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REPORT OF THE JOINT MEETING OF THE WORKING GROUP ON BALTIC SEALS

AND

THE STUDY GROUP ON THE EFFECTS OF CONTAMINANTS ON MARINE MAMMALS

Stockholm, 14-17 May 1990

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JOINT MEETING OF THE WORKING GROUP ON BALTIC SEALS
AND THE STUDY GROUP ON THE EFFECTS OF CONTAMINANTS
ON MARINE MAMMALS

Stockholm, Sweden 14-17 May 1990

1. Introduction

The Joint Meeting was held at the Swedish Museum of Natural History in Stockholm from 14-17 May 1990 under the chairmanship of John Harwood. Robin Law acted as rapporteur. The Agenda shown in Appendix 1 was adopted. A list of participants can be found in Appendix 2, and a list of Working Papers and associated documents in Appendix 3.

ICES C.Res 1989/2:23:8 had requested that the Joint Meeting should:

a) describe the history and background to the course of the 1988 seal epidemic.
b) provide tabulated and descriptive information on the mortality of seals in 1988 and 1989 on an area-by-area basis, preferably expressed in numbers found dead and percentage of the stocks' maxima in the respective years;
c) examine the available data and reports on possible relationship(s) between contaminant burdens in the seals affected by the epidemic and the wider aspects of disease susceptibility/mortality and reproductive failure as affected by contaminant burdens;
d) given the major changes in seal abundance due to the epidemic, describe the mechanism for and feasibility of assessing the importance of seal predation in determining fisheries yield and the relationship between seal abundance and levels of nematode infection in commercial fish, and inform the Working Groups on Multispecies Assessment of Baltic Fish and the Multispecies Assessment Working Group about its findings.

In addition, the Joint Meeting received a telefax from ICES Headquarters requesting that it consider some issues which arose during the 4th meeting of the North Sea Task Force. ICES had volunteered to coordinate activities under the following items of Annex 5 on the Protection of Species and Habitats:

1.1 common and grey seal population studies including migration, diet, disease and environmental factors, survey techniques; establishment of blood and tissue bank for future study of pathogens and contaminants; establishment of a data inventory including planned research;

1.2 studies to establish the source and characteristics of the 1988 seal epidemic, including immune response and the role of contaminants; identification of vulnerable colonies, their causes of decline, quality of habitat, and restoration techniques;

1.3 an international register recording all reports of strandings of marine mammals including external characteristics, post mortem analysis, age, health, contaminant analysis and relevant research.

2. History and Course of the 1988 Seal Epidemic

The history and course of the epidemic in 1988 is precisely documented in Dietz et al. (1989a). None of the new information available to the Joint Meeting substantially altered the description in this paper.

3. Mortality Caused by the Epidemic in 1988 and 1989

3.1 Numbers of dead seals recorded in 1988 and 1989

The following table indicates the number of dead harbour seals, grey seals and unidentified seals reported to national authorities in 1988 and 1989 using the areas defined in Dietz et al.(1989a):

	1988	1989
Western Baltic	143+3grey	4+3grey
GDR	9+2grey	
Kattegat	3909+3grey	<20
Wadden Sea		
Denmark	1238	22
Schleswig-Holstein	5808+2grey	91
Niedersachsen	1100+4grey	64
Netherlands	417	38+2grey
Skagerrak	1469	18+1grey
Limfjorden	391	1
Norway		
Oslofjord	467	-
Southwest	443	-
North	-	<50
British Isles		
East Anglia and NE England	316+57grey+1115unID	13+3grey+27unID
Irish Sea	71+28grey+ 284unID	0+1grey+ 4unID
Orkney	159+ 4grey+ 369unID	66 + 3unID
W & N Scotland	185+40grey+ 349unID	14+5grey+ 5unID
Shetland	34+ 8grey+ 17unID	2unID
East Scotland	59+23grey+ 52unID	4+7grey+ 4unID

In total more than 18,000 dead seals were recorded in 1988 and less than 500 in 1989. In the Wadden Sea the number of dead seals reported in 1989 was substantially higher than in years before 1988. In the Kattegat/Skagerrak the number of dead seals found in 1989 was not different from the numbers found in years before 1988. But this may have been because fewer pups than expected had been born in 1989, although the numbers at Anholt and Koster had been close to the expected level. This reduction was most noticeable at sites in the south. Almost all of the animals found dead in normal years were pups.

