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Report of Activities



**MARINE MAMMALS COMMITTEE**

by

**P.J.H. Reijnders**

**1988**

CANADA

(K. Ronald)

Seals

Harp and hooded seals. Continuation of research on the ecological energetics of harp and hooded seals (D.M. Lavigne, Zoology, University of Guelph, Ontario, in collaboration with S. Innes, Guelph and K.M. Kovacs, University of Waterloo).

Harbour, harp and Weddell seals. Field studies of in-air (harbor seals) and underwater (harp and Weddell seals) vocalizations are examining various seasonal and long-distance communication strategies. (J.M. Terhune, Dept. Biology, University of New Brunswick, St. John, N.B.).

Harbour seals. A laboratory project is examining the hearing abilities of a harbour seal, with special emphasis on the influence of masking sounds. An examination of the interactions between the Bay of Fundy, Canada, harbour seal population and the local herring and reactions to human disturbance are underway (J.M. Terhune, Dept. Biology, University of New Brunswick, St. John, N.B.).

Hooded seals. Between September 1986 and August 1988, blood samples were collected from a colony of captive hooded seals. Plasma was analysed by radioimmunoassay for the content of reproductive hormones.

Estrone-sulfate and progesterone were investigated in female hooded seals, while testosterone concentrations were determined from plasma samples of the male hooded seals (L.M. Noonan and K. Ronald, Zoology, University of Guelph, Ontario).

The platelets of hooded seals are being examined both biochemically and morphologically as to form and function. There appears to be a marked decrease in most of the platelet phospholipids upon stimulation with thrombin. It is also suggested that the high eicosapentaenoic acid and low arachidonic acid in the platelets may offer a pathway for understanding physiological mechanisms associated with the marine mammal being free of atherosclerosis. The structure of the platelets appears to be very similar to the human and offers a working model for the study of

human cardiovascular modifications that may be associated with disease (J. Miller and K. Ronald, Zoology, University of Guelph, Ontario). An initial experiment was carried out on evaluating the blood flow and oxygen energetic requirements of deep seal muscle during dive. The probe, although useful for terrestrial animals will have to undergo major modifications before it can be used for aquatic species. This may however lead to a full understanding of the aerobic/anaerobic function of muscle during deep dives (K. Keiver and P. Hochachka, Zoology, University of British Columbia; B. Chance, University of Pennsylvania; K. Ronald, Zoology, University of Guelph).

#### Grey seals

Twenty-one mature adult seals have been air-lifted from eastern Canada to Guelph. These animals will be examined as to their complete hormone cycles (male and female) and subsequently as to the effect of an anti-ovulant. This is to offer an alternative to killing a seal to achieve population control (A. Seeley and K. Ronald, Zoology, University of Guelph, Ontario).

Several of the imported animals tested positive for the neutralization test for the antibodies of canine distemper virus (= phocine distemper virus?). Historical and present-day seal virus levels will be examined using our museum collections and weekly bleedings of the captive grey and hooded seals (K. Ronald, Zoology and B. Derbyshire, Veterinary Microbiology and Immunology, University of Guelph, Ontario).

#### Sealworm research

The UNB Sealworm Research Group has been actively involved in a number of research projects pertaining to the sealworm (Pseudoterranova decipiens).

(1) Our extensive studies on the life cycle early stages have indicated that the best experimental Crustacean hosts are decapods and that there is a remarkable degree of host specificity exhibited by the  $L_2$  newly-hatched larvae. While copepods also function as hosts of the  $L_2$  larvae, the moult to the  $L_3$  seems to be restricted to larger crustaceans (such as decapod larvae or amphipods) which can be infected directly with newly-hatched  $L_2$ , by-passing the copepod infection.

(2) We have been able to culture sealworm to egg-producing adults for the

first time in vitro by using L<sub>3</sub> from infected fish as the starting material. We have also been successful with in vitro culture of Contracaecum osculatum (which also uses the seals' stomach for final maturation in vivo and thereby competes with the sealworm.

Several suggestions exist in the literature that C. osculatum out competes P. decipiens in the stomach of the seal. Our initial findings support this hypothesis in that P. decipiens grown alone produced more eggs/female than P. decipiens cultured in the presence of C. osculatum. Repeat experiments are in progress to verify these preliminary findings. (3) Developmental studies have confirmed that hatching and developing time of the larvae within the egg are temperature dependent. We have also shown that the time of hatching is independent of salinity with eggs hatching in distilled water at similar times as eggs in sea water. (4) Studies on the growth of L<sub>3</sub> larvae in experimental fish (brook trout) are now being repeated in cod as are studies on the number of times larvae can be passed from fish to fish. (5) The effect of both actual previous infection and inoculation susceptibility to further infections with sealworm, is under study using Atlantic salmon (Salmo salar) as the experimental fish host. (M.D.B. Burt, Biology, University of New Brunswick, Fredericton, N.B.).

#### Pinniped bibliography

Work is in progress on the Second Supplement to the Annotated Bibliography on the Pinnipedia (1975) which is slated for publication by ICES in 1990. This follow-up to the First Supplement (1983) will contain detailed listings of the scientific literature on pinnipeds published during the last 5 years, as well as any references missed in the preceeding publications (L. Ronald, B. Gots and J. Dougan, University of Guelph, Ontario).

#### Whales

A complete necropsy was performed on six odontocetes of small to moderate size (1 beluga, 1 pilot whale, 2 harbour porpoises, 2 white-sided dolphins) and a partial necropsy was performed on an adult sperm whale (P.-Y. Daoust, DVM, Atlantic Veterinary College, Charlottetown, PEI). Necropsy results in these seven animals were not considered significant

as far as the populations were concerned. However, valuable samples were collected for toxicological and biological analyses. One newborn harbour porpoise had a congenital heart defect.

#### Bottlenose dolphin

Work was focused on the extraordinary mortality of bottlenose dolphins which occurred along the mid to south Atlantic coast of the United States from July 1987 to March 1988. An estimated 50% of the inshore population of this species was lost. We determined that the dolphins became ill after consuming fish containing brevetoxin, a compound produced by Florida's red tide organism Ptychodiscus brevis. Subsequently a host of opportunistic microbial agents produced an inconsistent pattern of disease and contributed to the dolphin's eventual demise (J.R. Ceraci and D.J. St. Aubin, Pathology, University of Guelph, Ontario).

#### Harbour porpoise

This long-term programme began in 1969 in a modest way in the western Bay of Fundy, expanded during the 1970's as we examined distributional aspects throughout eastern Canada and northern New England waters, and then concentrated to the lower Bay of Fundy again in the late 1970's as we began to work more selectively on the series of biological puzzles which had become more evident during the earlier phases. Among the present priorities are: reassessment of age determination methodology; detailed investigations into individual energy budgets, and predator-prey relationships.

The long-term migration, dispersal, activity and population dynamic studies in the Bay of Fundy will be continued in the foreseeable future; since the animal is moderately long-lived, at least a decade is necessary before any patterns in population change can be discerned with any certainty (D.E. Gaskin, Zoology, University of Guelph, Ontario).

#### Humpback whales

An unusual mortality of humpback whales occurred in Cape Cod Bay in January 1988. Fourteen carcasses were recovered over a three week period. The whales died after consuming mackerel containing saxitoxin,

the dinoflagellate toxin responsible for the Paralytic Shellfish Poisoning in humans. These findings place new emphasis on the role of biotoxins in the natural mortality of marine mammals.

#### North Atlantic right whale

Started in 1983, work involves systematic sampling of zooplankton densities across a 25 x 25 km grid covering the main feeding ground of the species in the lower Bay of Fundy, and systematic radio-tracking of known individuals. In 1988, contact was maintained with one animal for about 5 weeks. Up to 60 individuals of a total surviving population of probably not more than 250 animals utilize this area intensively from July-October inclusive each year. The results for 1983 revealed an almost linear relationship between copepod density and the numbers of Right whales present, casting doubt on the generally accepted hypothesis that the region is valuable solely as a nursery ground. On the other hand, calves and yearlings are almost entirely concentrated in the coastal waters from Cape Cod to Fundy, and are hardly ever seen on the shelf edge of Atlantic Nova Scotia, which is the only other known concentration area of the species. For eight years, detailed observations of the movements and occurrence of several dozen recognizable individuals by the New England Aquarium research group and the University of Guelph team has provided invaluable information on social dynamics in the Fundy region.

#### Burmeister's porpoise

A research team has been working at Pucasana, Peru, under my supervision, collecting data on this species, which is the dominant phocoenid, not only in the Peru Current region, but also in the seine and gill net fisheries off southern Peru and northern Chile. There is already some evidence that the population may be close to a precipitous crash as a result of overexploitation. This programme is scheduled to run as long as funding can be obtained. The data are already beginning to provide a valuable test of hypotheses about phocoenid biology developed during our work on Phocoena phocoena in the Northwest Atlantic; P. spinipinnis has a very different diet, behaviour, and distribution pattern across the upwelling zone offshore than P. phocoena (D.E. Gaskin, Zoology, University of Guelph, Ontario).

