EUROPEAN RESEARCH ON CETACEANS

PROCEEDINGS OF SECOND ANNUAL CONFERENCE OF
THE EUROPEAN CETACEAN SOCIETY, TROIA,
PORTUGAL, 5 - 7 FEBRUARY 1988

EDITOR: P.G.H. EVANS

The **European Cetacean Society** gratefully
acknowledges the support of the following entities:

TORRALTA - Club Internacional de Férias

**SERVIÇO NACIONAL DE PARQUES, RESERVAS
E CONSERVAÇÃO DA NATUREZA**

INSTITUTO SUPERIOR DE PSICOLOGIA APLICADA

REGIÃO DE TURISMO DE SETÚBAL

EUROPEAN RESEARCH ON CETACEANS

Proceedings of the Second Annual Conference

of the European Cetacean Society, Tróia, Portugal,

5-7 February 1988

Editor : PGH Evans

Date of Publication: July 1988

Place of Publication: Lisboa, Portugal

CONTENTS

INTRODUCTION 5

Santos, M.E. dos Problems and perspectives for the study and conservation of cetaceans in Portugal 7

Sequeira, M.L. & Teixeira, A.M. Marine mammal surveys in Portugal 9

Santos, M.E. dos, Lacerda, M. & Sequeira, M.L. Preliminary aerial surveys in Portuguese coastal waters 13

Pérez, C. & Nores, C. Cetacean research in Asturias (North Spanish coast) 17

Nores, C. & Pérez, C. Multiple strandings of *Stenella coeruleoalba* and *Globicephala macrorhynchus* on the coast of Spain 25

Camiñas, J.A. & Rey, J.C. First record of a pygmy sperm whale (*Kogia breviceps*) on the southern Spanish Atlantic coast (Gulf of Cadiz) 27

Vonk, R. & Martel, V.M. First list of odontocetes from the Canary Islands (1980-1987) 31

Gordon, J., Arnbom, T. & Deimer, P. Cetacean research being conducted in the Azores by the International Fund for Animal Welfare 37

Arnbom, T., Gordon, J., Martins, H., Santos, R. & Walsh, V. Individual photographic identification of Risso's dolphin *Grampus griseus* near the Azorean Islands 39

Reiner, F. Note on the first recorded stranding of a humpback whale *Megaptera novaeangliae* on the Portuguese coast 42

Santos, M.E. dos & Harzen, St. Some new mating behaviour elements of free-ranging bottlenose dolphins 43

Giordano, A. New data on the presence of *Balaenoptera acutorostrata* in the northwest Mediterranean basin 45

Evans, P.G.H., Lane, M-R. & Scanlan, G. Cetaceans in UK & Irish waters: a check list 47

Danielsen, F., Skov, H. & Durinck, J. Ship-based survey of cetaceans in the Danish waters - a short description of the work with some preliminary results 50

Lindhard, M., Knudsen, L.Ø., Calvert, M. & Lyrholm, T. Sperm whale photoidentification, local fidelity and group behaviour off Andenes, Norway 51

Martin, A.R. & Desportes, G. Preliminary studies of long-finned pilot whales from Faroese waters since 1986: reproduction and growth 52

Andersen, L.W. Genetic differences among local populations of the long-finned pilot whale, *Globicephala melaena* , off the Faroe Islands and its karyotype 53

Desportes, G., Mouritsen, R. & Bloch, D. Preliminary results on the diet of the long-finned pilot whale exploited off the Faroe Islands 59

Raga, J.A., Balbuena, J.A. & Abril, E. Preliminary report on parasitological research on long-finned pilot whales in the Faroe Islands 65

Desportes, G., Balbuena, J.A. & Raga, J.A. First data on stomach parasites of long-finned pilot whales, *Globicephala melaena* (Traill, 1809), stranded in the Faroe Islands (European North Atlantic) 69

Rappé, G. & van Waerebeek, K. *Xenobalanus globicipitis* (Crustacea, Cirripedia) on cetaceans in the Northeast Atlantic and the Mediterranean: a review 75

Aguilar, A. & Borrell, A. Variation in blubber lipid reserves in fin whales off Spain 79

Behrmann, G. How do odontocetes perceive their own sounds? 81

Kinze, C.C. Studies on behaviour and ecology of the harbour porpoise (*Phocoena phocoena*): preliminary results from a series of sighting cruises in Danish waters, April - August 1987 91

Clausen, B. & Andersen, S. By-catch and health status of harbour porpoises from Danish waters 98

Lindstedt, I. & Lindstedt, M. Harbour porpoises deposited in Swedish museums in the years 1973 - 1986 99

Smeenk, C. Stranding records of the harbour porpoise *Phocoena phocoena* from the Netherlands 101

Kinze, C.C. Report of Harbour Porpoise Working Group meeting - Recent harbour porpoise research in Europe 105

Magnaghi, L. & Podestà, M. Report of Strandings Working Group meeting 111

Northridge, S. Report of By-catch Working Group meeting 113

EUROPEAN CETACEAN SOCIETY 117

INTRODUCTION

Between 5th and 7th February 1987, the European Cetacean Society held its second annual conference at Tróia, near Lisbon, Portugal. Over one hundred members from a dozen countries attended the conference and our thanks go particularly to the local organizer Manuel dos Santos for making it run smoothly and so enjoyably. We are also very grateful to the Portuguese Department of the Environment for sponsoring the conference, to TORRALTA for providing generous accommodation, to the Instituto Superior de Psicologia Aplicada for providing supporting facilities, and to Céu Baptista and Ana Salas, who so ably supported Manuel in the organization. Those who were fit enough to embark on the boat excursion in the Sado estuary had a most eventful and enjoyable time, with fine views of bottle-nosed dolphins.

The proceedings that follow are abstracts of the talks and posters offered to the conference (some of which, in the event, could not be presented in person). I am very grateful to all contributors for allowing me a free hand to edit their abstracts, mainly simply for clarity and uniformity of presentation. In this connection, I should like to thank Chris Smeenk for translating Günther Behrmann's contribution from German. I have tried to group the contributions according to subject, so that abstracts of talks and posters are not separated. Inevitably they vary somewhat in length. Some form summaries of material already published elsewhere; the remainder, it is to be hoped, will be published formally in refereed journals in due course. Finally, meetings were held by the harbour porpoise, strandings and by-catch working groups, and their reports are presented here.

The printing of these proceedings has been organized by Manuel dos Santos with funding support from the Portuguese Department of the Environment.

Peter G.H. Evans

ERRATA

Page 7 Title should read 'Problems and Perspectives for the Study and Conservation of Cetaceans in Portugal.'
10-11 lines from bottom Scientific name of the Mediterranean Monk Seal should read '*Monachus monachus*.'

Page 9, 12 lines from top Scientific name for sperm whale should read '*Physeter macrocephalus*.'

Page 14, top line should read 'groups of common dolphin *Delphinus delphis*, and striped dolphin *Stenella coeruleoalba*.'

Page 17, 3 lines from top should read 'Pérez.'
15 lines from top should read '...(see Table 1).'

Page 19, 11 lines from top should read 'españolas.'

Page 25, 4 lines from top should read 'Pérez.'

Page 27, 9 lines from top should read 'pygmy sperm whale *Kogia breviceps* was seen alive..'
14 lines from bottom should read '..(sampled from the Spanish fisheries on the African coast)...'
8 lines from bottom should read 'This first specimen...'

Page 40, 11 lines from bottom should read '...37: 204-210.'

Page 50, 4 lines from bottom should read '..one individual killer whale *Orcinus orca*, were observed.'

Page 53, 4-5 lines from bottom should read 'Comparisons of genetic identity for the different schools gave similar results as those from the multi-locus G test, with the Vidvik school....'

Page 54, 22 lines from bottom should read 'but in two odontocete families, the *Physeteridae* and the *Ziphiidae*, it is 42.'
13 lines from bottom should read 'on the basis of secondary sex characters.'

Page 60, 12 lines from top should read ' ..their presence was not recorded in the fjords. *Gonatus* becomes the principal prey though supplemented with other squids, and also not insubstantial numbers of fish. 1987 was a poor year for the *Todarodes* fishery; the species was recorded in the fjords but at deeper levels than usual.'

Page 79, 3 lines from top should read '...and Asunción Borrell.'
10 lines from top should read 'energy storage,...'

Page 96, should include Figure 5: Diving sequences. U ultra short dives, S short dives, M medium dives, and L long dives (for further explanation, please see text). Numbers indicate order of sequence:

UUMML	(1)	UUSUSL	(6)	UUSUUSUL	(11)
UUUUL	(2)	USUUSL	(7)	UUL	(12)
UMUUL	(3)	UUUUSSSUSSMUUUL	(8)	UUSUL	(13)
UUUSL	(4)	SUUSL	(9)	UUUUML	(14)
UUUL	(5)	UUUUL	(10)	UUUMUUSSSML	(15)
				UUUUUUSMULL	(16)

Page 97, Table 2, should read '6 Arctic tern (Sterna paradisaea)...'

PROBLEMS AND PERSPECTIVES FOR THE STUDY AND CONSERVATION OF CETACEANS IN EUROPE

Manuel E. dos Santos

Instituto Superior de Psicologia Aplicada,
Rua Jardim do Tabaco, 44
P-1100 Lisboa, Portugal

The development of cetology in Portugal has been hindered by serious difficulties, mostly of a legal and institutional nature. These difficulties are also reflected in the failure or inadequacy of protection measures regarding some marine mammal species. However, the relative abundance of a number of cetacean species in Portuguese waters still offers great potential for future studies.

Some of the major problems can be briefly outlined:

(1) Our 1981 Marine Mammal Protection Law, although successful with respect to its tough principles, does not specify the responsibilities of each of the various Authorities and institutions mentioned there. This has caused a great deal of problems and many conflicts.

(2) A disastrous consequence of these conflicts has been the lack of any national coordination of efforts regarding cetacean research and conservation. Basic tasks such as the maintenance of strandings and by-catch records, publication of such records, collection of dead animals for necropsy and histological studies, have all been neglected or carried out on a very limited scale. An obvious result is that animals stranded or netted in recent years have not been examined by researchers and were seldom reported.

(3) There is no visible effort of public education about cetaceans, and the Protection Law itself, although intimidating, is unlikely to change the attitudes of fishermen for example.