Seals showing symptoms of infection with the phocine distemper virus (PDV) had been recorded in Norway, Scotland and the Wadden Sea in 1989. Pneumonia had been recorded for the first time in Baltic seals in 1988. It was observed also in 1989, but it was not associated with other symptoms of PDV infection.

3.2 Reliability of reports

In all areas apart from the north and west coasts of Norway and the British Isles it was believed that at least 95% of all animals dying in 1988 had been recorded. This was because the deaths had occurred in relatively closed bodies of water and the carcasses had tended to float because of the effect of pneumonia. However, in the British Isles this phenomenon had probably resulted in a substantial proportion of carcasses being carried away from the coast and therefore not recorded. An approximate estimate of the level of under-reporting could be made if it was assumed that the proportion of seals hauling out on the east coast of England in August was the same as that estimated by Härkönen and Heide-Jorgensen (in press a) for seals in the Kattegat/Skagerrak. In this case, it was estimated that 2700 harbour seals had died in East Anglia in 1988, but onlJorgensen 1400 (approximately 50%) had been found. Some of these missed carcasses may have washed ashore in the northern part of the Wadden Sea.

In the Kattegat/Skagerrak, western Baltic and Wadden Sea almost all of the dead animals which were examined in 1988 showed evidence of severe pneumonia, indicating that they had probably died as a result of PDV infection, or had been abandoned or born prematurely as a result of this infection. However, in the British Isles only about 50% of the small number of carcasses examined in detail had shown these symptoms.

Species identification was considered to have been accurate in most areas because there were only small populations of grey seals in these localities. However, in the British Isles there are approximately three times as many grey seals as harbour seals. In this area, species identification was not reliable, as indicated by the high proportion of unidentified animals. Similar problems may have existed in southwest and north Norway. However, on the basis of the locations where animals were found it was believed that the majority of unidentified animals in the UK were harbour seals. Identifications had been more precise in 1989 because most reports had come from naturalists and conservation groups.

3.3 Results of surveys conducted before and after the epidemic

The Joint Meeting concluded that the most reliable way to estimate the mortality caused by the epidemic was to compare the results of surveys conducted before and after the epidemic, provided these had used the same techniques. This comparison should take account of expected population trends.

In the Kattegat/Skagerrak aerial surveys had been conducted in August 1988 after mortality due to the epidemic had ceased. Until 1988 the population had been increasing by 11% per annum and it was possible to calculate the expected population in August 1988 (see Harkonen and Heide-Jorgensen, in press a). Results of land-based pup surveys carried out in the Kattegat/Skagerrak throughout June, July and August 1989 showed that pup production was lower than expected in the seal groups where the disease had its highest intensity from the end of June to the end of July.

In the Wadden Sea and the British Isles the equivalent surveys had been conducted in July and August 1989. The harbour seal population in the German Wadden Sea had been increasing up to 1988 and an expected population size in 1989 had been calculated on this basis (WP13). There was no precise information on rates of change for harbour seal stocks in the British Isles and it had been assumed that these were stationary.

3.4 Mortality on an area-by-area basis

The results of surveys in 1988 and 1989 and the calculated mortality are shown below:

Kattegat	expected 1988	1666	observed 1988	732
	mortality	0.56		
Skagerrak	expected 1988	5287	observed 1988	2239
	mortality	0.60		
Oslofjord	mortality	0.80[a]		
Wadden Sea	expected 1989	12000	observed 1989	4500
	mortality	0.60		
British Isles				
East Anglia	expected 1989	3900	observed 1989	2013
	mortality	0.48		
Irish Sea	expected 1989	750	observed 1989	449
	mortality	0.40		
Orkney	expected 1989	6616	observed 1989	7070
	mortality	0.00		
West Scotland	expected 1989	3498	observed 1989	3605
	mortality	0.00		
East Scotland	expected 1989	1180	observed 1989	1004
	mortality	0.15		

[a] result from WP1, basis for calculation not specified.