Odontocetes

Ongoing studies on dynamics and diagnostic value of plasma indicators of stress in odontocetes have been supported by the US Office of Naval Research. Beluga whales captured for research or exhibit have been the principal subject of the programme. Emphasis has been on glucocorticoid-mediated changes in the thyroid hormone balance and iron metabolism. (J.R. Geraci and D.J. St. Aubin, Pathology, University of Guelph, Ontario).

Beluga whales

A four year investigation of seasonal cycles in epidermal growth and thyroid hormone secretion in beluga whales was concluded in 1988. Incursion into estuaries during the summer months stimulates thyroid activity and is associated with increased proliferation of skin. This moult-like process has no documented counterpart in any cetacean, and may account in part for the belugas' strong attraction to estuaries (J.R. Geraci and D.J. St. Aubin, Pathology, University of Guelph, Ontario).

DENMARK

(F.O.Kapel)

SEALS

Research on pinnipeds was carried out by the Wildlife Administration, Game Biology Station (GBS), Kalø, DK-8410 Rønde; by the Salt Water Aquarium (SWA), DK-6700 Esbjerg; by Ornis Consults ApS (OC), Vesterbrogade 140, DK-1620 Copenhagen V; by Danbiu ApS (Biological Consultants)(DBC), Henningsens Allé 58, DK-2900 Hellerup; by the Greenland Home Rule Administration (GH), Sjøleboerne 2, DK-1016 Copenhagen K; and by Greenland Fisheries Research Institute (GF), Tagensvej 135, DK-2200 Copenhagen N.

Harbour seal (*Phoca vitulina*)

Systematic searching for strandings on Danish beaches in February-March (1242 km) and May-June (700 km) resulted in registration of only 27 and 18 dead seals, respectively (OC).

Later in the year, however, an epizootic, emanating on Anholt in April, raged among Danish harbour seals, leading to fatal disease for thousands of animals. Enhanced monitoring of seal stocks, and collection of samples from dead seals was initiated. In the Skagerrak-Kattegat area aerial surveys revealed a 60 % decline in seal numbers after the epizootic. Examination of biological samples is in progress, and results will be published in 1989 (M.-P. Heide-Jørgensen, DBC).

In the Limfjord, S.W.Kattegat and S.E. Denmark regions expanded seal counting was conducted, and a total of 1,500 dead seals were registered, indicating a decline of 50 to 70 % for individual areas. Only two small populations in S.E. Denmark (appr. 100 animals) seem to have avoided the disease. Samples were collected from dead seals in the Limfjord area (E. Bøgebjerg Hansen, GBS).

During summer the epizootic also spread to the Danish Waddensea - and further south and west to German, Dutch and British waters. By September 1988 it was estimated, that around 3,000 harbour seals had died in Danish waters (and 4,000 in adjacent Swedish waters).

Ringed seal (*Phoca hispida*)

In the Thule district (North Greenland) four ringed seal were instrumented with satellite transmitters in June 1988, and tracked for up to four months. After ice break-up the seals showed considerable movement, and the technology is considered prosperous for future tracking of sea mammals in the High Arctic (M.-P. Heide Jørgensen, DBC, and S. Leatherwood, Sea World Research Institute, San Diego, USA).



A study of ringed seals was conducted in Olrik Fjord and Foulke Fjord (Thule district, North Greenland) in August 1988. The purposes were 1) netting and tagging to reveal migration patterns, and 2) testing the drug tiletamine hydrochloride: zolazepam hydrochloride (telazol/zolatil) as an immobilizing agent for pinnipeds. Of 11 seals tagged, two were observed a few days later close to the site of release in Olrik Fjord. One seal was shot in December about 75 km west of the tagging site, while another was recaptured in late December at Ilulissat (Jakobshavn, Central West Greenland) about 1000 km south of the site of release. The study thus confirmed previous evidence that young ringed seals disperse over great distances in the Baffin Bay area. During the testing of Zolatil anesthesia suitable for minor surgery was obtained, and this study indicates that the agent can be used successfully for immobilization of ringed seals (L.Ø. Knutsen and E.W. Born, GH).

#### Harp seal (*Phoca groenlandica*)

Collection of material for analyses of harp seal feeding in Greenland waters was continued in 1988. In the Diskobugt region (Central West Greenland) samples were collected in Qeqertarsuaq (Godhavn) in the fall 1987, winter and summer 1988 from a total of 213 harp seals caught by local hunters. In July 1988 an attempt was done to obtain material from seals in offshore areas of S.W. Greenland (Store Hellefiskebanke), resulting in a sample of only 17 specimens. In September the local catch was sampled in Kangersuatsiaq (Prøven, Upernavik district, N.W. Greenland), resulting in data from 194 harp seals and four ringed seals. The total sample of harp seal stomachs from West Greenland now exceeds 800. The analyses of this material is in progress, and results will be presented in 1989 (L.A. Angantyr, graduate student at the University of Copenhagen, and F.O. Kapel, GF).

#### Walrus (*Odobenus rosmarus*)

In order to reveal migration patterns of walrus in the Baffin Bay region a study was conducted in the Smith Sound area in August 1988 with the purpose of immobilizing walruses and deploying satellite transmitters to their tusks. Heavy ice delayed the arrival of the field team to the walrus grounds, with the result that most walruses were in the water and therefore not accessible for immobilization. During this study systematic census for walrus (and other marine mammals and sea birds) was made in the periode 14-24 August from boats and terrestrial observation sites in northern Smith Sound, southern Kane Bassin and the Buchanan Bay (eastern Ellesmere Island, Canada). The majority of walruses were observed at the entrance of Buchanan Bay where a minimum of 171 animals were observed on 21 August. During the study, observations of ringed seals, bearded seals, harp seals and hooded seals were recorded while no cetaceans were observed (E.W. Born and L.Ø. Knutsen, GH).

Results of an aerial survey for walrus conducted in late March 1984 off Central West Greenland was presented in 1988, with a summary of results of aerial surveys conducted in the same region during the spring of 1981 and 1982. These surveys indicate that during late winter the numbers of walruses at the shallow banks off Central West Greenland were in the low hundreds (E.W. Born, GH)

A summary of records of walrus stragglers in the coastal areas of western Europe was published in 1988. During the 20th century there has been an increase in observations of walrus along the European coasts. Between 1900 and 1986, 158 observations, representing at least 75 individuals have been reported from Europe. About 30 % of the observations were made between 1970 and 1986 (E.W. Born, GH).

#### WHALES

Research on cetaceans was carried out by the Zoological Museum (ZM), Universitetsparken 15, DK-2100 Copenhagen Ø; by Ornitho Consults ApS (OC), Vesterbrogade 140, DK-1620 Copenhagen V; by the Museum of Natural History (NMF), Debesstræde, FR-100 Tórshavn, Faroe Islands; by Danbiu ApS (Biological Consultants) (DBC), Henningsens Allé 58, DK-2900 Hellerup; by the Greenland Home Rule Wildlife Administration (GH), Sjøleboerne 2, DK-1016 Copenhagen K; and by Greenland Fisheries Research Institute (GF), Tagensvej 135, DK-2200 Copenhagen N.

#### Small cetaceans in Danish waters

Sightings, strandings, and by-catch data were collected for all cetacean species in Danish waters with special emphasis on the harbour porpoise. 97 harbour porpoises (Phocoena phocoena), 2 white-beaked dolphins (Lagenorhynchus albirostris), 1 pilot whale (Globicephala melaena), and 1 sperm whale (Physeter macrocephalus) were examined during 1988, and skeleton and other material were incorporated in the collection of Zoological Museum. A special project on management and conservation of the harbour porpoise was continued (C.C. Kinze. ZM).

As a by-product of ship-based surveys of the distribution of seabirds, systematic observations of harbour porpoises were done in January-February and April-May 1988, during a total of 10,000 km sailed in the Danish part of the North Sea, the Skagerrak and the Kattegat, using four dedicated vessels. Several hundreds of harbour porpoises, and some flocks of white-beaked dolphins, white-sided dolphins (Lagenorhynchus acutus) were observed. During systematic surveying of strandings at Danish beaches in February-March (1242 km) and May-June (700 km) 7 and 8 harbour porpoises were found, respectively (OC).

#### Small cetaceans in Faroese waters

The international research program on the North Atlantic pilot whale (Globicephala melaena) initiated in 1986 was continued, but systematic sampling of every school ended in June 1988. 1,690 pilot whales were caught in 20 drives in the Faroes in 1988. Biological samples were taken from 8 schools (1,169 individuals). In total 43 drives containing 3,653 specimens have been examined in the two year period. In addition, sampling was carried out from six harbour porpoises (Phocoena phocoena) taken in the spring 1988, from three bottlenose whales (Hyperoodon ampullatus) taken 30 August, and from one striped dolphin (Stenella coeruleoalba) stranded 1 December 1988. From the last-mentioned also the whole skeleton was secured for the museum (D. Bloch et al., NMF).

Systematic observations of sea-birds and cetaceans were carried out in June-August 1988 onboard a Faroese fisheries inspection vessel. Results are not yet available (OC, in cooperation with D. Bloch, NMF):

At least two specimens of the sperm whale (Physeter macrocephalus) were observed in 1988: a 15.5 m male was seen 31 March, and supposedly again 11 April, 19 April and 25 April; another male (16 m) was seen 24 July (D. Bloch, NMF).