(4) Conservation matters in Portugal are regional affairs. The Central Government has only had a very small influence on the Authorities of Madeira and the Azores concerning the protection of marine mammals. Those Regional Governments are not, for electoral reasons, clearly committed to conservation policies, and some issues have raised international scandals, often to the embarrassment of the Central Government. The main problems relate to the Mediterranean Monk Seal *Phoca hispida* in Madeira, which is being driven to local extinction by fishermen using bombs around the small Desertas islands, and also to sperm whale *Physeter macrocephalus* hunting in some Azorean islands. This traditional activity used to be a means of increasing the income of rural workers, but has now turned into an obscene killing of whales whose teeth are extracted for scrimshaw carving and illegal export.

The responsibility for the fulfilment of the obligations that Portugal has accepted when it signed the various relevant international Conventions lies with the Environment departments of the State. These departments must take the necessary actions to ensure full protection to these animals and to stimulate their study. This would be best done by making an amendment to the 1981 Protection Law, after consulting all interested parties. A more efficient use of the existing logistic and human resources needs to be promoted, and the traditional excuse of lack of funds (sometimes very true) can no longer be honestly used in this context. The existing resources allow the possibility of valuable new programs, if the institutions are stimulated to allocate some laboratory space and some of the time of their researchers to the study of cetaceans. It is necessary to coordinate these efforts, and to centralize all the information in order to obtain a national picture and to make it available to everybody interested. This would be best done by the creation of a "National Centre for the Study of Marine Mammals", which should also promote meetings for exchange of ideas and information and furthermore channel resources more effectively.

Not only do Museums and Universities have a role to play in this future development. Amateurs, students, conservationists and animal welfare organizations should be encouraged to get involved in these issues and to participate in research programs. There is also great need for the education of the general public about the nature and habits of cetaceans. This should concentrate upon fishermen, sailing clubs, and those that visit or work on the beaches. Fishermen continue to kill dolphins, probably on a small scale (except in the Azores, where they routinely kill dolphins for fish bait). There are reasons to believe (with some examples to support this belief) that the education of fishermen would do more for the protection of cetaceans than any law can do.

As to the problems in Madeira and the Azores, the situation is unfortunately all too clear: their Regional Governments must be forced to act according to the international Conventions that Portugal has subscribed. If this does not happen, Portugal is liable to suffer prosecutions in international courts, tourism boycotts and other necessary actions.

Portugal happens to be still rich in cetaceans, compared with some wealthier and better organized nations. It is the duty of the present government, of scientists and conservationists to make the country avoid some of the mistakes other nations have made, in order to preserve this natural wealth and to use the research opportunities that are available.

MARINE MAMMAL SURVEYS IN PORTUGAL

M.L. Sequeira & A.M. Teixeira

Serviço Nacional de Parques Reservas e Conservação
da Natureza - Research Division
Rua Filipe Folque, 46 - 5º,
1000 Lisboa, Portugal

With an extensive coastline to the Northeast Atlantic and well-known traditions in seafaring, the Portuguese would be expected to have developed a very special interest in the scientific study of marine mammals. Unfortunately this was not always the case and most attention was diverted to commercial whaling and other forms of hunting.

The Azores are well-known for their open-boat sperm whale *Physeter catodon* fishery, continuing the Moby Dick style hand-spearing techniques well into the twentieth century, only falling into disuse a few years ago. Other types of whaling were also developed on Madeira Island and on the Portuguese coastline in Iberia, but these have progressively fallen into disuse and are now abandoned.

Except for a few commercial whaling reports containing limited biological information on the species being exploited, short notes from early naturalists (Brotero, 1818; Bocage, 1863; Seabra, 1907; Nobre, 1935; Braga, 1940; Themido, 1947) and popular press-cuttings reporting unusual strandings, were virtually all that was available to the cetologist from Portugal only a decade ago.

Systematic surveys for cetaceans and pinnipeds were initiated only in 1976 as part of a short-term academic investigation within the Oceanography Department from the Faculty of Sciences at Lisbon. However, only the mainland coast of Iberia was included in these surveys.

Most of the field work was based on the examination of strandings reported by a network of volunteers, which had to be built up for the purpose, all along the Portuguese coastline. The basic techniques of these surveys follow similar work done elsewhere, namely in France (Duguy & Robineau, 1973; Duguy, 1987).

This pioneering step was possible due to the enthusiastic cooperation of many individuals and some Official Departments - such as the "Aquãrio Vasco da Gama" from the Portuguese Navy, the National Customs (Guarda Fiscal) and the "Museo do Mar" at Cascais. From these early surveys has emerged a very basic knowledge about the marine mammals occurring on the Portuguese Iberian coast, with sixteen species of cetaceans and three pinnipeds recorded by Teixeira (1979).

Comparing the information available at this stage with previous data, it became apparent that the populations of some species had undergone important changes since the turn of the century. This has been particularly obvious for the harbour porpoise *Phocoena phocoena*, which was found to be no longer "abundant" in Portuguese coastal waters as had been reported by Bocage (1863) and Nobre (1935).

The common dolphin *Delphinus delphis* was clearly the most abundant species with up to 67.4% of all individuals recorded between 1976 and 1979 (Teixeira, 1979). However, this sample could have been somewhat biased at that time because dolphins were not fully protected under Portuguese law and many were still harpooned by fishermen and subsequently offered for sale at fish markets (Teixeira, 1979). The common dolphin was particularly vulnerable to this form of mortality due to its gregariousness around sardine *Sardina pilchardus* schools in heavily fished areas, and their well-known acceptance towards bow-riding, which brings them within easy reach of hand-thrown harpoons (see frontispiece illustration in Mitchell, 1975). These results may account for a relatively high proportion of common dolphin sightings which required correcting for by observations at sea.

Land-based surveys were therefore followed by surveys at sea, starting in 1980 with an investigation supported by the Portuguese Navy that has sent out the N.R.P. LAGOA mine sweeper vessel specifically in search of marine mammals off the Portuguese Iberian coast (Teixeira & Duguy, 1981).

The results of these surveys re-emphasised earlier findings that common dolphins were the commonest cetaceans off Iberia. A most interesting relationship between the distribution of that species and the depth of the sea bed was also indicated, with most dolphin sightings being obtained around the edge of the continental shelf in areas of rapidly changing sea bed topography. This was thought to correlate with good upwelling conditions, but still requires further investigation.

Unfortunately, no well-organised systematic surveys could be carried out in Portugal between 1979 and 1986. Strandings recorded during that period were described in a series of short papers from "Museo do Mar" at Cascais or "Aquãrio Vasco da Gama" in Lisbon, and many observations are still unpublished. Nevertheless, two more species of cetaceans were reported from the mainland Iberian coast (Reiner 1979, 1985) and the occurrence of vagrant bearded seals *Erignathus barbatus* have been reported (Ray *et al.*, 1981).

Another major breakthrough during that period was the start of a detailed behavioural study of the bottle-nosed dolphins *Tursiops truncatus* living on the Sado estuary (Santos & Lacerda, 1987), where this species was known to remain through the year (Teixeira, 1981; Teixeira & Duguy, 1981; Hussenot, 1982).

An important piece of national legislation (Decreto-Lei No. 263/81) was passed in 1981, following national and international pressures to stop all forms of whaling or hunting of small cetaceans in Portuguese Iberian waters. The killing of cetaceans became technically illegal there and this measure certainly had an immediate positive impact on species such as *Delphinus delphis* and *Stenella coeruleoalba.*

The effectiveness of these measures upon other species was much more difficult to assess. This holds especially true for the harbour porpoise, a species well-known for its coastal habits and frequent involvement in accidental drownings in gill nets set by small boats close to the shore. In this case the law possibly brought no significant benefits and may simply have resulted in placing any cetaceans found dead by fishermen in their nets, automatically beyond reach of cetologists. There are still no reliable estimates of the numbers of small cetaceans killed annually in fishing incidents, and these may prove quite difficult to obtain, despite specific investigation.

There are still major gaps in our knowledge of the distribution and biology of marine mammals in Portugal. A small cetological unit was set up in 1987 within the research department of Serviço Nacional de Parques, Reservas e Conservação da Natureza in Lisbon.

The study of live cetaceans at sea was selected as its first priority and a series of surveys have been organised. Trained observers were placed on board the N/E NORUEGA oceanographic vessel from the Instituto Nacional de Investigação das Pescas and most valuable information has been gained from the initial five cruises, spanning most of the Portuguese continental shelf and adjacent areas in Iberia.

The possibilities and effectiveness of quick aerial surveys were also assessed, using a small fixed-wing Cessna aircraft, to examine the inshore reaches of the shelf zone between Cabo da Roca and Sines (see Santos *et al.*, this volume).

A total of 48 observations of live cetaceans at sea has been obtained since marine surveys were initiated in February 1987. Most of this information is supported by appropriate photographic data and this technique has proved an invaluable asset to the identification of the most elusive animals sighted under difficult conditions and further allows the inclusion of casual reports from inexperienced workers.

The common dolphin stands out again as the most common species, comprising up to 68.8% of all the recent cetacean sightings reported at sea. This is considered to be a reasonably adequate estimate of the relative abundance of that species and compares well with data obtained from strandings (Teixeira, 1979; Reiner, 1985) and the N.R.P. LAGOA cruise (Teixeira & Duguy, 1981).

Other cetaceans that have been found quite regularly include the bottle-nosed dolphin (18.8%) and the striped dolphin (10.4%). There is also sufficient evidence accumulated to suggest that Risso's dolphin *Grampus griseus* and the long-finned pilot whale *Globicephala melaena* may also be met with quite regularly off the Portuguese coast in Western Iberia.

The results that have been obtained so far suggest that most sightings are to be made during the summer months, when surface water temperatures average higher. The frequency of sightings could also prove to be greater in the southern half of the Portuguese Iberian coastal zone and to reach highest values in areas of marked discontinuities in the topography of the sea-bed, generally associated with the 100-200 m water depth.

As suggested earlier by Teixeira & Duguy (1981), these studies still need further attention and are currently being investigated. A full report will be published shortly.

The short-term development of cetacean studies sought for mainland Portugal should also include the organisation of a single data bank in Lisbon. The information obtained from strandings could then be properly filed and subsequently released, as appropriate, eventually as a series of technical reports published at regular intervals.