It was possible to calculate approximate 95% confidence limits for the mortality estimates from the Kattegat/Skagerrak. These are 0.48-0.72. The estimates of mortality from the British Isles may be biased downwards if the stocks involved had been increasing before the epidemic. Nevertheless the Joint Meeting recognized that the observed mortality in Scotland must be significantly lower than that observed elsewhere in NW Europe.

It was impossible to calculate mortality for the western population of Baltic harbour seals because there were no estimates of the size of the portion of the population in Danish waters. Similar problems existed for the calculation of mortality in Limfjorden. However, in both areas mortality was believed to be of a similar order to that estimated for the Kattegat/Skagerrak and Wadden Sea. The Joint Meeting recommended further work on the status of harbour seals in the Baltic.

3.5 Status of other North Sea and Baltic seal stocks.

Pup production at UK grey seal colonies in 1988 had been c15% less than expected. It was not known whether this was the result of mortality or abortions caused by PDV infection (over 90% of all breeding grey seals tested had significant antibody titres), or of increased human disturbance at the colonies. If the decline in pup production in 1988 had been the result of abortions, then production in 1989 should have risen to a level expected from the trend observed before 1988. However, although pup production in 1989 was higher than in 1988, it was not as high as expected.

During 1989 there was a substantial increase in the numbers of grey seals counted at Svenska Bjorn on the east coast of Sweden (WP2). This was believed to be a result of reduced ice coverage because of the unusually mild winter of 1988/89. Counts of grey seals in Finnish waters during 1989 were the highest in this decade. Figures recently provided by Estonian scientists indicated that there was a substantially higher population of grey seals in Soviet waters than previously believed. The minimum estimate for the Baltic grey seal population was therefore revised upwards from 2000 (ICES CM.1989/N:9) to 2500-3000 animals. The Joint Meeting recommended further work on the movements of grey seals in the Baltic to establish the relationship between seals observed in Swedish, Finnish and Soviet waters.

Aerial surveys of ringed seals in the Bothnian Bay during 1988 (Härkönen and Heide-Jorgensen, in press b) had indicated a population on the ice of 2,300 (95% confidence limits +24%) in the Bothnian Bay area. These results were not significantly different from those obtained by Finnish scientists in 1984 and 1987, and from the preliminary results of similar surveys in 1989 and 1990.

4. Effects of contaminants on the immune system and reproduction

WP11 provided information on PCB and DDT levels in harbour seals found dead in the British Isles during 1988, and in seals which were still alive in early 1989. Blood samples had also been collected from the live seals to determine whether they had been exposed to PDV and to assess the strength of their immune system. Although in some regions the dead animals appeared to have higher levels of contaminants, there was no consistent relationship between levels and mortality. The authors concluded that these data provided no clear evidence that the organochlorine contaminants which had been measured were directly involved in mortality, although other indirect effects could not be excluded. They also concluded that further analysis of large numbers of samples from seals found dead during the epidemic was unlikely to clarify this. The Joint Meeting agreed with these conclusions, but noted that the proportion of different contaminants found in seals would provide some indication on the potential threats to them in different regions, and of general organochlorine levels over the area used by the seals for feeding. Preliminary analysis of data on immune system strength in the same animals showed no clear relationship between immunoglobulin levels and contaminant levels or exposure to PDV. However, there were weak correlations between thymulin levels, anti-CDV titre in virus neutralization tests and total PCB levels (based on the sum of seven congeners). Thymulin levels are related to thymus gland activity, and therefore provide some broad indication of white blood cell production (see WP3 from the previous Joint Meeting, 15-18 May 1989). Other work linking immune system activity and PCB intake is described in ICES CM 1989/N:9.

WP8 summarized the results of experiments in which mink were given food containing clophen A 50, or aliquot fractions containing chlorobiphenyls with 0, 1- or 2-4 ortho chlorines. A fourth fraction contained mainly bicyclic and tricyclic chlorinated substances such as naphtalenes and dibenzofurans. The reproduction of mink fed clophen A 50 and fractions containing only 0, 1- and 2-orthochlorines was significantly reduced, although the single fractions could not explain the entire deterimental effect seen in the group fed the commercial mixture. When animals were fed combinations of fractions it was clear that the 0 and 1-ortho fractions together did explain the effect on reproduction. Only one of the PCB congeners chosen by ICES for individual analysis is of this type.