#### Small cetaceans in Greenland waters

A pilot study on harbour porpoise (Phocoena phocoena) in Greenland was carried out in the municipality of Maniitsoq (Sukkertoppen, S.W. Greenland). The main purpose was collection of data on stock identification, reproduction, growth, diet, parasites, and pollutant levels (C.C. Kinze, ZM).

Results from previous studies of the occurrence and hunting of killer whale (Orcinus orca) in Greenland was compiled and submitted for publication (M.-P. Heide-Jørgensen, DBC).

Samples of stomach contents from narwhals (Monodon monoceros) collected in the Ihule district, North Greenland, were examined for species composition and relative importance of food items (M.-P. Heide-Jørgensen, DBC).

Between 30 July and 11 August 1988 systematic observations for narwhal (Monodon monoceros) was made at the head of Inglefield Bredning (Ihule district, North Greenland) from the same site where observations were made in 1984, 1985 and 1987. The highest count was made on 31 July when a minimum of 473 narwhals occurred within the observation area. This figure represents about 12% and 31% of the highest count obtained in 1984 and 1985, respectively, but is approximately four times higher than maximum counts for 1987. The reason for these annual fluctuations is not clear (E.W. Born and L.Ø. Knutsen, GH).

#### Large whales (Balaenopteridae)

As part of an international project for assessing whale stocks in the North Atlantic, aerial surveys were carried out in West and East Greenland between mid-July and mid-August 1988 (F. Larsen, GF).

Between 25 July and 19 August a ship-based cruise was conducted in West Greenland between Paamiut and Ilulissat (62°-69°N), from the coastline until 40-50 n.m. offshore, in order to collect material for identification of individual whales. During the cruise, 7 blue whales (Balaenoptera musculus), 81 fin whales (Balaenoptera physalus), 22 minke whales (Balaenoptera acutorostrata), 169 humpback whales (Megaptera novaeangliae), 3 sperm whales (Physeter macrocephalus), and 9 killer whales (Orcinus orca) were observed. A preliminary examination indicates that photographs suitable for individual identification were obtained for 7 blue whales, 12 fin whales, 110 humpback whales, and 3 sperm whales. In addition, biopsies for studies of variation in DNA were obtained from 26 whales (F. Larsen, GF).

FRANCE

(R. Duguy)

Phoques

Dans le cadre de la 3ème année d'une Action intégrée franco-espagnole, le programme de parasitologie a été continué en collaboration avec l'Université de Valence (A. Raga et R. Duguy). Les données sont utilisées pour une mise au point de la parasitofaune des Cétacés et Phoques d'Europe, en utilisant ceux-ci comme indicateurs de milieu.

En ce qui concerne les phoques, 72 observations ont été rapportées et les opérations de sauvegarde ont permis de mettre en soins et de relâcher dans les sites favorables, après marquage (marques du Sea Mammal Research Unit) les jeunes phoques recueillis. Une attention particulière a été portée au contrôle des secteurs des côtes où se trouvent de petits groupes permanents : *Phoca vitulina* en baie de Somme ; *Halichoerus grypus* dans l'archipel de Molène-Ouessant et à la réserve des Sept-îles. Ces observations, ainsi que les autopsies effectuées chez des phoques morts en soins, ont permis de constater qu'aucun animal n'était affecté par l'épidémie virale jusqu'à cette date (R. Duguy).

Les autopsies pratiquées chez les phoques ont été particulièrement orientées vers la recherche des intoxications du tractus digestif par les hydrocarbures : la détection, par méthode chimique, était accompagnée de prélèvements d'organes par l'interprétation anatomo-pathologique des modifications tissulaires (R. Duguy et P. Babin).

Un contrat d'étude du Ministère de l'Environnement a été consacré à la synthèse des données connues pour la mise au point du statut des différentes espèces de phoques sur les côtes de France (R. Duguy).

Les observations à la mer des Cétacés en Manche, Atlantique, et Méditerranée, ont continué à être régulièrement collectées mais sont actuellement stockées en données brutes, le programme d'information étant en cours.

Dans les Terres australes et antarctiques françaises, deux études ont été réalisées : l'une sur les Orques autour des îles Crozet (C. Guinet), la seconde sur la reproduction chez *Cephalorhynchus commersonii* (A. Collet et D. Robineau). En outre, un programme de recherches est actuellement en cours sur le cycle de fréquence de *Mirunga leonina* aux îles Crozet (C. Guinet).

### Cétacés

Les observations de Cétacés trouvés sur les côtes de France ont fait l'objet, comme les années précédentes, d'un recensement systématique pour la poursuite du programme de faunistique et l'étude des variations de fréquence spatio-temporelle (R. Duguy). Trois cent quatre vingt un Cétacés ont été trouvés échoués, ou capturés accidentellement en 1988. Ces données sont stockées, après avoir été informatisées, au Musée océanographique de la Rochelle, ainsi qu'au Secrétariat faune-flore du Museum National. Une étude a été entreprise sur les corrélations entre les facteurs météorologiques et les échouages (R. Duguy et D. Widsdorff), ainsi qu'à une comparaison, en Méditerranée, des échouages sur les côtes françaises et espagnoles (R. Duguy et A. Casinos).

La recherche des facteurs de mortalité a été effectuée sur les animaux dont l'état permettait l'examen macroscopique des organes et l'interprétation anatomo-pathologique des préparations histologiques, soit 67 individus au total (R. Duguy et P. Babin). Les séries de pièces osseuses conservées au Musée océanographique de la Rochelle ont été utilisées pour les recherches sur la détermination de l'âge et la squelette-chronologie (V. de Buffrenil). En outre, une étude sur les fractures osseuses a été réalisée chez les Cétacés, essentiellement *Delphinidae* (L. Caruel). Les prélèvements systématiques des gonades ont également permis la poursuite du travail sur la reproduction chez les *Delphinidae* (A. Collet).

## ICELAND

(J. Sigurjónsson, E. Hauksson, S.T. Einarsson)

### Seals

#### SEAL HUNTING:

Catch statistics for the 1988 seal hunt are 1,679 common seals (*Phoca vitulina*) and 1,642 grey seals (*Halichoerus grypus*) or about 3,321 animals. This is a decrease from the 1986 and 1987 seasons, where 6,450 and 5,100 animals were caught, respectively.

#### RESEARCH:

In 1988 studies on the seal stocks were continued at the Icelandic Fisheries Laboratories. Common seals were counted from an aircraft at selected breeding and haul-out sites for investigating the effect of environmental and biological factors on haul-out behaviour. Grey seal pups were counted from air at selected breeding sites for investigating the propagation of the breeding in time. Blood samples from both common and grey seals were collected for virological studies with special respect to the recent mass death of seals in continental Europe. Fifty grey seal pups were tagged (by MRI) at the Hvalseyjar, West Iceland, and three tags were returned in the same area in 1988. As in recent years records were kept of visiting vagrant seal species, i.e. harp (*Phoca groenlandica*), hooded (*Cystophora cristata*), bearded (*Erignatus barbatus*) and ringed seals (*P. hispida*).

#### INTERNATIONAL COOPERATION:

E. Hauksson participated in the sealworm workshop, held in Halifax, Nova Scotia, in 1987 and 1988. The purpose of the workshop was to gather information on the status of research regarding the sealworm problem in North Atlantic waters, and the role of seals in the worm infestation in fish. Scientists from MRI participated in an informal meeting on the mass death of seals in European waters in 1988, held in Bergen in October 1988.

### Whales

As in recent years investigations conducted by the Marine Research Institute (MRI), Reykjavik and cooperating institutions concentrated on fin (*Balaenoptera physalus*), sei (*B. borealis*) and minke whales (*B. acutorostrata*) in Icelandic and adjacent waters. Other species studied were blue (*B. musculus*), humpback (*Megaptera novaeangliae*), killer (*Orcinus orca*) and pilot whales (*Globicephala melana*).

The implementation of a four year programme (1986-1989) of intensified research into the whale stocks off Iceland was continued in 1988. The main objective of the programme is to increase the knowledge on the state of the different whale stocks with respect to exploitation and conservation, and to assess the role of cetaceans in the ecosystem off Iceland. The investigations are Iceland's contribution to the International Whaling Commission's (IWC) Comprehensive Assessment of the whale stocks which is to be completed by 1990.

The research programme consists of over 30 different research projects addressing problems of relevance for improved management and conservation of the whale stocks, including investigations on different aspects of biology, distribution and abundance of large whales. Results have regularly been presented and discussed in the Scientific Committee of the IWC. The main areas of activities in 1988 were:

#### GENERAL BIOLOGY OF EXPLOITED SPECIES:

MRI staff organized or carried out routine sampling of biological material from 68 fin and 10 sei whales caught under special permit issued by the Government of Iceland.

Detailed material was collected on age, reproduction, food selection and general body condition of whales caught, with special reference to energetic status of the animals. Measurements of caloric value of different prey species and whale tissue samples were completed. Sampling and measurements of ecological factors such as prey density, primary productivity and temperature distribution on the grounds were also carried out for comparative analyses. Complete dissection and piecemeal weighing of whales (19 animals in 1988) was continued. Tissue samples were taken for analysis of pollutants.