Cetacean studies owe much to the enthusiasm of many skilled observers willing to report strandings or sightings of live animals. We are also very indebted to Dr R. Duguy (La Rochelle, France) for his continued support and technical help.

REFERENCES

Bocage, M.B. Du 1863. Liste des Mammifères et Reptiles observés au Portugal. Rev. Mag. Zool. pure appliquée (Paris), 15: 329-333.

Braga, J.M. 1940. A *Balaenoptera* da Praia do Paraíso. Publicações Inst. Zool. Dr. Augusto Nobre (Porto), 1: 1-13.

Brotero, F.A. 1818. Noções Históricas das Focas em Geral e Particular com as descripções das que conservão no Real Museu do Paço de Nossa Senhora da Ajuda. J. Coimbra (Lisboa), 11: 167-171.

Duguy, R. 1987. Rapport annuel sur les Cétacés et Pinnipèdes trouvés sur les côtes de France - XVI - Année 1986. Ann. Soc. Sci. nat. Charente-Maritime, 1986, 7: 617-639.

Duguy, R. and Robineau, D. 1973. Cétacés et Phoques des Côtes de France. Ann. Soc. Sci. nat. Charente-Maritime, suppl. juin 1973: 1-93.

Hussenot, E. 1982. Premier Recensement du Grand Dauphin *Tursiops truncatus* dans l'estuaire du Sado au Portugal. Actes du VI^{e} Colloque de Mammalogie. Ann. Soc. Sci. nat. Charente-Maritime, suppl. décembre 1982: 65-73.

Mitchell, E.D. (ed.) 1975. Review of Biology and Fisheries for Smaller Cetaceans. J. Fish. Res. Board Can., 32: 875-1242.

Nobre, A. 1935. *Fauna Marinha de Portugal. I.Vertebrados: Mamíferos, Répteis e Peixes*. Comp. Edit. Minho. Barcelos.

Ray, C., Reiner, F., Sergeant, D.E. and Quesada, C.N. 1982. Notes on Past and Present Distribution of the Bearded Seal, *Erignathus barbatus*, around the North Atlantic Ocean. Mem. Museo Mar, Portugal, 2: 23-32.

Reiner, F. 1979. Nota sobre um raro Ziphiid, *Mesoplodon densirostris* , Blainville 1817 nas costas de Portugal. Mem. Museo Mar, Portugal, 1: 1-12.

Reiner, F. 1985. Mammifères de l'Atlantique Portugais et le Phoque Moine de Madère. Thèse pour le diplôme d'Études Doctorales de L'Université d'Aix - Marseille III: 1-244.

Santos, M.E. and Lacerda, M. 1987. Preliminary observations of the Bottlenose Dolphin (*Tursiops truncatus*) in the Sado estuary (Portugal). Aquatic Mammals, 13: 65-80.

Seabra, A.F. 1907. Note sur les Cétacés du Portugal. A propos d'une nouvelle espèce pour la faune portugaise. Bull. Soc. port. Sci. nat. (Lisbonne), 15: 10-11.

Teixeira, A.M. 1979. Marine Mammals of the Portuguese coast. Sonderbruck aus Z. f. Saügetierkunde Bd., 44: 221-238.

Teixeira, A.M. 1981. Sobre a presença do Roaz Corvineiro *Tursiops truncatus* no estuãrio do Sado (Portugal). Actas 1ª Journada Ibér. Mamíf. Mar. (1981): 47-54.

Teixeira, A.M. and Duguy, R. 1981. Observations de Delphinidés dans les eaux cotières Portugaises. Relatórios de Actividades do Aquário Vasco da Gama (Lisboa), 9: 1-9.

Themido, A.A. 1947. As Focas das Costas de Portugal. Mems. Estud. Mus. Zool. Univ. (Coimbra), 179: 1-12.

PRELIMINARY AERIAL SURVEYS IN PORTUGUESE COASTAL WATERS

M.E. dos Santos*, M. Lacerda**, & M.L. Sequeira***

* Instituto Superior de Psicologia Aplicada,
Rua Jardim do Tabaco, 44 1100 Lisboa, Portugal.

** Av. de Sintra, 7 - 1, 2750 Cascais, Portugal

*** Serviço Nacional de Parques, Reservas e Conservação
da Natureza, Rua Filipe Folque, 46-5º, 1000 Lisboa, Portugal

Twenty-four species of marine mammals have been recorded in Portuguese continental waters (see Teixeira, 1979; Reiner, 1981, 1985). Some are apparently rare, while others seem to be relatively abundant, but the lack of coordinated recording schemes has made it very difficult to collect data towards better estimates.

Recently, some ship surveys have been carried out, resulting in more information (see Sequeira & Teixeira, this volume). We also decided to test the feasibility of using aerial surveys as a method for detecting, identifying and counting marine mammals in Portuguese coastal waters.

Three flights have been conducted, on 30 September 1986, 6 February 1987, and 1 March 1987. The survey on 6 February 1987 was cancelled after ten minutes flight above the sea, because of decreasing visibility, and so it will not be mentioned further. We used a high-wing Cessna 172 aircraft, which was flown at an altitude of about 250 m and a speed of about 170 km/h (as recommended by Leatherwood *et al.,* 1982), following the courses shown on the map (Fig. 1). At each sighting, the aircraft would descend to an altitude of about 70 m for closer observation and photography, and then return to the original altitude and speed. In both successful flights, the weather was clear and the sea was calm (Force 1 on the Beaufort scale).

Tables 1 and 2 refer to three sightings made on 30 September 1986 and ten sightings on 1 March1987, respectively. These results indicate that the occurrence of natural groups of cetaceans is common in the surveyed area, as other observations had suggested, and that aerial surveys in this region have a high probability of success in terms of sightings. Furthermore, weather conditions are often good for this region; there are many days of favourable weather, allowing fairly close observation even of the small delphinids. Identification of species and counting of animals are also possible, as it would be expected, and the use of this method should thus be continued and perfected.

This preliminary effort does not allow us any conclusions as yet about the relative abundance of the various species recorded, or about their distribution, but the results seem to reflect our present knowledge of the relative abundance of different species in the area, with the exception of Risso's dolphin *Grampus griseus*.. This species was previously considered "very infrequent", but our aerial sightings suggest this is probably not the case.

Previous observations also indicate that some species may regularly associate, in coastal waters, but actual interactions were not seen except in the case of the mixed groups of common dolphin *Delphinus delphis*, or striped dolphin *Stenella coeruleoalba*.

These aerial surveys have been funded by a branch of the Portuguese Environment Department, the "Serviço Nacional de Parques, Reservas e Conservação da Natureza". The plane was flown by João Penaguião, and we thank José Mexia Alves for assistance.

REFERENCES

Leatherwood, S., Reeves, R.R. and Show, I.T. 1982. Effect of varying altitude on aerial surveys of bottlenose dolphins. Rep. Int. Whal. Commn, 32, paper SS/14B, pp. 569-575.

Reiner, F. 1981. Guia de identificação dos Cetáceos e Focas de Portugal Continental, Açores e Madeira. Memórias do Museu do Mar, Portugal, 1: 1-60.

Reiner, F. 1985. Mammifères de l'Atlantique portugais et le Phoque moine de Madère. Thèse d'Université, Université d'Aix-Marseille. 244pp.

Sequeira, M. and Teixeira, A. 1988. Marine mammal surveys in Portugal, (this volume).

Teixeira, A. 1979. Marine mammals of the Portuguese coast. Zeitschrift fur Saugetierkunde, 44: 221-238.

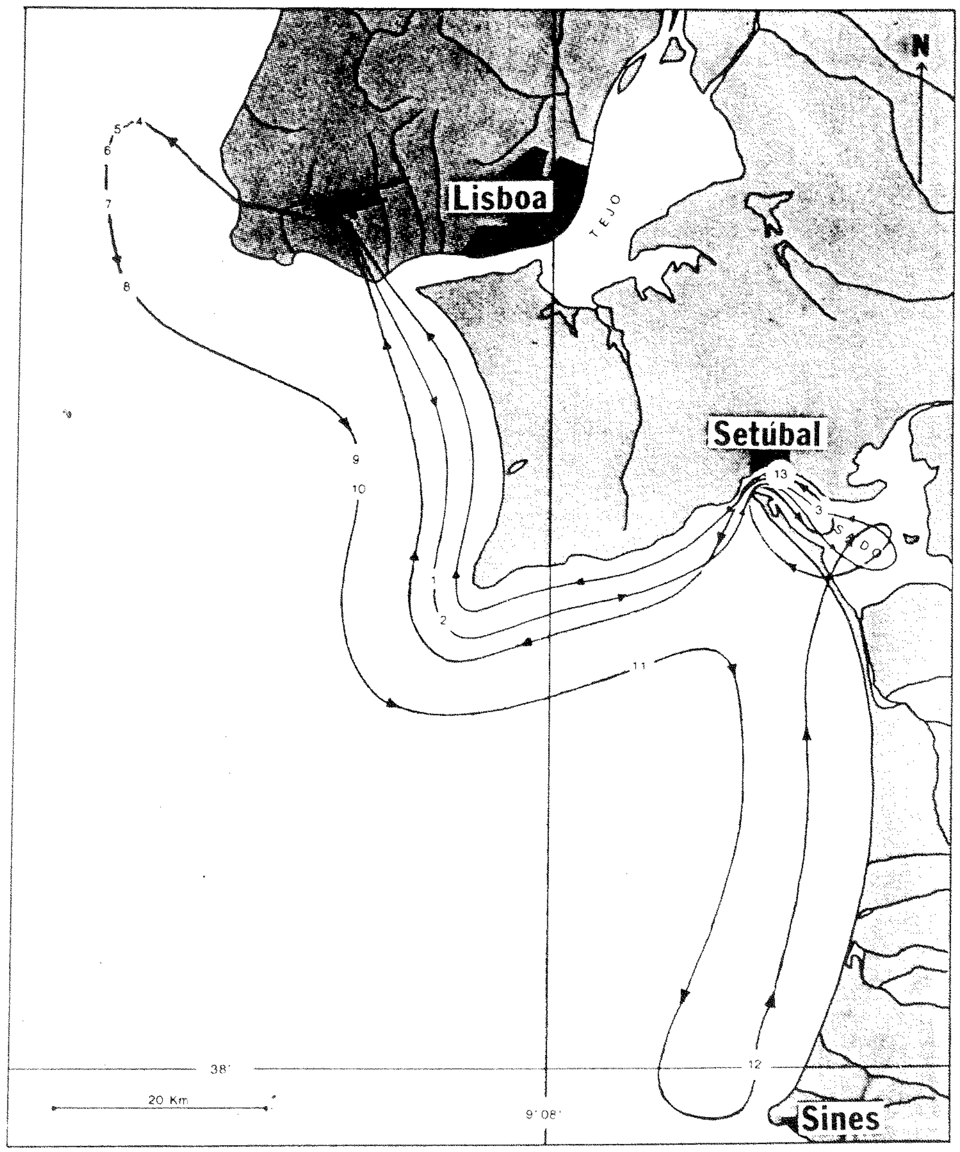


Fig. 1. Flight courses on 30 Sept. 1986 (thinner line) and 1 March 1987. Numbers refer to sightings (see Tables 1 and 2).