WP15 provided data on organochlorine levels in seals from the Antarctic, Spitzbergen, Iceland, the Baltic and the German North Sea. The highest DDT levels were recorded in the Baltic, and the highest PCB levels in the Baltic and German North Sea. The Joint Meeting welcomed this analysis using identical methods on samples from animals covering a wide geographic area. However, it recommended that, in future, it would be preferable to standardize the age, sex and cause of death of the animals which were compared in this way.

The results in these working papers confirmed the conclusions of the previous joint meeting that seals in the Baltic and parts of the North Sea carried levels of organochlorine contaminants which were likely to affect their reproductive ability and possible their resistance to disease. Results of experiments with mice (Jonsson et al, in press) had indicated that the methylsulphonyl metabolites of DDE could have a substantial effect on adrenal gland activity. The primary cause of the disease complex observed in Baltic seals is pathological changes in the adrenals. Methylsulphonated metabolites of DDE and PCB have been found in Baltic seals (Jansson et al., 1975). The Joint Meeting therefore recommended that more work should be done on the biological effect of these compounds and on their levels, and those of 0 and 1-ortho PCBs, in marine mammals.

The first meeting of the Study Group on the Effects of Contaminants on Marine Mammals had discussed the case of beluga whales in the St Lawrence River, Canada where a high incidence of disease had been linked with high levels of organochlorines, particularly mirex. Samples for organochlorine analysis were still being collected from animals found dead, and full autopsies were carried out whenever possible by the Quebec Veterinary College. Twenty animals had been examined in 1989.

5. Assessment of impact of seals on fisheries and on levels of nematode parasites

5.1 Information required to assess the impact of seals on fisheries

A full evaluation of the interaction between seals and commercial fisheries requires information on the species, size classes and quantities of fish consumed by seals, and the location where they are consumed. Similar information is also required on fisheries activities and on the size and population biology of the fish stocks involved (see Harwood and Croxall, 1988).

5.2 Areas within the ICES region where such information has been collected and where seal numbers have changed substantially as a result of the epidemic.

There is no locality in the ICES region where all such information is available. Data on seal diet and movements are available for grey seals in the North Sea, harbour seals in the Skagerrak (particularly around Koster and Anholt), and harbour seals in the Wadden Sea. However, in none of these cases is there detailed information on the biology of the fish stocks involved. Both the Skagerrak and Wadden Sea populations were reduced by about 60% as a result of the epidemic (see Section 3.4).

5.3 Potential research projects

Despite its previous enthusiasm about the opportunities for research on the effects of seal predation following the epidemic (ICES CM 1989/N:9), the Joint Meeting noted that it would be difficult to interpret the changes in fisheries catches which might follow decreases in seal numbers. This was because of the large number of other factors which may influence fish abundance and catches. It recognized that studies of seal diet in areas where there was already good data on diet before 1988 (like the Koster archipelago), or where there are good data on fish abundance collected independently from commercial fisheries (such as Väröhalvön, described in WP3) would provide valuable information. It also noted that an area like the eastern part of Limfjorden, where there are well-defined local seal and fish populations and there is some information on fish abundance, might provide a suitable study site for monitoring the long term effects of a recovering seal population on fish stocks. However, such studies were unlikely to yield conclusive results in the short term.

5.4 Nematode parasites

The grey seal and the common porpoise are believed to be the principal final hosts for two economically important nematode parasites of fish (Pseudoterrranova decipiens in the case of grey seals, and Anisakis simplex in the case of the porpoise). An extensive study of the ecology of Pseudoterranova is now under way in Canada. Preliminary mathematical modelling of the parasite's epidemiology in the UK had indicated that parasite levels in fish were related to seal abundance in a complex way. WP7 provided information on the abundance of nematode parasites in the stomachs of harbour seals from the Kattegat/Skagerrak. It indicated that adult Pseudoterranova occurred frequently in harbour seal stomachs, but only young Anisakis were found. The Joint Meeting concluded that harbour seals were therefore probably not economically important hosts for Anisakis but suggested their potential role should be considered when mathematical models of the dynamics of Pseudoterranova were being developed.