Analysis of biological material is in progress including a comprehensive review of fin and sei whale biology based upon data collected in recent 20 years. Although working up of material is being done after each season, many of the projects are to be considered as long term investigations not being concluded until in few years' time.

All whales were sampled for biochemical analysis. Work on genetic markers in blood and tissue proteins was continued (Reykjavik Blood Bank) with the general aim to discriminate between different stocks of North Atlantic fin and minke whales. Experiments with DNA-fingerprint methodology were initiated on fin and sei whales.

Monitoring of catch/effort relationship in the Icelandic fin whale fishery was continued, where number of hours spent for effective searching on the whaling grounds was compared with data from recent decades.

In cooperation with researchers at the Science Institute of the University of Iceland models of whale stocks have been tried and investigated with the general aim of improving future management of the stocks.

#### WHALE CENSUSES:

All whale species (including the protected blue and humpback whales) were routinely recorded onboard whaling vessels west off Iceland and on a more opportunistic basis onboard other vessels in Icelandic waters. Improved data set was collected onboard the whaling vessels to facilitate assessment of both past and present densities of different whale species on the grounds.

Analysis was made on data collected during a period of five weeks in June/July 1987 onboard three Icelandic sightings vessels and one aircraft, that were allocated to the 1987 North Atlantic Sightings Survey. The survey area covered the East Greenland coast, the Irminger Sea between Iceland and Greenland, coastal and deep waters off Iceland towards Jan Mayen and the Faroe Islands south to 55 N deep off the Irish coast. The aerial survey concentrated on the coastal area allround Iceland. While all species of whales encountered were recorded, both design and conduct of the survey was primarily aimed at estimating abundance of fin and minke whales in the area. Based on the sightings results, the size of the East Greenland/ Iceland stock of fin whales is around 6,500 animals and the Central (East Greenland/ Iceland/ Jan Mayen) stock of minke whales around 19,500 animals.

During July 1988 a series of experiments were conducted in the waters west off Iceland to improve the basis for interpretation of earlier sightings results, particularly with respect to minke whales. These include 1) I/O (independent observer) experiments onboard a sightings vessel to assess the proportion of animals missed on the track-line, 2) a comparative aerial experiment simultaneously conducted in the same area and 3) dive-time rhythm studies by radio-tracking animals from a research vessel.

#### KILLER WHALE RESEARCH:

A special project designated to killer whale research was continued with the main aim to estimate the stock size off Iceland and the predation of killer whales on local herring stocks. During October and November 1988 photoidentification work was conducted on the herring grounds east off Iceland. Photographs and acoustic recordings of killer whale sounds are being processed and compared to data from other ocean areas. Preparations were made to satellite track killer whales in the area for long-term monitoring of movements and behaviour, but field work, scheduled in November, was postponed to 1989.

In cooperation with scientists at the Hubbs Marine Research Center, USA, editing and publication of a special volume on North Atlantic killer whales was completed. The issue (published in the series *Rit Fiskideildar*, Journal of the Marine Research Institute) contains 21 original papers by 36 European and North American authors on the biology, distribution and killer whale fishery in the North Atlantic.

#### WHALE STRANDINGS AND NET ENTANGLEMENTS:

The MRI staff investigated or received information on a number of whales that beached (or were washed on land) and that drowned in fishing gear in 1988. These include three male sperm whales (*Physeter catodon*) that beached at South (Feb. 1988, 13.3m), Northwest (23.3. 1988, 17-18m) and Southwest Iceland (1.6. 1988); four Northern bottlenose whales (*Hyperoodon ampullatus*) that were found at South (26.5. 1988, ca 5m female), West (4.7. 1988, 7.94m; a second in August 1988) and Southwest Iceland (12.10. 1988, 6.37m male), the last one had been rescued several times in the preceding month; one long-finned pilot whale that was found at the southwest coast (15.6. 1988, 4.31m female); two white-beaked dolphins (*Lagenorhynchus albirostris*), one that beached alive and died at the south coast (20.6. 1988) and a second that was found dead in West Iceland (9.12. 1988, 2.16m male); two minke whales that were found dead at Southwest (10.6. 1988, 6.6m male) and West Iceland (15.10. 1988, 5.15m) and additional three animals that were found dead in fishing gear at North (22.9. 1988, 24-5ft male) and West Iceland (5.10. 1988, one 6.2m male; second 8.10. 1988, 7.2m male).

In November and December the MRI received complaints from captains onboard capelin purse-seiners off northern Iceland of humpback whale interference with the ongoing fishery. Recently, major damages of fishing gear and loss of catches due to this are being reported as a serious threat to the industry. The MRI sent its representative to the grounds to study the extent of the interference and to suggest means of avoiding recurrence of such incidences.

#### INTERNATIONAL COOPERATION:

The MRI participated in the planning of the NASS-89 (North Atlantic Sightings Survey 1989), the second international sightings survey to be conducted in July-August 1989. Iceland plans to allocate three large sightings vessels to the project during July-August. For the Iceland part, the main target species will be the Denmark Strait stock of sei whales.

As in earlier seasons MRI offered scientists from other countries free room and board during their stay at the field laboratory in Hvalfjörður, and full access to research facilities and scientific material as required. Scientists from several universities and research institutions made use of this opportunity or requested specific material to be collected for their studies.



N O R W A Y

(A. Bjørge and I. Christensen)

Seals

Harp seals and hooded seals

Field investigations on harp seals were carried out by personnel from the Institute of Marine Research (IMR) onboard Norwegian vessels participating in sealing activities in the Jan Mayen area in 1988. Samples for age analyses of catches were collected from 1 366 moulting harp seals. This material has been analysed. A total of 313 harp seal pups were tagged in 1988 in the whelping area at Jan Mayen.

A total of 6 770 harp seal pups have been tagged off Jan Mayen in the period 1970-1988. Mark/recapture estimates indicate productions of about 40 000 - 60 000 pups annually around 1980. However, a low production estimate for 1987 of about 30 000 pups causes concern about the status and recent trends in this stock.

No research was carried out on hooded seals in 1988.

A large number of harp seals invaded the coast of northern Norway also in 1988. However, the invasion this year was less extensive in numbers and distribution compared to the invasion in 1987. A total of about 21 600 harp seals were recorded caught and drowned in gillnets in the period from January to August 1988. It is not known whether the invading seals belong to the Jan Mayen stock or the Barents Sea stock.

An analysis of stomach contents from 59 seals caught in the northern Barents Sea in 1987 indicate that the amphipod (Parathemisto libellula) is a significant food item for harp seals in this area in late summer. Several species of fish and squids were also recorded in these stomachs.

#### Grey seals and Common seals

The stocks of coastal seals in the Vesterålen-Lofoten area were surveyed by IMR in June-July. A total of 719 common seals (incl. 161 pups) and 89 grey seals were recorded. Fifty common seal pups were tagged.

Tagging of common seals was also carried out in the Oslofjord by the Institute of Biology, Univ. of Oslo (UiO) (25 seals) and in the Froan Nature Reserve where the Conservation Management tagged 23 common seals and 198 grey seal pups in 1988.

An extensive epidemic disease afflicted the common seal population in southern Norway during the summer of 1988. The disease, possibly caused by a morbilli virus, spread from the Swedish border along the coast to Møre and Romsdal county (63°N), where it apparently faded out in late August. The Institute of Biology, (UiO) recorded 950 dead common seals along this coastline from July to October 1988.

#### Ringed seal

A survey and assessment of suitable ringed seal breeding habitats at Svalbard was carried out by the Norwegian Polar Research Institute. Availability of potential prey species and food preferences of ringed seals in Kongsfjord at Svalbard were examined by UiO in collaboration with the Polish Academy of Science. This project is a part of the Norwegian Research Program for Marine Arctic Ecology, PRO MARE.

Theoretical and experimental studies on food and energy requirements of several marine mammal species are being continued by the Institute of Biology, UiO and the Dept. of Arctic Biology, Univ. of Tromsø.

## Whales

The Government of Norway objected to the classification by IWC of the Northeast Atlantic stock of minke whales as a Protection Stock. This classification, which came into force on 30 January 1986, was therefore not binding for Norway, but the Government stopped all commercial whaling after the end of the whaling season 1987 in anticipation of the IWC comprehensive assessment in 1990. An international adviser group of scientists, appointed by the Norwegian Government to review previous research, submitted its report with recommendations for future research on minke whales. Norwegian scientists from interested institutes met in Bergen in January 1988 and agreed on the objectives and scope for a whale program. It was agreed to concentrate research in the first year (1988) on transect surveys and development of methodology. Planned methodological studies required a take of up to 30 minke whales in 1988, and the Norwegian Government gave permission for a take up to that number.

### General biology

Two whaling vessels were chartered for a cruise of three weeks in August to catch and sample minke whales. A total of 29 minke whales, 8 females and 21 males, were caught. The material collected includes standard morphometric measurements, material for age determination, sexual organs and stomach contents. Also total weights and weights of organs, meat, blubber and bones were recorded.

Infrared radiation from whales in the sea was registered via an AGA Thermovision camera, and surface and inner body temperatures were also measured. About 50 different measurements of blubber thickness were recorded.

Tissue samples from blubber, meat and organs were collected for analyses of contaminants. Also samples for DNA-fingerprint examination were collected. Diving and exposure times were measured from minke whales.