Table 1. Sightings on 30 September 1986.

(Duration of flight: 1 hr 39 min. Length of flight: ± 180 km)

No. of Sighting	Species	No. of animals	Activities
1	*Grampus griseus*	5	Slow, directional swimming
2	*Delphinus delphis* & *Stenella coeruleoalba*	100+	Fast, dispersed swimming
3	*Tursiops truncatus*	10-12	Feeding

Table 2. Sightings on 1 March 1987..

(Duration of flight: 4 hr 05 min. Length of flight: ± 360 km)

No. of sighting	Species	No. of animals	Activities
1	*Tursiops truncatus*?	2	-
2	Small cetaceans	6	-
3	*Grampus griseus*	14	Fast swimming, close formation
4	*Delphinus delphis*?	6	Slow, dispersed swimming
5	*Delphinus delphis* & *Stenella coeruleoalba*	100+	Fast, dispersed swimming
6	*Tursiops truncatus*	10-12	Social interactions
7	*Globicephala melaena*	10	Slow, dispersed swimming
8	*Delphinus delphis*	15	Slow swimming, close formation
9	*Delphinus delphis* & *Stenella coeruleoalba*	25	Close formation
10	*Tursiops truncatus*	10-12	Directional swimming

CETACEAN RESEARCH IN ASTURIAS

(NORTH SPANISH COAST)

Concepción Perez and Carlos Nores

Departamento de Biologia de Organismos y Sistemas,
Universidad de Oviedo, Spain.

Over the last decade, information has been obtained concerning cetaceans in the coastal waters of Asturias (between 4° 31' and 7° 02' W) in relation to faunistic and biogeographic studies of the region. Various papers have been published which consider some of these aspects (Perez, 1978a, 1979b; Nores & Perez, 1980, 1982a, 1982b, 1983, & 1988).

The data compiled from strandings, catches and sightings at sea have allowed us to obtain an overall picture of the status, seasonal distribution and frequency of the different species in this area.

We obtained a total of 179 records, of which 169 belong to odontoceti and ten to mysticeti (see Table 2). Seventeen species have at some time frequented these waters more or less regularly. These included four mysticete species and thirteen species of odontocetes. Three of them (northern right whale *Eubalaena glacialis*, humpback whale *Megaptera novaeangliae*, and false killer whale *Pseudorca crassidens*) were not included in the present work, as they represent only ancient records. The last northern right whale disappeared from the waters of this area at the turn of the century, while the other two are presently considered to be very rare in the region.

The most common species, both with regard to the number of records and the total number of specimens are: common dolphin *Delphinus delphis*, followed by the pilot whales *Globicephala* spp., harbour porpoise *Phocoena phocoena*, and bottle-nosed dolphin *Tursiops truncatus*. The relative frequency of different species has changed between the periods 1977-83 and 1984-87. Thus, the harbour porpoise has diminished in relative importance, while common dolphins have increased, and pilot whales remained in similar proportions in the two periods. Rarer species recorded since 1977 in Asturian waters include minke whale *Balaenoptera acutorostrata*, the sperm whale *Physeter macrocephalus*, the pygmy sperm whale *Kogia breviceps*, and the fin whale *Balaenoptera physalus*, this last being more abundant in the more northerly latitudes (between 45° and 48° N) as clearly demonstrated by our recent surveys (Perez & Nores, in prep.). However, striped dolphin *Stenella coeruleoalba*, killer whale *Orcinus orca*, Risso's dolphin *Grampus griseus*, and short-finned pilot whale*Globicephala macrorhynchus* cannot be considered common. Since the short-finned pilot whale and the pygmy sperm whale are warm water species, they have the northern limits of their ranges in our latitudes. With respect to European waters, we have found a greater number of specimens of warm water species than of cold water species.The Cuvier's whale *Ziphius cavirostris* and northern bottlenose whale *Hyperoodon ampullatus* are accidental, the latter represented by only one unconfirmed report. The status of bottlenose whales is unknown in this area.

STRANDINGS We have calculated that 39% of all records obtained refer to specimens stranded along the coast. In Table 1, the number of records and total number of individuals per species are shown.

The topography of our region results in a coastline made up of cliffs (more than 70%) which allow the formation of only small beaches and coves, as well as a few shallow estuaries; hence strandings are more difficult and carcasses are less likely to remain ashore. The distribution of strandings along the coast is shown in Figure 1. It should be noted that areas in which there is an accumulation of strandings coincide either with the presence of an important urban settlement, or where there is the collaboration of a permanent recorder.

The sector with the highest number of records is number 2, which corresponds to the area around Cape Peñas. This also coincides with the area of the greatest number of sightings. We have also observed a relationship between the superficial coastal currents in the area of Cape Peñas, and variation in the presence of stranded animals for the different months in that sector.

CATCHES According to the data given in Table 1, only 11% of records result from by-catches from fishing boats which operate in the coastal waters of Asturias. The positions where incidental catches were made are marked on Figure 1. The majority of catches again correspond to sector 2, the fishing zone most exploited by artisanal fishing boats which concentrate over a restricted area.

The species affected by the nets of these boats are harbour porpoise, common dolphin, striped dolphin, and long-finned pilot whale. Of the 39 specimens taken between 1977 and 1987, 74.3% were harbour porpoises caught mainly in fixed nets and pursing nets, followed by common dolphins (20.5%), while the other two species have only been caught sporadically. Some stranded specimens appear to have been harpooned, but the importance of this mortality cannot be evaluated. However, we suspect it is quite a lot higher than that produced by the different fishing nets.

Most catches occur between January and April, although the differences are small. We have compared the relative frequencies of caught and stranded species, and used the proportion as an index of the vulnerability of the species, on the basis that the number of stranded animals is directly proportional to the population size of that species in the sea. Using this method, it appears that the harbour porpoise is the most vulnerable to entanglement in fishing nets, whilst the pilot whale is the least vulnerable (see Table 2).

SIGHTINGS Observations at sea make up 50% of all the records. In Table 1, the number of sightings for each species is given, together with the total number of specimens of each species. The most frequently sighted species was the common dolphin, followed by pilot whales (*Globicephala* spp.). The size of the schools shows great variability, ranging from solitary specimens to more than two hundred animals. Nevertheless, schools which exceeded one hundred in number were exceptional. Occasionally, mixed schools of pilot whales and bottle-nosed dolphins have been observed.

The positions where cetaceans have been observed are given in Figure 2. The majority of the records are from waters close to Cape Peñas, between 40 and 200 m depth, and it is in this sector that the greatest density of specimens was found. This abundance is probably related to the richness of the area in trophic resources both for squid feeding and fish feeding cetaceans, since this is an important region for fisheries of pelagic fishes and cephalopods.

The most coastal cetacean species is the harbour porpoise, being confined to waters belonging to sectors 1 and 2, with no record outside the continental shelf.

The two pilot whale species and striped dolphin are more abundant in offshore waters, but common dolphins, though represented in both areas, are more abundant in coastal waters. The few records of bottle-nosed dolphin that we have, come from both coastal and offshore waters. The killer whale has been frequently found in waters close to the shore, but also occurs in offshore waters.

REFERENCES

Nores, C. and Pérez, C. 1980 (1982). Apariciòn de un *Globicephala* albino en la costa Cantábrica (Cetacea, Delphinidae). Misc. Zool., 6: 161-163.

Nores, C. and Pérez, C. 1982a. Primera cita de un cachalote pigmeo, *Kogia breviceps* (Blainville, 1862) (Mammalia, Cetacea) para ias costas peninsulares espanõlas. Bol. Cien. Nat. I.D.E.A., 29: 139-144.

Nores, C. and Pérez, C. 1982b. Varamientos en masa de cetáceos en las costas Cantábricas. Mems. Mus. Mar, Portugal, 2(21): 1-20.