6. Response to requests from the North Sea Task Force

The Joint Meeting concluded that the most effective response to the first request from the North Sea Task Force would be to amalgamate the Working Group on Baltic Seals and the Study Group on the Effect of Contaminants on Marine Mammals into a new Working Group on Seals and Coastal Dolphins in the Baltic, North Sea and Irish Sea. This would consider the status and health of marine mammal populations in three major sea areas where there is concern about the effects of disease and contaminants. Dolphins have been included because of concern about the status of some North Sea populations and because the North Sea states recently signed a Memorandum of Understanding about their conservation. Draft terms of reference are provided in Appendix 4.

6.1 Source and characteristics of the seal virus

Information on the characteristics of the 1988 epidemic are given in Section 2 and 3. The origin of the virus is still unclear although research is underway in laboratories in the UK, Netherlands, Denmark, Sweden and the Federal Republic of Germany on the structure of the virus and its relationship to other morbilliviruses (such as canine distemper virus - CDV), and on the prevalence of these viruses in seal populations in the North Atlantic. Preliminary work (Dietz et al., 1989b) has already indicated that ringed and harp seals around Greenland, and harbour seals in Canada (ICES CM 1989/N:19) have been exposed to morbilliviruses. The viruses known to occur in Antarctic and Baikal seals appear to be more closely related to CDV than to PDV (Bengtson et al., in press; Osterhaus et al., 1989).

6.2 The role of contaminants in the epidemic

Work on contaminant levels in seals which is planned or under way is summarized in the following table.

Contaminant	Country	Species	Region[1]
PCB & DDT	Sweden	young harbour grey & ringed	K, S, B Bothnian Bay
	Finland	incidental caught grey & ringed	B, Bothnian Bay
	FRG	harbour	WS
PCB congeners	Sweden	young harbour grey & ringed	K, S, B Bothnian Bay

	FRG	harbour	WS
	Denmark	harbour	K, WS, Limfjorden
	UK	harbour, grey dolphins	particularly Irish Sea
dioxins & dibenzofurans	Sweden	young harbour grey & ringed	K, S, B Bothnian Bay
	Denmark	harbour	K, WS, Limfjorden
toxaphene, chlordane methylsulphonates	Sweden	young harbour grey & ringed	K, S, B Bothnian Bay
heavy metals	Sweden	young harbour grey & ringed	K, S, B Bothnian Bay
	FRG	harbour	WS

1. K=Kattegat, S=Skagerrak, WS=Wadden Sea, B=Baltic proper

The Swedish research programme also includes studies of age- and sex-related variation in substances being analysed. Results from the Finnish studies should be ready by 1991, from Sweden by the end of 1991, and from Denmark by early 1992. It may be some time before the results of other studies are complete.

Studies of the effects of organochlorines on the immune system of captive harbour seals and free-living grey seals are planned in Germany, the Netherlands and the UK. The University of Munich is comparing the histology of spleen and lymph nodes from Icelandic and Wadden Sea harbour seals.

The Joint Meeting noted that it was important that the analyses of these studies should be carried out in a comparable way, and presented and archived in a common format. It recommended that ICES should offer to act as the centre for this.

6.3 Vulnerable populations and causes for concern

Although the North Sea Task force has requested information on vulnerable colonies, the Joint Meeting considered that it was more meaningful biologically to consider populations. It noted that, although a number of harbour seal populations around the North Sea had suffered substantial mortality as a result of the seal epidemic, only the population in the Baltic could be described as vulnerable. Overall the only seal populations in NW Europe which were potentially vulnerable were those in the Baltic. The Joint Meeting welcomed the news that Finland had not granted any licences for the hunting of ringed seals for the past two years.

Continuing autopsies of Baltic seals have shown symptoms of hyper-adrenocorticism, even in fairly young animals, indicating that the disease complex can still develop. Hyper-adrenocorticism had also been reported in harbour seals from Schleswig-Holstein (WP16). The Joint Meeting noted that, although the levels of organochlorines in the Baltic had declined (WP15), the decline appears to have levelled off in recent years, indicating that there is still some release of contaminants. A similar phenomenon had also been noted in the North and Irish Seas. It therefore recommended further work to identify the nature and source of these imputs.

The other threats to seal populations in the Baltic were from drowning in fishing nets and disturbance at pupping sites. The Joint Meeting recommended further work on the modification of fishing gear to reduce the numbers of seals entangled, especially in areas where the population is regarded as vulnerable. It also recommended the maintenance of existing protected areas for seals in the Baltic and the establishment of new ones where appropriate.