Morphometric analyses of minke whales based on previous and new data from different areas of the North Atlantic have been completed.

#### Whales census

Five whaling vessels and one expedition vessel with a helicopter covered areas between Kola and Jan Mayen, and from the coast of Nordland to Svalbard in transect surveys of whales during four weeks in July 1988. The aims of the surveys were also this year to collect distributional data for abundance estimates of cetaceans in the North Atlantic. Minke whales were of primary interest, but all sightings of sea mammals were recorded. A total of 925 observations of cetaceans were recorded on these cruises, including the following species: blue, fin, humpback, minke, sperm, northern bottlenose, killer and white whales and whitebeaked dolphins, harbour porpoises and unidentified dolphins.

The questionnaire survey of killer whales which was started in 1982, has been completed as part of a joint international research program on killer whales in the North Atlantic. In connection with this program, killer whale catch statistics and sightings have also been analysed.

#### Strandings

There is no reporting system in Norway for sea mammals stranded or drowned in fishing nets, but occasionally the IMR is informed by newspapers and others of such events. A total of 25 sperm whales were reported and confirmed as stranded along the coast in 1988. In addition 11 sperm or large whales have been observed drifting in the sea. Most of the animals had apparently been drifting for some time. The reason for the many dead drifting animals is not known. A sampling program for harbour porpoises drowned in fishing nets resulted in about 100 reports of drowned animals.

#### Radio-tagging

A series of practical problems has to be resolved before radio-transmitters can be implanted for tracking of minke whales. In addition to technical problems with the transmitter, also the problem

of attaching the transmitter to the animals is unresolved. In principle the transmitter may be implanted by gunshot, lance or surgery. Surgery would ensure an exact and controlled positioning of the transmitter, and a program for immobilization and implantation of transmitters in minke whales was initiated in 1988. A whaling vessel and a helicopter was hired for two weeks in August-September. A total of six minke whales were injected with increasing dosages of drugs, so far without any effect on the behaviour of the immobilizing whales. Apparently the dosages applied were too small for immobilization of minke whales.

NETHERLANDS

(P.J.H. Reijnders)

SEALS

Harbour seals

A massive seal die-off happened during 1988 in the North Sea. More than 17,000 seals have been found dead. It is estimated that in the Wadden Sea area between 70-80% of the estimated population has died because of the virus outbreak. Extensive research efforts have been carried out on collected dead animals: autopsies and subsequent parasitological, virological, bacteriological, toxicological, and (histo)pathological investigations. Virological investigations showed that neutralizing antibodies against a cdv-like virus were present in most seals. It is concluded that this 'phocine distemper virus' (pdv) is the primary cause for the massive seal death (A.D.M.E. Osterhaus). Further work is still in progress on processing the obtained samples:

- Virology - virus isolation and serological investigations (A.D.M.E. Osterhaus, I. van der Heyden & E.J. Vedder);
- Parasitology - endoparasitic fauna (F.H.M. Borgstede, H.G.J. Bus, J.A.W. Verplank & E.J. Vedder);
- Bacteriology - (E.J. Vedder);
- Toxicology - quantitative and qualitative analyses for pollutants (P.J.H. Reijnders);
- Pathology - histology and microscopy (J.S. van der Kamp, E.J. Vedder & M. Verhagen).

Monk seals

Two young orphaned Mediterranean Monk seals (Monachus monachus) were transported from Greece to The Netherlands and succesfully rehabilitated in the Seal Rehabilitation and Research Centre in Pieterburen. In April they have been released in the marine park 'The Northern Sporades' in Greece. The animals were provided with VHF-radiotransmitters, and their behaviour was followed until October. Data on feedig behaviour, diurnal behaviour and dispersal could be collected in this way. The animals obviously adapted rather quickly after their release and showed a similar

behaviour as compared with the scarce data on wild seals (P.J.H. Reijnders, E.H. Ries, I. Traut, L. 't Hart, E.J. Vedder).

#### Grey seals

Geomorphological changes happened during 1988 with a small island in the Wadden Sea where a colony of Grey seals used to haul out. Most of the animals dispersed to a neighbouring tidal flat, as the increasing trend in numbers observed in the foregoing year was also observed this year (P.J.H. Reijnders).

#### Walrus

The sensitivity of the vibrissae, topography of the nerves of the vibrissae and the in-air audiogram of captive Pacific walruses were studied (R.A. Kastelein).

#### Steller sea lions

The distribution, abundance, reproduction and behaviour of Steller sea lions was investigated in Prince William Sound, Alaska (R.A. Kastelein & F.C. Weltz).

#### Seals in general

Serological investigations on exposure of pinnipeds to viruses have been continued (A.D.M.E. Osterhaus).

Autopsies on stranded/drowned grey, ringed, hooded and harp seals have been carried out and relevant tissues for parasitological, bacteriological and toxicological studies have been collected (J.S. van der Kamp, W. Wouda & E.J. Vedder).

An anatomical study on the closure of the foramen ovale and the ductus arteriosus in the common seal has been completed; the pathological consequences of some cases of an open foramen ovale in adult animals are discussed (C.J. van Nie & J.S. van der Kamp)

## WHALES

An anatomical study on the conducting system of the heart of Phocoena phocoena, has been completed. A macroscopical as well as microscopical description has been provided (C.J. van Nie).

Aerial surveys of marine mammals in the Dutch part of the North Sea have been carried out since 1987. A model, to simulate sampling in populations with low densities and different types of clustering is developed, to calculate the accuracy of the counts (H.J.M. Baptist).

Occurrences of cetaceans and pinnipeds are noted during regular counts of sea birds in the North Sea. Ship-based sightings are obtained in a standardized way, with transects throughout the North Sea, divided in 10 minutes observation periods (M.F. Leopold).

A comparative study on the bio-acoustic behaviour of the riverine dolphin S.f. fluviatilis and its neretic counterpart S.f. guianensis with regard to ecology and taxonomy has been carried out during an expedition to Columbia and Brazil (C. Kamminga, F. Engelsma & R.P. Terry).

Stranding records of several cetacean species on the Dutch coast are being analyzed. The existing collecting scheme of stranded whales has also been in operation during 1988. Whenever possible, autopsies have been carried out and tissues obtained for further studies (C. Smeenk, C.J. van Nie & A.W. van Foreest).

Research on cetacean locomotion is continued, i.e. the anatomy of the swimming apparatus of Phocoena phocoena and analysis of cine films of swimming and gliding of Tursiops truncatus and Sotalia guianensis. The latter study comprised i.a. calculations of velocities, accelerations, propulsive forces and drag during steady swimming, gliding, fast starts and tail dancing (J.J. Videler, R. de Boer, I.A. van Pijlen).



POLAND

(K.E. Skóra)

Seals

Monitoring investigations of occurrence of pinnipeds (*Leptonychotes weddelli*, *Lobodon carcinophagus*, *Hydrurga leptonyx*, *Mirunga leonina*, *Arctocephalus gazella*) in the region of Admiralty Bay, King George, Shetland Islands, Antarctica (Stanisław Rakusa-Suszczewski)

Seals and whales

Investigations of food and occurrence of marine mammals (*Phoca hispida*, *Odobenus rosmarus rosmarus*, *Ursus maritimus*, *Balaenoptera acutorostrata*, *Delphinapterus leucas*) in the region of South Spitsbergen (Jan Marcin Wesławski).

Whales

Investigations focused on occurrence of harbour porpoise (*Phocoena phocoena*) in the Southern Baltic (Krzysztof E. Skóra).

SPAIN

(S. Lens & O. Cendrero)

Seals and whales

Records on pinnipeds and cetaceans stranded in the north and northwest coast have been kept by the Spanish Institute of Oceanography in Santander and Vigo, the Galician Society of Natural History (Santiago de Compostela), the Faculty of Biology of the University of Oviedo and the Maritime Museum of Santander. Observations were made on a male Halichoerus grypus arrived at the river Eo estuary (western Asturias province) in October 1977 which was kept alive in the area until his death about one year later (M.C. Pérez and C. Nores).

Whales

A preliminary field work has been carried out last summer by the Spanish Institute of Oceanography for the study of the movements of cetaceans in the area of the Gibraltar Straits.

Studies on pollution and stress tracers of the pilot whale (Globicephala melana) from the Faroe Islands are in progress at the University of Barcelona. A team of the University of Valencia is studying the parasites of the pilot whale from the Faroe Islands and also the parasites of the porpoises.

The distribution and stock identity of the species Delphinus delphinus and Stenella ceruleoalba in the Mediterranean and Atlantic waters being investigated by the University of Barcelona in collaboration with American scientists.

The Universities of Barcelona and Valencia are working together in a project on the energetics, pollution and parasites of South American dolphins.

The Spanish Fisheries Secretariat commissioned the University of Barcelona to transfer the data of the Spanish whaling activities into data files.