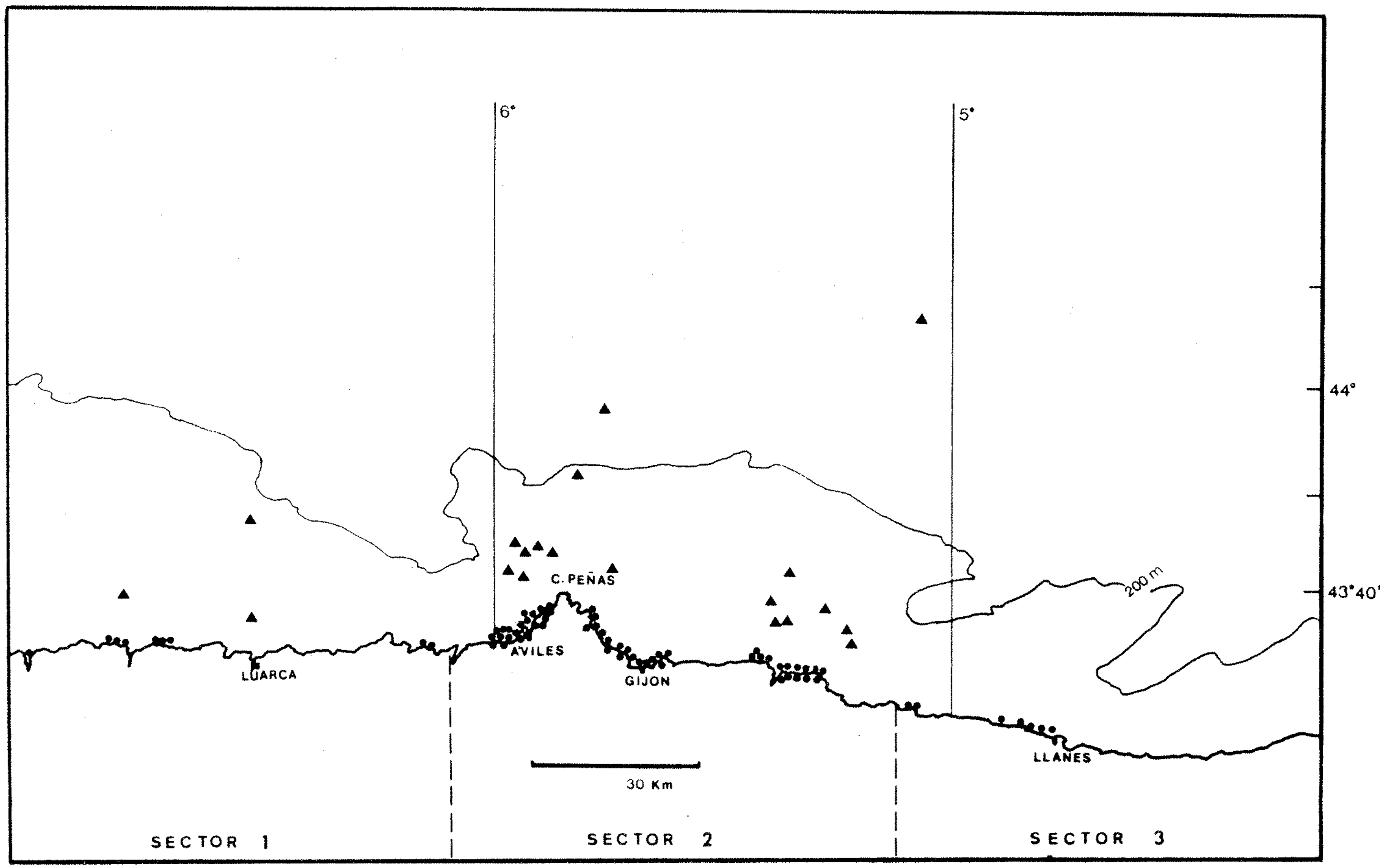
Nores, C. and Pérez, C. 1983. Mamíferos marinos de la costa asturiana: I. Relaciones de observaciones, capturas y embarrancamientos hasta 1982. Bol. Cien. Nat. I.D.E.A., 31: 17-48.

Nores, C. and Pérez, C. 1988. Overlapping range between *Globicephala macrorhynchus* and *Globicephala melaena* in the Northeastern Atlantic. Mammalia, 52: 46-53.

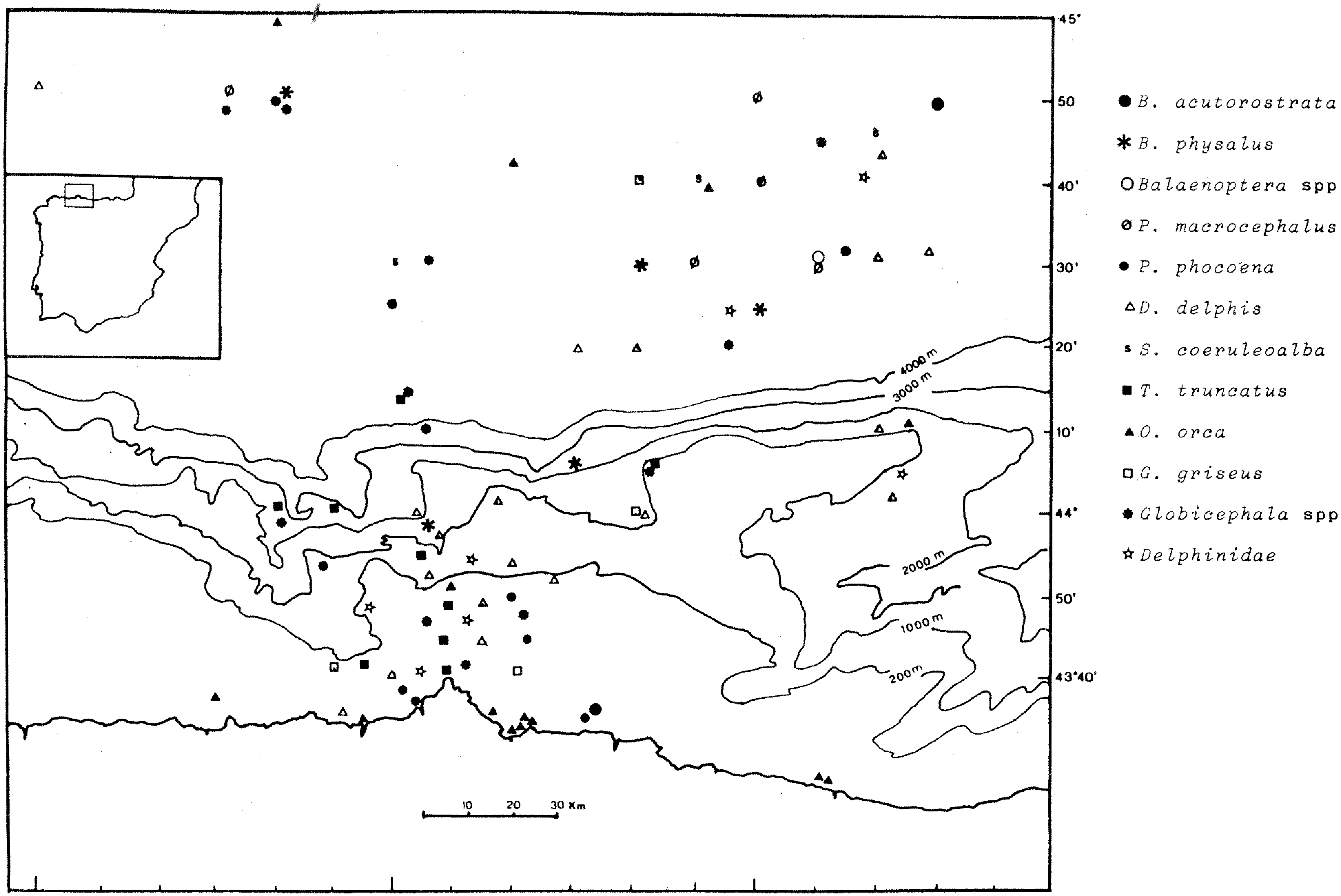
Pérez, C. 1979a. Aparición de un *Physeter macrocephalus* L. en Gijón, Asturias (Cetacea. Odontoceti, Physeteridae). Sup. Cien. Bol. I.D.E.A., 24: 101-105.

Pérez, C. 1979b. Sobre la presencia de un delfin de Risso *Grampus griseus* (Cuvier, 1812) en la costa Cantábrica (Cetacea, Odontoceti, Delphinidae). Sup. Cien. Bol. I.D.E.A., 24: 159-165.

Pérez, C. and Nores, C. (in prep.) Avistamientos de cetáceos en el Atlántico Nororiental (Golfo de Vizcaya y aguas adyacentes).



MAP 1.- DISTRIBUTION OF CETACEANS STRANDED ON AND CAPTURED OFF THE ASTURIAN COAST DURING THE PERIOD 1977-1987.



MAP 2.- POSITIONS OF SIGHTINGS OF THE DIFFERENT SPECIES RECORDED.

TABLE 1.- DATA COLLECTED BETWEEN THE PERIOD 1977-1987

CETACEA	STRANDINGS		SIGHTINGS		CATCHES		TOTAL	
	RECORDS	SPECIMENS	RECORDS	SPECIMENS	RECORDS	SPECIMENS	RECORDS	SPECIMEI
MYSTICETI	2	2	8	13			10	15
Balaenoptera acutorostrata	2	2	2	2			4	4
Balaenoptera physalus			5	9			5	9
Balaenoptera spp (unidentified)			1	2			1	2
ODONTOCETI	67	68	82	1030	20	40	169	1138
Physeter macrocephalus	1	1	5	14			6	15
Kogia breviceps	4	4					4	4
Ziphius cavirostris	1	1					1	1
Hyperoodon ampullatus (?)	1	1					1	1
Phocoena phocoena	8	8	4	44	10	29	22	81
Delphinus delphis	18	18	21	627	7	8	46	653
Stenella coeruleoalba	7	7	3	32	1	1	11	40
Tursiops truncatus			9	69			9	69
Orcinus orca			12	68			12	68
Grampus griseus	5	5	4	19			9	24
Globicephala melaena	5	5	2	12	1	1	8	18
Globicephala macrorhynchus	7	8					7	8
Globicephala spp			15	105			15	105
Delphinidae	10	10	7	40	1	1	18	51
TOTAL	69	70	90	1043	20	40	179	1153

TABLE 2

RELATIVE FREQUENCIES OF CATCHES AND STRANDING OF CETACEAN ON THE ASTURIAS COAST

(NORTH OF SPAIN)

SPECIES	CATCHES	STRANDING
Delphinus delphis	20,5 %	47,4 %
Stenella coeruleoalba	2,6 %	18,4 %
Phocoena phocoena	74,3 %	21,0 %
Globicephala melaena	2,6 %	13,2 %

MULTIPLE STRANDINGS OF *Stenella coeruleoalba* AND *Globicephala macrorhynchus* ON THE COAST OF SPAIN

Carlos Nores and Concepción Perez

Departamento de Biología de Organismos y Sistemas,
Facultad de Biología, Universidad de Oviedo,
33071 Oviedo, Spain

INTRODUCTION Two multiple strandings that could be described as "voluntary beaching" have been recorded on the northern coast of Spain. The first of these happened at Puerto de Bares (province of La Coruña) (43° 45'N, 7° 41'W) when a school of striped dolphins *Stenella coeruleoalba* stranded on a beach on the morning of 23 August 1987. The second incident took place in Llanes (province of Asturias) (43° 25'N, 4° 45'W) on 28 December 1987 when two short-finned pilot whales *Globicephala macrorhynchus* tried more than once to swim against the rocks of the cliff.

