as much information as possible on seal and small cetacean distribution and abundance from these datasets. In addition, a protocol should be developed for the collection of data of small cetacean sightings on surveys targeted at other species.

6.2 Strandings

For some species, strandings are the only source of material for scientific study. In addition, carefully collected strandings records could provide supplementary information on by-catch levels. However, the Study Group noted that it was extremely unlikely that there was a consistent relationship between strandings and population size, and that surveys of stranded animals should not be seen as a substitute for dedicated shipboard or aerial surveys.

Coordinated schemes for recording and sampling stranded animals have been developed in England and Wales, the Netherlands, Germany, Denmark, Sweden and France. Although the set of information that was collected in each country was not identical it was, in practice, very similar. The Study Group concluded that it was unlikely that there would be agreement on a common format for the collection of such data. There were, however, well-developed national schemes for archiving this information and for making material available to other interested scientists. It therefore believed that the proposal it had made at its last meeting for a central repository of core information on stranded animals was no longer necessary.

The Study Group did recommend that sampling of stranded animals should be targeted at species of particular interest and at unusual occurrences. In most countries there was good baseline information so that unusual events could be recognized.

6.3 By-catch

By-caught animals provide a source of material whose provenance is better documented than for stranded animals and which is usually in better condition. It was therefore important that such animals are made available for study whenever possible. The Study Group noted that the only national schemes which had been successful in obtaining such material on a regular basis were those where some payment was made to fishermen who landed their by-catch. It was unlikely that such payments would lead to a directed catch of small cetaceans. A CITES permit may be required for such landings, but this could be held by the scientists responsible for the programme.

7. PLANS FOR AN ICES WORKSHOP ON THE DISTRIBUTION AND SOURCES OF PATHOGENS IN MARINE MAMMALS

Recent mass mortalities of striped dolphins, harbour seals and Baikal seals as a result of infection with pathogens had highlighted the potential importance of such events in the population dynamics of marine mammals. There was a particular need to modify existing epidemiological mathematical models, which had been developed for diseases of man and his domestic animals, so that they were more appropriate for the analysis of the impact of pathogens on wild populations. It was also important that biologists and veterinarians investigating such incidents were aware of the kinds of information which were required for epidemiological modelling and that modellers were aware of the limitation on data collection in the field.

The Study Group noted that the Isaac Newton Institute for the Mathematical Sciences, Cambridge, UK was planning a series of workshops on exactly these topics from 15-19 March 1993 and encouraged interested ICES scientists to attend. It also recommended that ICES convene a workshop on The Impact of Pathogens on Marine Mammal Populations. This could be held in Cambridge immediately after the Isaac Newton Institute workshop; the Sea Mammal Research Unit offered to host the ICES workshop.

The aims of the workshop would be to:

(a) review the sources and potential effects of pathogens which might occur in marine mammals and provide an inventory of natural and anthropogenic disease agents;
(b) consider the role of contributory factors in disease outbreaks.
(c) develop a protocol for the study of any future outbreaks among marine mammals;
(d) consider the likely risks of future disease events and their likely consequences, in particular for endangered species and threatened populations;
(e) assess the likely effects of climate change on these risks;
(f) conduct a retrospective analysis of information collected during the 1988 phocid distemper epidemic as a case study of the approach developed during the workshop.

8. OTHER RESEARCH REQUIREMENTS

In addition to the research needs that the Study Group had identified under specific topics, it noted the lack of information on seal numbers from Ireland and recommended further research in this region. It also noted the need for more detailed information on the nature of gill net fisheries in inshore waters and the amount of effort dedicated to these fisheries.

Considerable quantities of data were now being collected on the distribution and behaviour of marine mammals at sea. Ultimately such data could be used to determine how oceanographic features affected this distribution and to identify critical habitat areas for marine mammals. However, there was a need for high resolution oceanographic data, in a common and accessible format, which could be used to interpret the results of these studies.

The Study Group strongly supported the proposal now being made to the European Commission for a synoptic survey of small cetaceans in the North Sea. However, it noted that information on the proportion of time that small cetaceans spent at the surface and on their visibility from the air and sea would be needed to convert density estimates from these surveys into estimates of overall abundance. It recommended further research on this topic.