UNITED KINGDOM

(J. Harwood)

Seals

1. Annual surveys of grey seals (D. Thompson, SMRU). All the major grey seals breeding sites in England and Scotland were surveyed from the air or by counts on the ground. Preliminary results indicate that pup production in Orkney and the east coasts of England and Scotland was approximately 20% less than in 1987.
2. Common seal aerial surveys (A. Ward, SMRU). A thermal imager mounted in a helicopter was used to survey the common seal population on the west coast of Scotland during the moult in August. The thermal imager proved exceptionally effective for detecting seals on dark rocks. A total of 3664 animals were counted, approximately twice as many as were counted in the same area on a previous boat survey carried out at the end of the pupping season.
3. Feeding ecology of seals (J.H. Prime, SMRU). Studies of geographical and temporal variations in the diet of grey seals based on analysis of faecal samples collected at a number of sites around the UK in 1985 have continued.
4. VHF-monitoring of seal behaviour (P.S. Hammond, SMRU). VHF-radio transmitters have been used to monitor the haul out behaviour of 10 grey seals at the Farne Islands and 4 common seals in the Wash.
5. Satellite monitoring of seal behaviour (B.J. McConnell, SMRU). A UHF-transmitter capable of communicating via system ARGOS satellites was used to monitor the movements of an adult grey seal from the colony on the south shore of the River Humber during August and September. The animal was later found dead with lung congestion and giving a positive result in an ELISA test for the presence of antibodies to morbilli-viruses.
6. Acoustic tracking of seals at sea (D. Thompson, SMRU). The movements and swimming behaviour of 4 adult female grey seals from the colony at the Isle of May in the Firth of Forth, Scotland was monitored from a sailing boat during November. Blubber, milk and blood samples were collected from these animals to determine if there is any relationship

between body burdens of contaminants and feeding distribution.

7. Long-term studies of reproductive success in grey seals (S. Anderson, SMRU; S. Twiss, University of Glasgow; W. Amos, University of Cambridge). Studies of the reproductive performance of individually-marked male and female grey seals at the colony on North Rona have continued. DNA-fingerprinting is being used to determine the paternity of individual pups and the reproductive success of individual males.

8. Organochlorine contaminants and the phocine distemper epidemic (J. Harwood, SMRU; S. Carter, University of Liverpool; M. Kendall, St. Thomas' Hospital; D. Wells, Department of Agriculture & Fisheries Scotland; R. Law, Ministry of Agriculture, Fisheries and Food). As part of a study to determine whether the immune system of seals in the North Sea has been depressed by organochlorine contaminants, blood and blubber samples are being collected from seals which have survived the phocine distemper epidemic. Animals are being caught at sites where the environmental levels of these contaminants are known to vary substantially. The status of the immune system is being determined by immunoglobulin assay, lymphocyte assay and thymulin assay.

#### Whales

1. Population biology and energetics of Faroese pilot whales (C.H. Lockyer, SMRU; W. Amos, University of Cambridge). The analysis of samples collected from the Faroese drive fishery is continuing.

DNA-fingerprinting is being used to determine the paternity of calves within schools.

2. Satellite tracking of beluga whales (A.R. Martin, SMRU; T. Smith, Canadian Department of Fisheries & Oceans). A UHF-transmitter capable of communicating through system ARGOS satellites was used to follow the movements of a beluga whale in the Canadian Arctic for 10 days.

3. International Whaling Commission (P.S. Hammond, SMRU). The UK continues to contribute to the activities of the Scientific Committee of the International Whaling Commission.

UNITED STATES  
(R. V. Miller)

Seals

NORTHERN SEA LIONS (T. R. Loughlin)

Research on northern sea lions included counts of pups, juveniles and adult sea lions on Marmot Island.

The counts of live northern sea lion pups at Marmot Island on July 2, 1988, and for 4 previous years are:

Year	Date	1	2	3	<u>BEACH</u>		6	7	Total
					4	5			
1988	7/2	0	0	832	1,436	75	16	777	3,136
1987	7/2	0	0	1,076	929	88	0	817	2,910
1986	7/8	0	0	1,477	1,355	199	7	1,228	4,266
1984	7/7-8			(no beach counts)					5,751
1979	7/7	0	178	1,847	2,253	619	426	1,335	6,658

Counts of adult and juvenile sea lions totaled 3,206 including 2,221 females, 155 territorial males, 321 other males, and 509 juveniles and "others". The total count was less than 1987 counts on June 13 (3,788) and July 3 (3,335), but easily accounted for by day-to-day variability in abundance. However, a decline in adult and juvenile abundance has undoubtedly occurred since 1985 (4,983 sea lions) and even more noticeably since 1979 (6,381).

We also tagged and branded 400 pups (207 females and 193 males), attached 13 radio transmitters to female sea lions (ten were monitored through August) and tested the drug Telazol as an immobilizing agent. We resighted 43 different animals or 10.7% of the population marked in 1987. During long-term observations of these animals during October 1987 through March 1988, over 200 had been resighted. The paucity of marked animals observed during June 1988 implies that pregnant females weaned their pups born in 1987 just prior to parturition in May-July 1988.

NORTHERN FUR SEAL (T. R. Loughlin and C. W. Fowler)

Adult male fur seals were censused on the Pribilof Islands during 10-17 July. On St. Paul Island 3,585 harem males (adult territorial males with females) and 3,201 idle males were counted. On St. George Island 1,259 harem males and 1,258 idle males were counted for a total of 4,844 harem and 4,459 idle males respectively for both islands. The number of idle males on St. Paul increased by almost 70%, an apparent effect of the ending of the commercial harvest.

The size of the fur seal pup population is estimated using the "shearing-sampling" method as the breeding structure breaks up on the rookery but before the pups begin to spend most of their time in the water. From 7-14 August, a total of 10,038 pups were marked, 6,172 from four sample rookeries on St. Paul Island and 3,866 from all six rookeries on St. George Island. After shearing, each rookery was sampled twice at 3-day intervals during 11-20 August, leading to an estimate on St. Paul of 202,000 pups born in 1988, an increase of about 31,000 over 1987; 24,900 pups were estimated on St. George.

During continuing entanglement studies, a total of 66 roundups were done on St. Paul Island; 24,519 subadult males of the size historically taken in the commercial harvest were examined for debris to estimate the entanglement rate for comparison with rates observed in the commercial harvest prior to 1985. Fifty-three entangled subadult male seals were captured and marked. For each entangled seal, two controls (similarly sized seals with no debris entangling them) were also tagged for comparison of rates of return in succeeding years. Thirty juvenile (subadult) male seals were fitted with radio tags for a study of the probability of being on land as it might be affected by entanglement (15 each on entangled and control animals). Two were fitted with imitation satellite tags and radios for testing of how those telemetry systems will be carried.

Aerial photographs (vertical views) of all fur seal rookeries on the Pribilof Islands were taken from 600 to 1,000 ft. elevation, and will be compared with historic aerial photos. On land, photographs of selected views of rookeries were also taken for comparison with historic photographs taken in 1895, 1948 and 1960.

Observation blinds were erected at the Kitovi rookery study site for longitudinal studies of marked individual female seals to observe and record the presence of female seals on a daily basis and whether or not these seals nurse pups.

Vocalization from 11 marked fur seals were recorded to determine the variability and changes that are associated with communication between pups and their mothers.

A long-term study of survival was begun by double tagging 7,181 pups with a modified round post monel cattle ear tag at four major rookeries on St. Paul. Tags were applied proportionally by rookery section according to the estimated number of pups present on each rookery in an effort to distribute the tags more randomly.

Studies on feeding and diving behavior continued on St. George Island where eight adult female fur seals were instrumented and released. Two instruments measured swim velocity, and six instruments measured water temperature as a function of dive depth. All eight females returned in a normal length of time, and the harnesses and instruments were recovered.

The new colony on Bogoslof Island continues to grow, and on 2 August scientists counted 80+ pups, 22 territorial males, 159 females, and 188 other males.

The 1988 census of northern fur seal pups on San Miguel Island of the California Channel Islands was very similar to 1987 with 721 pups born in Adams Cove and 496 born on Castle Rock. A study was initiated there to determine the effect of time of tagging on survival of northern fur seal pups, since pups tagged in October 1976 experienced significantly higher survival than did any of the subsequent cohorts through 1985, all of which were tagged in September of each year. In another comparison on St. Paul Island, pups tagged in September had higher survival than those tagged in August. Based on these observations, 175 fur seal pups were tagged during 19 to 24 September and another 175 pups were tagged during 18 to 22 October 1988.

#### Whales

#### **LARGE WHALE RESEARCH (J. Breiwick, C. W. Fowler, D. Withrow)**

The National Marine Mammal Laboratory has conducted shore-based counts of migrating gray whales since the mid-1960s. Recent counts began in December 1984 after a lapse of 4 years. Counts were conducted near Monterey, California (December/January) during 1984/85, 1985/86 and 1987/88. The first two counts were conducted without concurrent aerial surveys to adjust counts for distance offshore. Estimates of average distance offshore (based on binoculars with reticles) in 1987/88 indicated that the migration had moved further offshore than during the 1960s and 1970s. Preliminary experiments based on double counting during the 1985/86 census indicated that observers may miss up to 25% of the whales passing by. In

1987/88 double counting was maintained throughout the entire census and an aerial survey to verify the distribution of distances offshore was conducted. Using a new model to estimate whale abundance and applying a correction factor for whales missed based on double counts, the population was estimated to be 21,000 animals. Further work is being done to improve the variance of the new estimate. Although the standard error (688) is rather small, it is most likely the result of having censused nearly the entire migration period and having counted nearly one-third of the estimated population.