OBSERVATIONS For thirty minutes (from 0900 to 0930 h), a school of approximately 100 striped dolphins beached twice on the coast of the Ría del Barquero, near the Cape Estaca de Bares, after about six killer whales *Orcinus orca* were seen in the vicinity, although no attacks were recorded. The incident started when one dolphin approached a diver standing on the shore, swam around him and even touched him, then suddenly a number of animals started to swim quickly towards land pulling the diver. A second attempt occurred after all the dolphins had been dragged out to sea. In both strandings almost half of the school - dolphins of various ages (from 1.4 m long to adult size) - came into waters of 0.5 m depth or onto land, while the rest stayed in water of at least 2 m depth. Finally, all the animals were taken back into the sea and were discouraged from coming ashore by people making a lot of noise. Dolphins swam around nearby the shore during the following half hour and were driven out to deeper waters by a motor boat. An acoustic signal (described as a whistling sound), different to the habitual whining emitted by dolphins, was heard three times, on two occasions immediately before the sudden breaching.

The second incident lasted the entire day. In the morning, an uncertain number (somewhere between three and six) of short-finned pilot whales were seen near the harbour of Llanes. At noon, two specimens swam 200 m away from the shore, another one swam in circles (15-30 m diameter) hitting its head intermittently against the rocky shore, and a fourth whale swam also in circles a little further away, showing wounds on its head, and loss of skin. Between 1700 and 1730 h, the two whales that were closer to the coast (the only ones remaining at that time) changed their positions, and displayed the same behaviour as the preceding one. Both animals, at times, exhibited their tail vertically out of the water but without slapping against the surface. Their movements were slow with a breathing rhythm of between ten and twenty seconds. After hitting the coast, the wounded animals usually floated motionless on their back for a few seconds. The following day, at sunrise, one carcass was stranded on the adjoining beach of Sablón, and the second whale stranded at noon. Both animals were adult females, and six more specimens of this species, uncommon in European waters, were stranded during the following days (one of these was an aborted male foetus; the rest were females) along the coast (Nores & Pérez, 1988).

DISCUSSION The apparently active breaching showed by both species could be explained by an erroneous orientation caused by the local geomagnetic topography (Klinowska, 1986). In the first incident, in addition to the presence of killer whales, there are permanent geomagnetic abnormalities due to deep igneous rocks southwards of Estaca de Bares (Aller, 1986). In this same Ría del Barquero, another mass stranding of eleven animals (probably common dolphin *Delphinus delphis*) was recorded in August 1869, and in the next Ría de Vivero, almost twenty cetaceans (probably long-finned pilot whales *Globicephala melaena*, or Risso's dolphin *Grampus griseus*) were also stranded on 5 October 1930 (Nores & Pérez, 1982), indicating a concentration of live strandings in this part of the northern coast of Spain.

We cannot consider the pilot whale stranding of Llanes as a mass stranding because both carcasses did not strand simultaneously nor alive (the second one at least) but the behaviour observed the previous day was very similar to a live stranding with the original characteristic that it was against a vertical cliff, not on a shelving beach. Other different and classical explanations do not seem to explain this behaviour any better.

ACKNOWLEDGEMENTS We wish to thank Santiago Tabullo and José M. Barbas for their information on the stranding of Puerto de Bares and for the graphic material (slides and video recordings). The report of the second event was made by Jesus Iglesias, Luis Carrera and our own observations.

REFERENCES

Aller, J., 1984 (1986) Una hipótesis sobre la estructura geológica profunda causante de la anomalía regional de una parte del manto de Mondoñedo. Breviora Geol. Asturica, 27: 4-12.

Klinowska, M. 1986. The cetacean magnetic sense: evidence from strandings. Pp. 400-432, in M.M. Bryden and R.J. Harrison (editors), *Research on dolphins*. Oxford University Press, Oxford.

Nores, C. and Pérez, M.C. 1982. Varamientos en masa de cetáceos en las costas cantábricas. Mem. Mus. Mar, Ser. Zool., 2: 1-17.

Nores, C. and Pérez, M.C. 1988. Overlapping range between *Globicephala melaena* and *Globicephala macrorhynchus* in the Northeastern Atlantic. Mammalia, 52: in press.

FIRST RECORD OF A PYGMY SPERM WHALE (*Kogia breviceps*) ON THE SOUTH SPANISH ATLANTIC COAST (GULF OF CADIZ)

J.A. Camiñas and J.C. Rey

Instituto Español de Oceanografia,
Centro Costero Oceanográfico de Fuengirola,
Apdo. 285, 29640 Fuengirola,
Málaga, Spain

A specimen of pygmy sperm whale *Kogia breviceps* have been seen alive in the Gulf of Cadiz, close to the beach of "Puerto de Santa Maria" (see Fig. 1). The coordinates of the site are 36° 30'N, 6° 15'W.

The specimen was seen swimming around in the area until it appeared near the beach, floating on the water and with numerous wounds, probably due to shooting.

Personnel from the IMUCONA (Local Institute for Nature Preservation) were in charge of recovering the carcass, and measurements of the specimen. The results are given in Table 1. When the specimen had been described and identified, it was frozen in order to preserve it for a later dissection.

On 10 November 1987, the whale was defrosted, and a total of 31 measurements taken (Table 2), based on the identification guide of Leatherwood *et al.* (1976) and the papers of Nores and Pérez (1982).

The back of the animal was coloured bright black, merging into grey on the flanks. The ventral side was mixed pink-white colour, becoming grey on the abdomen and in the lowest part of the flippers and tail fin.

The left flank showed some marks similar to the scars found on swordfish *Xiphias gladius*, sampled from the Spanish fisheries on the African coast) caused by the bite of a shark.

The teeth of the lower jaw were small and sharply pointed, oriented from the edge of the jaw towards the inside of the mouth. A typical example (fourth tooth of the lower jaw) measured 9 mm long with a diameter of 2.35 mm at its base, and showing a slight curvature at the top.

The first specimen was an adult male, with considerable erosion on the first two teeth.

The skeleton of the whale is being prepared for mounting in a show-window. When the mounted work is completed, we shall make some further skeletal measurements to check that the species is not a dwarf sperm whale *Kogia simus*.

REFERENCES

Leatherwood, S., Caldwell, D.K. and Winn, H.E. 1976. *Whales, Dolphins, and Porpoises of the western North Atlantic. A guide to identification.* NOAA

Tech. Rep. NMFS CIRC-396.

Nores, C. and Pérez, M.C. 1982. Primera cita de un cachalote pigmeo, *Kogia breviceps* (Blainville, 1862) (Mammalia, Cetacea) para las costas peninsulares españolas. Bol. Cien. Nat. I.D.E.A., no. 29.

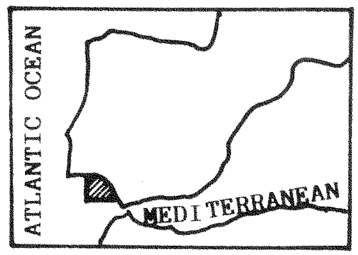


Fig. 1.- Area of capture.

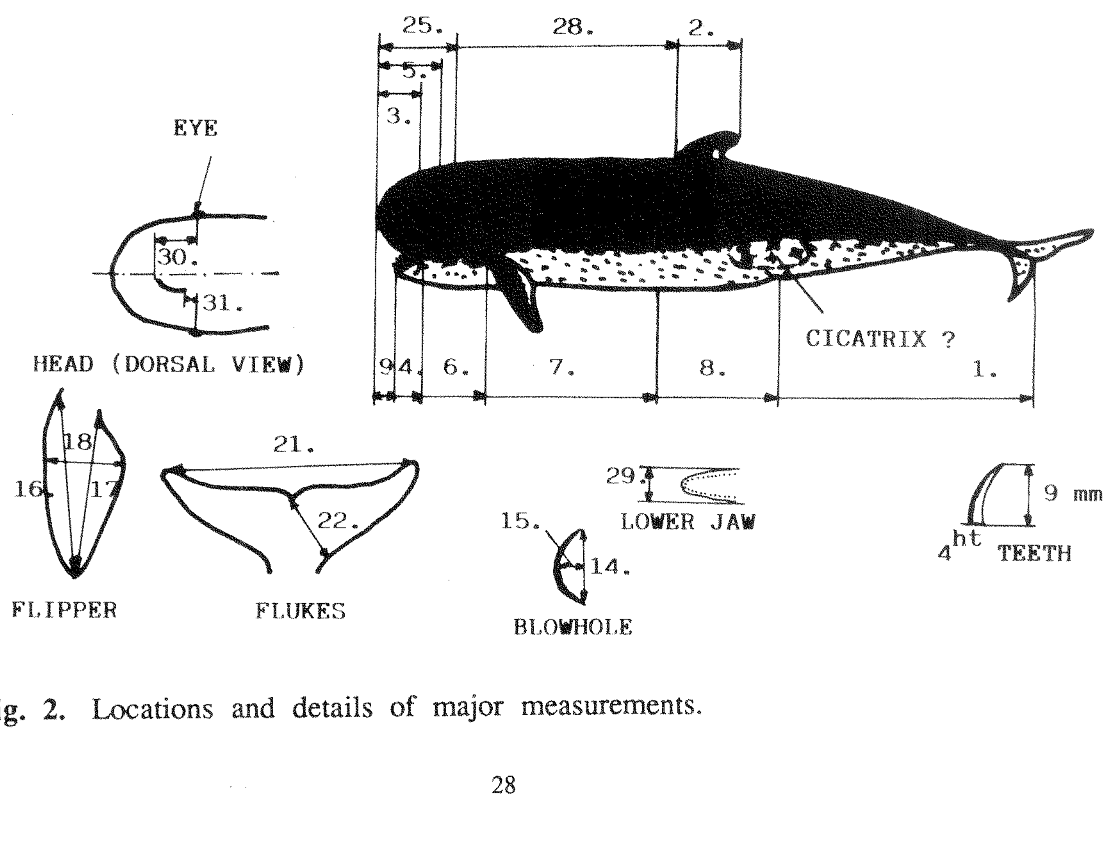


Fig. 2. Locations and details of major measurements.