9. FUNCTION OF STUDY GROUP AND RESPONSE OF ICES TO REQUEST FOR ADVICE ON MARINE MAMMALS

There are now a number of bodies (such as the North Sea Task Force, the Commission of the European Communities and the Secretariat for the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas) which will be seeking scientific advice on the management

and conservation of marine mammals. Many of these requests for advice are likely to involve a complex set of issues including direct exploitation, the effects of environmental contaminants, and indirect and multispecies effects. ICES is an appropriate organization to provide advice on such issues because it has a long history of dealing with multidisciplinary problems of this kind. However, the current infrastructure for dealing with such issues (which overlap the responsibilities of ACMP, ACFM and the Marine Mammals Committee) may need to be reviewed. Any Study Group or Working Group which is formed to provide advice on exploitation should obviously report to ACFM. However, it should be recognized that the management procedures now being developed by the International Whaling Commission for the exploitation of large cetaceans are philosophically and structurally different from those currently used by ACFM.

For other issues there is a need for a more interdisciplinary approach which involves substantial variation from meeting to meeting in the composition of the Study and Working Groups involved, and improved communication with other Groups (such as those on Harp and Hooded Seals, Pilot Whales, Pathology and Diseases of Marine Organisms, Biological Effects of Contaminants, and Ecosystems Effects of Fisheries Activities). However, there should be a core of expertise on marine mammals to maintain continuity. The Study Group considered that this might be achieved if it became a Working Group which could respond to requests to ICES for advice on multidisciplinary aspects of the management of marine mammals.

There would be a need for flexibility in the nominated membership of this proposed Working Group and it might be necessary for the ICES Secretariat to approach Delegates about specific nominations. The Working Group would also need to be more immediately aware of activities within related Working Groups. This improved communication might be achieved if an ICES officer attended meetings of as many Working Groups as possible so that he/she could keep members of these groups aware of new developments.

10. DATE AND TERMS OF REFERENCE FOR FUTURE MEETINGS

The Study Group recommended that it meet again as soon as possible after the 1992 Statutory Meeting to:

(a) review new information on the status of seals and small cetaceans in its area of responsibility;
(b) develop a standard protocol for the deployment of observers to record by-catches, and review progress with pilot studies;
(c) 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.

It was possible that separate meetings would be required for items (b) and (c) because each would require a significant number of invited participants.

11. RECOMMENDATIONS

Recommendations relating specifically to population health can be found in section 3. They have been highlighted in boldface type. In addition to its recommendations concerning its next meeting, the Study Group recommended:

1. That specimens from seal populations outside the Baltic and Wadden Sea should be examined to determine the incidence of paradontitis and alveolar exostosis, which are believed to be associated with high contaminant levels.

2. An integrated survey of the distribution and abundance of small cetaceans in the North Sea, along the lines of a recent proposal to the European Commission's NORSPA programme. In the meantime, further research on the proportion of time that small cetaceans spend at

the surface and on their visibility from the air was needed.

3. That records should be kept of marine mammal carcasses which are found in ghost nets which are recovered as part of national collection and disposal programmes

12. OTHER BUSINESS

The Study Group thanked Paul Thompson and his colleagues at the Lighthouse Field Station of the University of Aberdeen for providing logistic support for the meeting and arranging local facilities in such an efficient way.

13. REFERENCES AND WORKING PAPERS

Anon. 1991. Compte rendu des travaux du groupe *ad hoc.* "Mortalité de petits cétacés, essai d'évaluation. IFREMER, Nantes. 15 April 1991.

Bjørge, A. 1991. Status of the harbour seal *Phoca vitulina* L. in Norway. *Biol. Conserv.* **58**: 229-238.

Bjørge, A., and N. Øien 1990. Distribution and abundance of harbour porpoise *Phocoena phocoena* in Norwegian waters. Paper SC/42/SM3 submitted to Scientific Committee of the International Whaling Commission.

Clausen, B. 1991. Health status and bycatch of harbour porpoise (*Phocoena phocoena*) in Danish waters. Paper SC/090/G56 presented at International Whaling Commission Workshop on Mortality of Cetaceans in Passive Fishing Nets and Traps. La Jolla, California,.

Gjertz, I and N. Børset (in press) Pupping in the most northerly harbor seal (*Phoca vitulina*). *Mar. Mamm. Sci.* **8**.

Härkönen, T., and M.-P. Heide-Jorgensen. 1991. The harbour seal *Phoca vitulina* as a predator in the Skagerrak. *Ophelia* **34**(3): 191-207.

Haug, T., G. Henriksen, A. Kondakov, V. Mishin, T. Morset, K.T. Nilssen, N.E. Skavberg, and A. Orjebu 1991. Grey seal investigations in coastal areas of north Norway and the Kola Peninsula during autumn in 1991. Havforskningsinstituttets Tromsoavdeling, Norges Fiskerihogskole, Tromso. Rapport SPS 9110. 19pp.