The NMML humpback whale fluke photo-identification project continues with cross-matching completed on nearly 5,000 fluke photographs from all major research groups in the North Pacific. Continuous efforts are directed toward improving software and distributing test versions and user's guides to selected contributors. Plans are underway for a joint workshop on humpback whale calf mortality (and possibly including information on reproductive intervals) based on photographic data put together in the computer system.

#### **KILLER WHALE/BLACKCOD INTERACTIONS (M. Dahlheim, T. R. Loughlin)**

NMML staff trained observers to collect data on domestic longline vessels with respect to the interaction of killer whales and blackcod fisheries in Alaska. A subsequent publication summarizing available information estimated that fishermen may suffer damages of as much as \$2,000/day in lost fish and gear in certain areas of the southeastern Bering Sea and Prince William Sound. NMML staff worked closely with the fishing community and environmental groups to study the problem, to develop alternative fishing methods and mitigating measures, and to educate members of the fishing community about the biological, economic, and political issues involved in this problem.

#### **NORTHEAST FISHERIES CENTER (Tim Smith and Gordon Waring)**

#### Whales

Since 1980, Manomet Bird Observatory, under contract to NMFS, has principally used NMFS research vessels as survey platforms to gather sightings of all species of sea birds, marine mammals, and sea turtles between Nova Scotia and Cape Hatteras, North Carolina. The 1980-1987 data are on the Centers' VAX computer. This database is compatible with the Centers' trawl survey data, thus it will allow researchers to correlate sightings with fisheries, plankton, and oceanographic data.



Researchers at the College of the Atlantic continued to maintain the North Atlantic humpback fluke photo-catalogue. This catalogue is helping researchers to monitor the population demographics, mortality, and habitat use of individual animals, and will be used in determining population estimates through mark-recapture analysis.

Researchers at the Provincetown Center for Coastal Studies (PCCS) continued to study the seasonal distribution and abundance of fin and humpback whales in Cape Cod Bay, along the Provincetown Slope, and in the Great South Channel. Also oceanographic behavioral, photographic, and population demographics information were collected. In addition, in high use habitats researchers documented the oceanographic (biological, physical) and geographic characteristics of those regions to identify the mechanisms which attract and maintain groups of whales.

A consortium of research institutions was funded through a cooperative agreement to the University of Rhode Island (URI) for the continuation of an integrated research program on the North Atlantic right whale. The overall goal of this research is detecting changes and causes of change in the North Atlantic right whale population size and distribution. The 1988 research was comprised of: 1) Database Maintenance - All cooperators provided copies of their data to URI to be incorporated into a central database, which includes all right whale sightings since 1956. These data are in a format that is compatible to the NEFC's database, and are in a format that allows each sighting event to be recreated; 2) Aerial Surveys - Surveys using high-winged aircraft were conducted along the southeastern USA coast in February 1988 to collect distribution, abundance, population demographics, photoidentification and other data; 3) Shipboard Surveys - Surveys were conducted principally in the northeast region (Nova Scotia to Great South Channel). Goals were to obtain data on distribution, respiration rates, micro-scale movements, high-use habitats, behavior, social groups, ecological and oceanographic parameters, and take photographs for individual identifications and of cow/calf pairs to determine calf size/age estimations, reproductive and mortality rates; 4) Data Analyses - Analyses included matching of animals photographed in 1988 to prior sightings or assigning new identifications to unmatched animals, estimation of mortality and calving rates, group size composition, and sex. In addition, high use-habitats were documented and described in relation to oceanographic and biological parameters. This research will continue in 1989.

In August 1988 the NOAA R/V GLORIA MICHELLE was used to conduct a three day harbor porpoise survey off Grand Manan, Nova Scotia. Participants included USA and Canadian scientists who had previous experience with harbor porpoise sighting surveys.

The objective of this study was to determine the effect of observer height on the density estimates derived from line transect methods. Data was collected from two independent observer teams, searching simultaneously on the same vessel, but using platforms of different heights. Since both teams were searching the same water, the true density of animals was equal for both teams. As such, the data represents a test not only of the effect of observer height, but can also be considered a general test of the robustness of line transect methods in this situation. Analyses of these data are underway.

#### Fisheries Interactions:

Foreign fishery compliance inspectors have continued to monitor and record all incidental takes of marine mammals in east coast distant-water fleet fishing operations. Pilot whales (Globicephala sp.) and common dolphin (Delphinus delphis) are the principal species taken in the Atlantic mackerel fishery.

SOUTHEAST FISHERIES CENTER  
(Larry Hansen)

Whales

The first year of three year low-level monitoring studies of bottlenose dolphin populations in the southeast has been completed. Local populations of these dolphins are being monitored under contract in two locations: the Sarasota-Tampa Bays, Florida area by Dolphin Biology Research Associates, Inc. (DBRA), and the Indian-Banana Rivers, Florida area by Mote Marine Laboratory (MML). The objectives of the monitoring are to: 1) be able to detect large-scale interannual changes in relative abundance and/or production of the dolphin stocks; and 2) establish archival databases for long-term trend detection. DBRA is using small boat surveys and photographic identification, and MML is using aerial surveys.

The Cooperative Institute for Marine and Atmospheric Science (CIMAS) completed the first phase of development of an image processing and analysis system. This system is being developed for use with photographic images of individually recognizable whales and dolphins. The system consists of an advanced graphic, microcomputer based image acquisition, analysis, and archival system. CIMAS configured and tested the system, and the SEFC will complete the further development of the system. The result of this project will be an expert type system for analyzing and archiving information on individual animals in order to estimate various parameters of population dynamics.

SEFC staff completed an analysis of local aerial surveys of bottlenose dolphins conducted in four embayments in the southeast during 1980-83. The areas were distributed as follows: Louisiana, two along the Florida west coast, and Georgia. The final report on the analyses is expected during early 1989.

SEFC staff also completed an analysis of regional aerial surveys of marine mammals of the Gulf of Mexico. These extensive surveys were conducted during 1983-86, and covered the area from the shore out to the 100-fathom isobath. The final report on the analysis is expected during early 1989.

**Bottlenose Dolphin Dieoff**

The SEFC is part of the Atlantic Bottlenose Dolphin Response Team which was formed to determine the causes and impact of the unprecedented dieoff of bottlenose dolphins along the US Atlantic coast during 1987-88. As part of this team, the SEFC was responsible for several projects during 1988, including:

### Stock Structure

The SEFC contracted Dr. Sandra L. Hersh to analyze the stock structure of bottlenose dolphins stranded along the US east coast during the dieoff. Dr. Hersh used skull and body morphometrics to differentiate stocks. The analysis indicated that the observed mortality probably affected only the coastal, shallow-water stock of bottlenose dolphins;

### Age Class Distribution

The SEFC also contracted Dr. Hersh to examine the age class distribution of bottlenose dolphins affected by the dieoff. Ages were determined by examining prepared teeth. Dr. Hersh concluded that the age class distribution was not that much different from that of animals stranded before the dieoff, except that proportionately more dolphins 5-9 years old stranded during the dieoff than in previous studies;

### Impact of Mortality

SEFC staff estimated the mortality that occurred during the dieoff and the impacts on the affected population. Basically, the stranding rate during the dieoff was compared to the rate prior to the dieoff. The strandings during the dieoff were at least an order of magnitude higher. The analysis indicated that approximately a minimum of 55% of the affected population died. Population recovery rates were estimated and varied from 18-100+ years, with a median time to recovery of 50.5 years.

SOUTHWEST FISHERIES CENTER  
(D. P. DeMaster)

### Seals

At Kure Atoll, the Headstart Program for Hawaiian monk seals completed a successful year. The project collects female pups at weaning and maintains them in a wire mesh enclosure for their first summer, affording them protection from sharks and aggressive adult male seals. Seal births at Kure Atoll had declined from about 30 per year in the late 1950s and the 1960s to a low of 1 birth in 1986. This decline was due to poor survival of pups and resultant low recruitment of reproductive females. Since then, pupping has increased, with eight pups born in 1988. Particularly encouraging is that the Headstart Project has entered its "second generation"; that is, females who were themselves maintained by the project in the early years are now giving birth. At least four seals who "graduated" from the Headstart Project in 1981 and 1982 have contributed at least five pups to the Kure population in the past 2 years.

## Whales

### HONOLULU LABORATORY (George Boehlert)

A survey was conducted aboard the NOAA ship TOWNSEND CROMWELL in the nearshore waters of the Hawaiian Archipelago to document the species and local abundance of cetaceans, and to record any interactions between the marine mammals and bottom fishing. A 1-week survey of Penguin Bank off south Molokai in December resulted in several sightings of bottlenose dolphins, Tursiops truncatus, and spotted dolphins, Stenella attenuata. The cetaceans did not interfere with fishing operations conducted from the vessel. A second survey was conducted in January while the ship transited between Honolulu and Hilo. Thirty humpback whales, Megaptera novaeangliae, were sighted during 4 survey hours on Penguin Bank and between the Islands of Maui, Molokai, and Lanai. Bottlenose dolphins and spotted dolphins were sighted off the south and west sides of the Island of Hawaii during the return transit.