Table 1. Morphometric characteristics of *Kogia breviceps*

Weight	137 kg
Total length	185 cm
Tail fin	62 cm
Dorsal fin	30 cm
Pectoral fin	34 cm
Total no. of teeth	24

Table 2. Measurements of *Kogia breviceps* after being defrosted.
Data collected by straight line measurements

Measurement	cm
1. Total length	212
2. Length from anterior border of head to tip of dorsal fin	129
3. Length from anterior border of head to blowhole	19
4. Length from anterior border of head to commissure	22
5. Length from anterior border of head to centre of eye	27
6. Length from anterior border of head to flipper insertion	49
7. Length from anterior border of head to centre of genital slit	84
8. Length from anterior border of head to centre of anus	141
9. Length from anterior border of head to anterior margin of lower jaw	11
10. Length of the eye	2.4
11. Height of the eye	1.2
12. Maximum length of genital slit	1.0
13. Maximum length of anus	9.5
14. Maximum length of blowhole	5.5
15. Radius of blowhole	1.2
16. Maximum length of flipper	31.5
17. Minimum length of flipper	21.5
18. Width of flipper	11.5
19. Height of dorsal fin	13.0
20. Length of base of dorsal fin	22.5
21. Width of fluke	60.0
22. Length of fluke	21.1
23. Length of fluke neckline	4.2
24. Length from anterior border of head to external ear	34.0
25. Width of head	27.5
26. Length from anterior border to dorsal fin	132.0
27. Length from anterior border of head to dorsal fin insertion	106.0
28. Maximum width of lower jaw	7.1
29. Maximum length from blowhole to imaginary line between eyes	6.2
30. Minimum length from blowhole to imaginary line between eyes	3.3

FIRST LIST OF ODONTOCETES FROM THE CANARY ISLANDS, 1980 - 1987.

Robert Vonk* and Vidal Martin Martel**

* Apartado de Correos 1413, 38200-La Laguna, Tenerife

** Boya 19, Playa Honda, 35550-San Bartolomé, Lanzarote

This is the first list of records from the Canary Islands, including most of the strandings occurring between 1980 and 1987. During this period, 12 species have been found: *Delphinus delphis, Tursiops truncatus, Stenella coeruleoalba, Steno bredanensis, Globicephala macrorhynchus, Grampus griseus, Physeter macrocephalus, Kogia breviceps, Ziphius cavirostris, Mesoplodon densirostris, M. europaeus, and M. mirus.*

Delphinus delphis (Linnaeus 1758) Common dolphin

1. 21/04/1981. Playa de la Restinga, Guimar (Tenerife). Male. Total length 230 cm.

2. 21/05/1983. Playa de la Gaviotas, Santa Cruz de Tenerife (Tenerife). Sex undetermined. Total length 181 cm.

3. --/--/1983. Caught and taken to Puerto Lajas (Fuerteventura). Sex and total length unknown.

4. --/--/1984. Corralejo (Fuerteventura). Complete skeleton found on beach. Sex and total length unknown.

5. 20/03/1985. El Guincho, Arona (Tenerife). Female. Total length 203 cm.

Tursiops truncatus (Montagu 1821) Bottle-nosed dolphin

6. 12/10/1984. Las Galletas (Tenerife). Female. Total length unknown.

Stenella coeruleoalba (Meyen 1833) Striped dolphin

7. 09/04/1985. Playa de Arencibia (Lanzarote). Live stranding of a group of six, five of which were returned to the sea. A female died with a total length of 212 cm.

Steno bredanensis (Lesson 1823) Rough-toothed dolphin

8. --/10/1983. El Médano (Tenerife). Female. Total length unknown.

9. --/--/1983. Puerto Lajas (Fuerteventura). Complete skeleton found on beach. Sex and total length unknown.

Globicephala macrorhynchus (Gray 1846) Short-finned pilot whale

10. 16/07/1984. Playa de las Canteras, Las Palmas de Gran Canaria (Gran Canaria). Live stranding of a group of six, five of which were returned to the sea, and only a male died with a total length of 455 cm.

Grampus griseus (Cuvier 1812) Risso's dolphin

11. 14/10/1985. Punta del Hidalgo, La Laguna (Tenerife). Sex undetermined. Total length 285 cm.

Physeter macrocephalus (Linnaeus 1758) Sperm whale

12. 17/05/1982. Charco de los Muchachos, Taganana (Tenerife). Sex undetermined. Total length 1100 cm.

13. --/05/1982. Orzola (Lanzarote). Female. Total length unknown.

14. 24/05/1984. Moya (Gran Canaria). Male. Total length 1200 cm.

15. --/05/1985. La Garita, Telde (Gran Canaria). Sex and total length unknown.

16. 30/05/1985. Playa de las Salinas, Valle Guerra (Tenerife). Sex undetermined. Total length 9600 cm.

Kogia breviceps (De Blainville 1838) Pygmy sperm whale

17. 06/10/1987. Playa de Guacimeta, San Bartolomé (Lanzarote). Male. Total length 320 cm.

Ziphius cavirostris (Cuvier 1823) Cuvier's or Goosebeaked whale

18. 03/05/1980. El Prix, Tacoronte (Tenerife). Caught by local fishermen. Male. Total length 430 cm.

19. 25/11/1982. Garachio (Tenerife). Sex unknown. Total length 472 cm.

20. --/08/1983. Punta de Güímar (Tenerife). Male. Total length unknown.

21. 02/08/1984. Baja Amarilla, Janubio (Lanzarote). Sex undetermined. Total length 560 cm.

22. 08/02/1985. Morro Jable (Fuerteventura). Live stranding of a group of at least 12 individuals along 15 km of coast. Nearly all died, but it was only possible to examine three animals: (a) Female. Total length 435 cm; (b) Male. Total length 553 cm; (c) Female. Total length 612 cm. Group probably mixed with *Mesoplodon* since, at the same time, one *M. europaeus* stranded near to this area.

23. --/03/1986. Mogán (Gran Canaria). Sex and total length unknown.

24. 01/06/1986. Group of four stranded on different parts of Lanzarote's northern coast. Only two animals were possible to examine: (a) Guatiza. Male. Total length 488 cm; (b) Orzola. Female. Total length 430 cm. This group was probably also mixed with at least one specimen of *Mesoplodon europaeus*.

25. --/--/1986. Near to Playa Jóver, Valle Guerra (Tenerife). Sex and total length unknown.

26. 28/06/1987. Punta de la Vaca, San Miguel (Tenerife). Two specimens stranded alive. One died, stranding again 25 km away. Both sex and total length unknown.

27. --/11/1987. Jameos del Agua (Lanzarote). Female. Total length 540 cm.

28. --/11/1987. Guatiza (Lanzarote). Female. Total length unknown.

Mesoplodon densirostris (De Blainville 1817) Blainville's or Dense-beaked whale

29. 22/05/1983. Mesa del Mar, Tacoronte (Tenerife). Female. Total length 420 cm.

30. 29/10/1983. Playa de los Fariones, Puerto Carmen (Lanzarote). Female. Total length unknown.

Mesoplodon europaeus (Gervais 1855) Gervais' or Antillean beaked whale

31. 08/02/1985. Ginijinamar (Fuerteventura). Male. Total length 430 cm.

32. 01/06/1986. Mala (Lanzarote). Male. Total length 457 cm.

33. 04/07/1987. Two specimens stranded on the northern coast of Lanzarote: (a) Jameos del Agua. Male. Total length 410 cm; (b) Punta Mujeres. Male. Total length 424 cm.

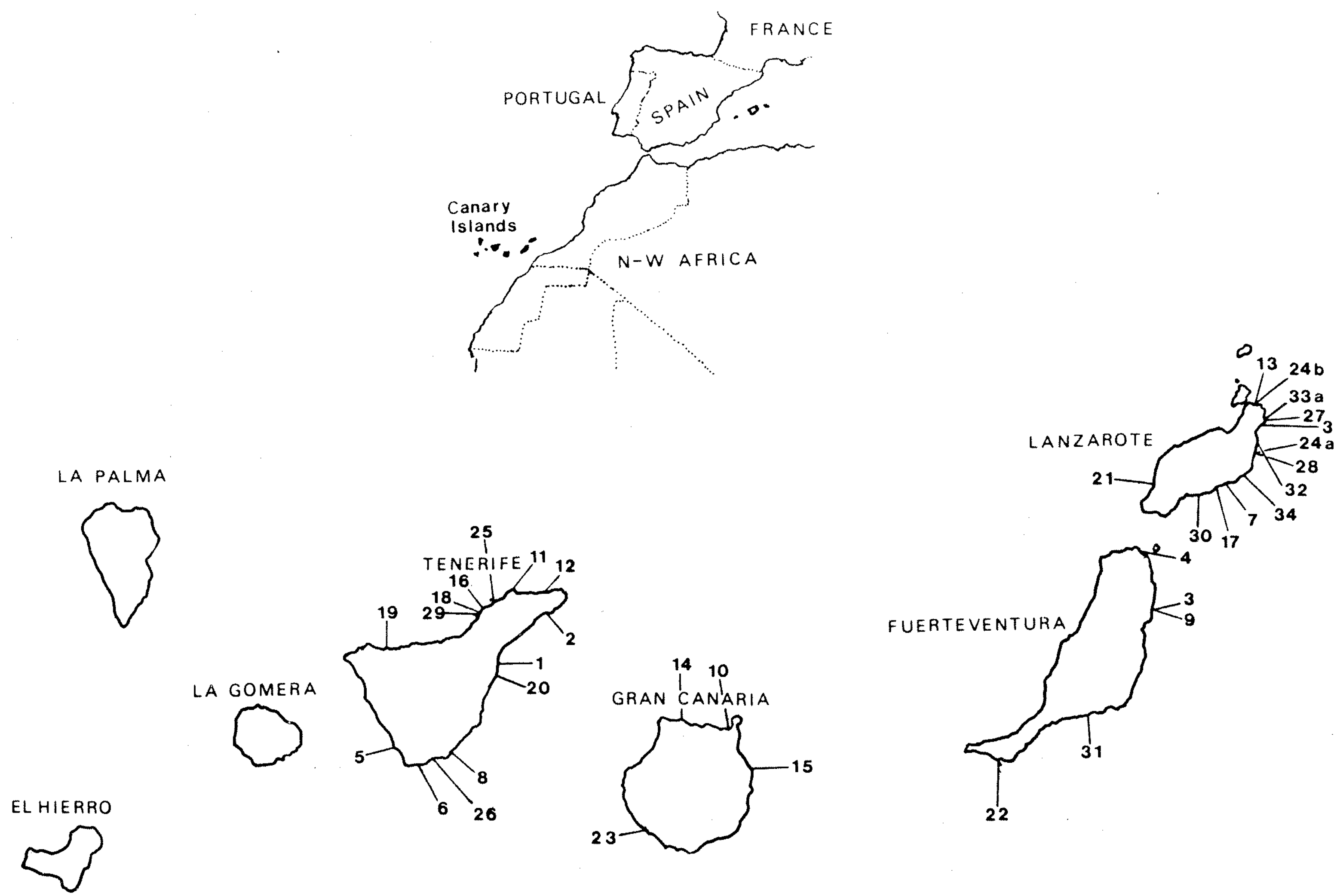
Mesoplodon mirus (True 1913) True's beaked whale

34. 31/03/1984. Muelle de los Mármoles, Arrecife (Lanzarote). Male. Total length 500 cm.