Heide-Jorgensen, M.P., T. Härkönen, and P. Åberg. (in press) Long-term effects of epizootic in harbor seals. *Ambio*

Hiby, A.R., C.D. Duck, and D. Thompson. 1992. Seal stocks in Great Britain: Surveys conducted in 1990 and 1991. *NERC News* (January 1992): 30-31.

Hiby, A.R., and P.S. Hammond. 1989. Survey techniques for estimating abundance of cetaceans. *Rep. int. Whal. Commn* (Special Issue 11): 47-80.

Kinze, C.C. 1991. Incidental catches of harbour porpoises (*Phocoena phocoena*) in Danish waters 1986-89: Recent data and behavioural implications. Paper presented at International Whaling Commission Workshop on Mortality of Cetaceans in Passive Fishing Nets and Traps. La Jolla, California,.

Leopold, M., and P.A. Wolf. (in press) The elusive Harbour porpoise exposed: strip-transect counts off southwest Ireland. *Neth. J. Sea Res.*

Lick, R. 1991. Parasites from the digestive tract and food analysis of harbour porpoise *Phocoena phocoena* from German coastal waters. In *European Research on Cetaceans. Proceedings of the Fifth Annual Conference of the European Cetacean Society, Sandefjord, Norway, 21-23 February 1991* Evans, P.G.H. (Ed.) ECS, Cambridge. 13-19.

Mortensen, P., A. Bergman, A. Bignert, H.J. Hansen, T. Härkönen, and M. Olsson. 1991. Förekomst av käkskador hos knubbsäl *Phoca vitulina* från perioden 1835-1988. Naturvårdsverket, Rapport 3987. 18pp.

Prestrud, P., and I. Gjertz. 1990. The most northerly harbor seal, *Phoca vitulina*, at Prins Karls Forland, Svalbard. *Mar. Mam. Sci.* **6**(3): 215-220.

Shomura, R.S., and H.O. Yoshida 1985. Proceedings of the Workshop on the Fate and Impact of Marine Debris, 27-29 November 1984, Honolulu, Hawaii. NOAA-TM-NMFS-SWFC-54. 580pp.

Thompson, P.M., G.J. Pierce, J.R.G. Hislop, D. Miller, and J.S.W. Diack. 1991. Winter foraging by common seals (*Phoca vitulina*) in relation to food availability in the inner Moray Firth, N.E. Scotland. *J. anim. Ecol.* **60**: 283-294.

Wiig, O. 1987. The status of the grey seal (*Halichoerus grypus*) in Norway. Abstract from the Coastal Seal Symposium, Oslo, Norway, 28-29 April 1987.

Woodley, T.H., and A.J. Read. 1991. Potential rates of increase of a harbour porpoise (*Phocoena phocoena*) population subjected to incidental mortality in commercial fisheries. *Can. J. Fish. Aquat. Sci.* **48**(12): 2429-2435.

WP1 Helle, E. and Stenman, O. Baltic seal populations in 1986-90. Translated extracts from Itämeren hyljekannat 1986-1990. Maailman Luonnon Säätiön WWF, Suomen Rahaston Raportteja Nro. 1.

WP2 Heide-Jørgensen, M.-P., Mosbech, A., Teilmann, J., Benke, H. and Schultz, W. The variance of harbour porpoise, *Phocoena phocoena*, densities obtained from aerial surveys.

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Appendix 2
AGENDA

1. Opening of meeting, appointment of rapporteurs.

2. New informartion on the current status of:
    - 2.1 *Phoca vitulina*
    - 2.2 *Phoca hispida*
    - 2.3 *Halichoerus grypus*
    - 2.4 *Phocoena phocoena*
    - 2.5 *Tursiops truncatus*
    - 2.6 Other species

3. Effects of food availability of marine mammals
    - 3.1 Theoretical expectations
    - 3.2 Available evidence
    - 3.3 Predicted consequence of changes in fisheries activity
    - 3.4 Needs for further research

4. By-catches of marine mammals in fisheries
    - 4.1 Information on numbers, and types of fishery involved
    - 4.2 Techniques for assessment of by-catch
    - 4.3 Methods for preventing by-catches

5. Management action required
    - 5.1 Populations whose status is satisfactory
    - 5.2 Populations which are considered to be vulnerable

6. Methods for selecting, collecting and archiving data
    - 6.1 Surveys and sightings
    - 6.2 Strandings
    - 6.3 By-catch

7. Plans for an ICES workshop on the distributions and sources of pathogens on marine mammals

8. Other research requirements

9. Function of study group

10. Date and terms of reference for future meetings