### LA JOLLA LABORATORY (S. Sexton, D. P. DeMaster)

The SWFC is responsible for detecting trends in the relative abundance of those dolphin stocks taken incidentally by tuna purse seiners in the eastern tropical Pacific (ETP). The status of the spotted dolphin, Stenella attenuata, is of special concern because it is the major species taken by the fishery. Of the several stocks of spotted dolphins in the ETP, the northern offshore stock is considered to be the most affected by the fishery because it has been fished more frequently than any other stock. Other species involved in the fishery include spinner (S. longirostris), striped (S. coeruleoalba), common (Delphinus delphis) and Fraser's (Lagenodelphis hosei) dolphins. In the abundance analyses discussed below, these five species are often grouped and termed target species. Also, "abundance estimate" refers to a relative abundance index. At this time, we are not prepared to equate our abundance estimate, based exclusively on research vessel data, with estimates of absolute abundance.

In 1986, the SWFC initiated a research program to monitor relative abundance of dolphin populations in the ETP using two research vessels for at least five years during which six surveys (using line transect methodology) indicated that a 10% annual rate of decrease in northern offshore spotted dolphins could be detected (a total 41% decrease over six surveys) with alpha and beta error levels of 10%. In 1987 and 1988, the SWFC conducted the second and third surveys utilizing the same vessels (NOAA R/V McARTHUR and DAVID STARR JORDAN) during the same seasons (July through December). During these last two surveys, a helicopter, based off the D. S. JORDAN, was used to obtain vertical photographs of dolphin schools. Analyses to date include data from the first two years of the program (1986 and 1987).

The study area within the ETP was partitioned into four strata: inshore, middle, west and south. All four strata comprise the total area; northern offshore spotted dolphins are found in the inshore, middle and west strata. During 1986, 43, 28, 14, and 15 percent of the survey effort was in the inshore, middle, west and south strata, respectively. The allocation of survey effort during 1987 was similar.

The estimates of abundance for northern offshore spotted dolphins during 1986 (929,000) and 1987 (1,275,400) were not statistically different ( $p > 0.01$ ). The 1987 estimate was larger because of higher estimates of school density in all strata. The 1986 estimates for density in the inshore, middle, and west strata were 3.62, 2.56, and 189 schools/1000 km<sup>2</sup>, respectively; the corresponding 1987 estimates were 4.74, 3.15, and 2.16 schools/1000 km<sup>2</sup>, respectively. In addition, the proportion of spotted dolphins in the target species increased in the middle stratum (0.378 in 1986 to 0.524 in 1987). However, the proportion of all dolphins that were target species in the middle stratum slightly decreased from 0.906 in 1986 to 0.858 in 1987.

The observed increases in abundance between 1986 and 1987 occurred in spite of a decrease in school size in the inshore and west strata. Estimates during 1986 in the inshore, middle, and west strata were 89.41, 83.97, and 104.55 animals, respectively. Corresponding estimates of school size during 1987 were 81.57, 84.56, and 94.12 animals, respectively.

Abundance estimates for the southern stocks of the target species varied significantly between 1986 and 1987 because of few sightings. For example, the estimate for southern common dolphins was 943,200 animals during 1986 but was 201,000 animals during 1987. Estimates for the other species exhibited corresponding changes.

The total abundance estimates for all target species in 1986 and 1987 were 4,471,200 and 5,185,600 animals, respectively. Although the 1987 estimate is 16% larger, the observed difference is not statistically significant.

The reason for the larger 1987 abundance estimate for northern offshore spotted dolphins is attributed at this time to sampling variability between surveys. Various methods of calculating the abundance index have been investigated. Several possible contributing factors including ship effects, observer variability, sea state effects and survey coverage variability are being examined.

U.S.S.R.

(S.A. Studenetsky)

Seals

The studies on the state of the seal populations in the Baltic Sea continued. The expeditions made to the Gulf of Finland, Riga Bay in August/September 1987 were aimed at investigation into the distribution and abundance of seals in insular rookeries and collection of biological data. The abundance of the Baltic ringed seal continues to be stable. Grey seals are not numerous; main rookeries in the territorial waters of the USSR are located around Hiiuma and Saaremaa Islands (about 300 animals).

Seal distribution and seal fisheries interactions are studied in the eastern Baltic-Estonian and Latvian coast (V. Pilats).

As a result of the investigation on seals in the Greenland Sea the following data were collected:

a) Hooded seal

456 immature females and 300 males were aged by fangs, ovaries of 401 females were determined for reproduction and 247 puppies were analysed for sex and the dates of their birth were determined.

b) Harp seal

434 females (immature) were aged by fangs, ovaries of 391 females were determined for reproduction and 1160 puppies were analysed for sex and the dates of their birth were determined.

Two vessels and IL-18 DORR plane were used to study seal distribution. Aerial photographic survey of harp seal puppy gathering and hooded seal moulting rookery was made.

As for the harp seal of the White and Barents Seas, the following material was collected: 1618 specimens were analysed for age and sex compositions (by colour), 479 females from puppy gatherings and 1463 specimens from moulting rookeries were aged by fangs and ovaries of 900 females were analysed for reproduction; aerial photographic survey of seal puppy gatherings in the White Sea was made.

ADDENDUM 1

**MARINE MAMMALS COMMITTEE**

**FINLAND**

Baltic grey seal (*Halichoerus grypus*)

Research on grey seal continued for the third year in succession as an Finnish-Swedish joint project supported by the WWF. Individuals counted in summer numbered 550-600 in Finland's south-western archipelago and 75-100 elsewhere in the country's sea-area. This totals one-third of the numbers counted in the whole Baltic area. The diurnal rhythm of a local group was also observed, 59 pups were tagged, and 34 individuals drowned in fishing gear or found dead were studied for pathology and environmental contaminants. Blood samples from some of the tagged individuals were analysed for chromosomal aberrations.

Baltic ringed seal (*Phoca hispida botnica*)

Two aerial surveys were made during further population monitoring in the Bothnian Bay. In the Gulf of Finland, only observations on ringed seals were collected.

There was no open season for the ringed seal, but a licensed hunting resulted in a bag of 31 individuals altogether. Studies on age structure and on occurrence of occlusions in females of reproductive age were made with the aid of the catch material obtained. The results confirm earlier findings indicating that the number of females with uterine occlusions or stenosis is less than it used to be in seals younger than 10-15 years, though it is still high in older females.

Analysis of heavy metals and organochlorine compounds also continued, the material consisting of organs taken from ringed seals shot or found dead in fishing gear or on the shore.

(The research work on grey seal and on ringed seal was done mainly by Eero Helle and Olavi Stenman, both of the Game Division of the Finnish Game and Fisheries Research Institute. The working group consists also of researchers from the universities of Helsinki and Turku, the State Veterinary Medical Institute, the Institute of Marine Research and the Technical Research Centre of Finland.)

Saimaa ringed seal (*P. h. saimensis*)

The population, amounting to 150-180 specimens at present, was again monitored extensively. Estimation of the population size relied mostly on a count of winter lairs and that of reproductive success on the number of birthlairs among them. Specimens found dead were studied for pathology and environmental contaminants. Detailed field studies on the ecology and behaviour of a sub-population were started. Experimental captive propagation and behavioural studies incorporated with it were continued. New restrictions for net fishing were again imposed in pupping areas in April-June to protect young seals from drowning when entangled in nets. (The research was carried out and the conservation work led by a specialist group within the WWF, operating chiefly at the Department of Biology, University of Joensuu.)



SWEDEN

(M. Olsson)

WHALES

Studies on sinotinos, bycatches and stranded harbour porpoises (*Phocoena phocoena*) have started in 1987. (I and M Lindstedt, P Berqoren and F Pettersson).

SEALS

Common Seal

Swedish westcoast population (T Herkönen): About 4800 common seals died in Skaderack and Kattegat during 1988 in the infection by the morbillivirus named Phocine Distemper Virus (PDV). This number represent about 60 % of the estimated population. 95% of the pups in the area are thought to have died.

Baltic population (B Helander): In the south western part of the Baltic PDV caused a mortality rate similar to figures for Kattegat and Skaderack. There is no evidens that the small groups of common seals east of the Swedish mainland have been infected. Since the Baltic population only comprise some few hundred of animals the situation is critical for the species in Baltic.

Grey seal

The Baltic: Census of the Baltic population (B Helander) during the last 12 years has shown no dramatic change in number despite the fact that hunting has been banned since 1974. Numbers in the Gulf of Bothnia shows an uncertain slight increase. Seal sanctuaries have been established during the investigated period. It is believed that the number of seals recorded during the investigated period partly is influenced by the fact that the protection has increased and that the seals are now easier to count.

Studies on pathology in Baltic seals continue (Beroman Olsson). The PCB levels have not decreased significantly in grey seal pups since 1976 despite the fact that trend studies on Baltic fish often have shown a slight decrease during the last 10 years.

Ringed Seal

Baltic: Census studies on ringed seal in the Gulf of Bothnia using a modified strip method started in 1988 (Härkönen). The estimated numbers of basking ringed seals was about 2300 animals in the area. The figure is similar to the figure earlier found by Helle in Finland.