6.4 International reporting and study of stranded marine mammals

The Joint Meeting noted that a number of international organizations (including the International Whaling Commission, the European Seal Group, and the European Cetacean Society) had already developed guidelines for examining and sampling stranded marine mammals. It did not have access to these guidelines at this meeting, but suggested a list of items which should be given priority. These are listed in Appendix 5. The decision to collect more detailed samples from a particular stranding would depend on the marine mammal species involved, its condition and location, and on national research priorities and the availability of suitable specialist facilities.

7. Advice to the Working Group on Multispecies Assessment of Baltic Fish Stocks

The Joint Meeting noted that the only seals in the Baltic which had been affected by the epidemic were harbour seals in the western part. This population had been reduced from low to very low numbers. This change was not likely to have any effect on fish stocks in the Baltic.

8. Advice to the Multispecies Assessment Working Group

Although some of the harbour seal stocks in the North Sea had been substantially reduced in size by the seal epidemic, the dominant marine mammal predator in the area was the grey seal. This has been less affected than the harbour seal. The Joint Meeting noted that the effects of harbour seak predation on fish stocks were only likely to be important on a local scale, and these were not modelled explicitly by the Working Group.

9. Advice to ACMP

The Joint Meeting noted that none of the results presented at this meeting, or the previous meeting had indicated a direct link between organochlorine contaminants and the extent or severity of the 1988 seal epidemic. However, evidence that these compounds could have a detrimental effect on reproduction and disease resistance continued to accumulate. Progress had been made on establishing the mechanism for this and on the identification of the particular compounds involved.

In particular, more research was required on the levels and biological effect of metabolites of organohalogen compounds, and of 0 and 1-orthochlorine molecules. Studies of the possible synergistic effect of these compounds on enzyme induction were also needed.

Evidence from the Baltic, North and Irish Seas indicated that organochlorine contaminants were still entering the ecosystem. The Joint Meeting recommended further research to identify the source and nature of these inputs, and to develop safe methods of disposal. It noted that the wide range of contaminant levels found in seals from some areas, which appeared to be the result of different feeding strategies, might provide a means for locating contamination "hot spots". Marine mammals may also be useful indicators of the entry of new compounds into the marine environment. The meeting strongly endorsed the agreement by North Sea states to remove and destroy all PCBs by 1998.

10. Recommendations

The Joint Meeting recommended:

1. That the Working Group on Baltic Seals and the Study Group on the Effect of Contaminants on Marine Mammals should be replaced by a single Working Group on Seals and Coastal Dolphins in the Baltic, North and Irish Seas.

2. That ICES should offer to coordinate the assessment and compilation of the results of analysis of contaminant levels in seals found dead during the 1988 epidemic.

3. That the status of the harbour seal population in the Baltic proper should be determined as a matter of priority.

4. That further research was required on the movements of grey seals between Swedish, Finnish and Soviet waters in the Baltic, and to improve methods for the international assessment of Baltic grey seal population.

5. That efforts be made to reduce the number of seals which are drowned incidentally in Baltic fisheries.

6. That further research was required on levels and biological effects of the metabolites of PCBs and DDE, and of 0 and 1-ortho PCBs in marine mammals.

7. That further efforts be made to identify the source and nature of continuing inputs of organochlorines to the Baltic, North and Irish Seas.

APPENDIX 1

AGENDA

1. Chairman's introduction and appointement of rapporteurs.

2. History and course of the 1988 seal epidemic.

3. Mortality caused by the epidemic
   - 3.1 Number of deaths reported in 1988.
   - 3.2 Number of deaths reported in 1989.
   - 3.3 Reliability of reports.
     - 3.3.1 Animals not reported
     - 3.3.2 Causes of death
     - 3.3.3 Species identification
   - 3.4 Results of surveys conducted before and after the epidemic.
   - 3.5 Calculation and tabulation of mortality of harbour seals
   - 3.6 Status of other North Sea and Baltic seal stocks.

4. Effects of contaminants on the immune system and reproduction.

5. Assessment of impact of seals on fisheries and on levels of nematode parasites.
   - 5.1 Information required to assess the impact of seals on fisheries.
   - 5.2 Areas within the ICES region where such information has been collected and where seal numbers have changed substantially as a result of the epidemic.
   - 5.3 Potential research projects.
   - 5.4 Nematode parasites.

6. Response to requests from the North Sea Task Force
   - 6.1 Source and characteristics of the seal virus
   - 6.2 The role of contaminants in the epidemic
   - 6.3 Vulnerable populations and causes for concern
   - 6.4 International reporting and study of stranded marine mammals.

7. Advice to Working Group on Multispecies Assessment of Baltic Fish

8. Advice to the Multispecies Assessment Working Group

9. Advice to ACMP

10. Recommendations.

APPENDIX 2

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APPENDIX 3

WORKING PAPERS PRESENTED TO THE MEETING

WP1 Markussen, N H Note on seal mortality in Norway

WP2 Helander, B Survey of grey seal and harbour seal at the Swedish Baltic coast in 1989

WP3 Neuman, E Variations in the abundance of fish at a harbour seal colony in Kattegat

WP4 Klingeborn, B Evaluation of presence of antibody to phocine distemper virus in organ material from seal

WP5 Härkönen, T and Heide-Jorgensen, M-P Comparative life histories of east Atlantic and other harbour seal populations.

WP6 Schwarz, J and Heidemann, G Report on the seal epidemic 1988/89 in the Federal Republic of Germany.

WP7 Lunneryd, S G Anisakine nematodes in the harbour seal *Phoca vitulina* in the Skagerrak-Kattegat and the Baltic.

WP8 Bergman, Å, Jensen, S, Kihlstr/om, J E and Olsson, M Effects of various fractions of PCB on mink reproduction. Preliminary results from experimental studies within the Swedish seal project.

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APPENDIX 4

DRAFT TERMS OF REFERENCE FOR PROPOSED WORKING GROUP ON SEALS & COASTAL DOLPHINS IN THE NORTH, BALTIC AND IRISH SEAS

1. Consider the current and future status of seal and coastal dolphin (particularly _Phocoena phocoena_ and _Tursiops truncatus_) populations in the North, Baltic and Irish Seas, to include population size and trends, movements and diet.

2. Evaluate the importance of environmental factors, particularly pathogens, contaminants, fishing activities and disturbance for the status of these populations.

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

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

APPENDIX 5

DRAFT GUIDELINES FOR THE SAMPLING OF STRANDED OR INCIDENTALLY CAUGHT MARINE MAMMALS

On arrival at the site where the animal has been stranded the biologist should make an initial assessment if the animal can be taken back to the laboratory for detailed autopsy, and of its condition. In general, unless the animal has died at the time of the moult, it is not worth carrying out detailed sampling of an animal whose hair can easily be pulled out.

The external appearance and the presence of any wounds, lesions or parasites should be recorded. Photographs should be taken for future identification and records.

Standard measurements (as defined by the American Society of Mammalogists) should be taken.

Blubber thickness over the sternum should be measured, taking care to avoid stretching the blubber.

If the animal cannot easily be removed, the body cavity should be opened and the following organs and tissues removed:

ORGAN	SAMPLE SIZE	STORAGE	PURPOSE
Head	Entire	Frozen	Bone measurements age determination
Heart	Weigh intact		Calibrate body size
Liver	Slice	Formalin	Only if very fresh
	Slice	Frozen	Contaminant analysis
Kidney	Entire	Frozen	Contaminant analysis
	Slice	Formalin	Histology- disease
Muscle	cube from lower back	Freeze	Contaminant analysis
Blubber	200g cube	Freeze	Contaminant analysis
Adrenals	Entire	Formalin	Histology- disease
Reproductive tract	Entire	Split in formalin	Abnormalities
Spleen	Entire	Formalin	Only if fresh - disease resistance
Thymus	Entire	Liquid N2	Only if fresh - disease resistance
Bladder	Entire	Formalin	Morbillivirus
Rib	One entire	Freeze	Contaminant analysis
Humerus	Entire	Freeze	Contaminant analysis

If the animal can be removed to a suitable laboratory a much more detailed autopsy can be performed.

If the animal is known or believed to have died as a result of entanglement in fishing gear, the following information should also be recorded:

Type of fishing gear, where set, depth of water, target fish, how animal was caught, nature of external wounds (if any).