CONCLUSIONS The absence of data from La Palma, La Gomera and El Hierro is essentially due to the coastal topography of these islands (most of them are very rocky and with high cliffs), which makes it very difficult for animals to remain beached for any length of time.

The high frequency of *Mesoplodon* strandings on the Canary Islands, makes them a very interesting area for the study of this genus. Since parasitological material and stomach contents have been collected, particularly from Ziphiids, its study should give us in the near future more information about their habitat, diet, and feeding behaviour.

ACKNOWLEDGEMENTS We are very grateful to Dr. P.J.H. van Bree and particularly to Dr. James Mead for confirming the *Mesoplodon* species identifications and their helpful comments.



Odontocetes strandings on the Canary Islands

(1980-1987)

CETACEAN RESEARCH BEING CONDUCTED IN THE AZORES BY THE INTERNATIONAL FUND FOR ANIMAL WELFARE

Jonathan Gordon*, Tom Arnbom**, and Petra Deimer***

* Department of Zoology, University of Cambridge, Downing Street, Cambridge CB2 3EJ, UK.

** Department of Zoology, University of Stockholm, S-106 Stockholm, Sweden.

*** Gesellschaft zum der Meeressaugetiere, Mohlmannweg 2, D-2000 Hamburg, Federal Republic of Germany.

The International Fund for Animal Welfare (IFAW) is currently conducting a program of cetacean research in the seas around the Azorean archipelago. There are a number of objectives:

1. To determine the occurrence and distribution of cetaceans around the Azores and in particular to investigate the feasibility of commercial whale watching in this area.

2. To study aspects of the biology and behaviour of sperm whales *Physeter macrocephalus* , especially those relevant to the species' conservation and welfare.

3. To develop a methodology for assessing cetacean populations acoustically.

4. To continue to develop, and demonstrate the effectiveness of, minimally disturbative benign research techniques for studying cetaceans.

Most of the research conducted from IFAW's small research vessel "Song of the Whale". The first field season lasted from July until August, 1987.

Nine species of cetaceans were encountered and positively identified in the waters around the central group of islands of the Azorean archipelago. The species of most interest to us was the sperm whale. Acoustic monitoring gave us a qualitative indication of the distribution of this species in the study area. Passive acoustics and directional hydrophones were used to locate and track sperm whales. Two extended trackings of sperm whale groups lasted for over 24 hours. On one of these occasions, the group moved over 70 nautical miles in an approximate straight line, while on the other occasion, the group moved up and down the same (approximately 35 mile long) stretch of ocean. A total of 23 sperm whales were individually identified using photographs of their flukes. A photo-identification study of Risso's dolphins *Grampus griseus* was also initiated (see Arnbom *et al.*, this volume).

Sperm whale body length was measured using two photographic techniques, one involving some adaptations to stereo-photography, and the other essentially a new technique. Results are encouraging. It appears to be a highly accurate method which will have many applications to a number of other species. Underwater sound recordings were made from whales whose length had been measured, to allow further assessment of an acoustic length estimation technique. Recordings were also made for studies of sperm whale communication and echolocation.

Experiments with different types and configurations of hydrophones for acoustic assessment were undertaken, and some trials of suitable methods also conducted.

The project will continue through 1988 and we intend to be in the field from May until October.

INDIVIDUAL PHOTOGRAPHIC IDENTIFICATION OF RISSO'S DOLPHIN *Grampus griseus* NEAR THE AZOREAN ISLANDS

T. Arnbom*, J. Gordon**, H. Martins***, R. Santos***,

& V. Walsh****

* Department of Zoology, University of Stockholm,
S-106 91 Stockholm, Sweden

** Department of Zoology, University of Cambridge,
Downing Street, Cambridge CB2 3EJ, UK

*** Department of Oceanography and Fisheries, University
of Azores, Horta, Fayal, Azores, Portugal

**** 202 Bay Street, Orillia, Ontario, Canada L3V 3W8

The use of individual photographic identification of free-living whales has increased our knowledge of migration, population biology and social behaviour of several cetacean species. Most studies have been on larger species such as humpback whales *Megaptera novaeangliae* (Katona & Whitehead, 1981), minke whales *Balaenoptera acutorostrata* (Dorsey, 1983), southern right whales *Eubalaena australis* (Payne *et al,* 1983) and sperm whales *Physeter macrocephalus* (Gordon, 1983; Arnbom, 1987). The technique has also been applied on smaller species such as the bottle-nosed dolphin *Tursiops truncatus* (Wursig & Wursig, 1977), dusky dolphin *Lagenorhynchus obscurus* (Wursig & Wursig, 1980), and, recently, Risso's dolphins *Grampus griseus* (Evans, 1987; Kruse, 1987). The methods of individual identification applied to Risso's dolphins by us in the Azores, are described, followed by a discussion of problems and biases.

Risso's dolphins were visually observed and photographed from a 14 metre ketch near the Azorean Islands from July to August, 1987. The encounters were generally off the shelf in deep waters. Whenever possible, photographs of the dorsal fins were taken with 35 mm cameras and 300 mm telephoto lenses. Distinctive natural marks on the dorsal fin and body made it possible to use the method of individual photographic identification.

The number of Risso's dolphins photographically identified individually with certainty was 56 from the right hand side and 58 from the left side, of the dorsal fin. These individuals were photographed and identified from ten different encounters. A comparison of the number of identified individuals and estimated number of dolphins observed at each encounter shows that between 10 and 100% of the group could be individually identified. Individuals were re-identified within but not between days. The average visually estimated number of Risso's dolphins at 14 of the 15 encounters was nine (range 1-14, standard deviation 3.68). However, on one occasion 80-100 Risso's dolphins were sighted at the same time, although they were spread out in several sub-groups. At this last encounter, there were more juveniles and calves present than was usually observed.

Kruse (1987) has been able to identify individual Risso's dolphins within and between years off the Californian coast and similar results have been obtained off Scotland over a period of seven years (Evans, 1987). Our preliminary results are hard to interpret while we have no re-identifications between days. One difference between our results and others is that we were collecting data from a much larger area while the other two were within a coastal zone in a relatively small area. Another explanation may be that our sample size of the Risso's dolphin population near the Azores is too small to have achieved any matchings. It may also be that the dolphins encountered were migrating through the area so that the chances of re-identifying individuals was small. We hope that in coming seasons, we shall be able to answer some of these speculations.

Natural marks used for individual identification were scars which often resembled tooth mark scars. The origin of these scars is not known, although the most likely sources of these marks are from other Risso's dolphins (aggressive interactions between individuals have been frequently observed by Evans (pers. comm.)) and from squid hooks.

When using the method of individual photo-identification for population estimates, based on mark-recapture techniques, it is desirable to photograph whales at random and for the identifiability of individuals to be equal. There was a difference in the number of marks on larger (presumably older) and smaller (younger) animals. Larger animals had more scars than smaller individuals, whilst calves in particular had very few natural marks on their dorsal fin and body. Most large individuals were coloured whitish-grey but some were blackish. The difference in the number of natural marks on dolphins of different age and the variation in colouration of adult animals will bias the identification of individuals. Risso's dolphins with more scars are easier to identify individually than animals with few scars. The photographers tended to concentrate on animals which were whitish, which are easier to follow under the water and therefore these dolphins could be predicted where they would break the surface. Social individuals would also be photographed more often than solitary ones, and it was easier to detect a group than single individuals. It is not known if some of the animals were more likely to approach the boat and be photographed. Despite these biases, the method of individual photographic identification is a powerful tool in the study of free-living cetaceans.

REFERENCES

Arnbom, T. 1987. Individual identification of sperm whales. Rep. Int. Whal. Commn, 37: 201-210.

Dorsey, E. 1983. Exclusive adjoining ranges in individually identified minke whales (*Balaenoptera acutorostrata*) in Washington State. Can. J. Zool., 61: 174-181.

Evans, P.G.H. 1987. *The Natural History of Whales and Dolphins*. Christopher Helm Ltd, Bromley, Kent. 343 pp.

Gordon, J. 1983. Photographic studies of sperm whales (*Physeter catodon*). Abstract, 5th Biennial Conference on the Biology of Marine Mammals. Boston, Mass., November 1983.

Katona, S. and Whitehead, H. 1981. Identifying humpback whales using their natural markings. Polar Record, 20: 439-444.

Kruse, S. 1987. Behavior of Risso's dolphins in Monterey Bay, California. Abstract, 7th Biennial Conference on the Biology of Marine Mammals. Miami, Fl., December 1987.

Payne, R., Brazier, O., Dorsey, E., Perkins, J., Rowntree, V., and Titus, A. 1983. External features in southern right whales (*Eubalaena australis*) and their use in identifying individuals. Pp. 371-445. In Payne, R. (editor) *Communication and Behavior of Whales*. Westview Press, Boulder, Colorado, USA. 643 pp.

Wursig, B. and Wursig, M. 1977. The photographic determination of group size, composition, and stability of coastal porpoises (*Tursiops truncatus*). Science, 198: 755-756.

Wursig, B. and Wursig, M. 1980. Behavior and ecology of dusky dolphins, *Lagenorhynchus obscurus*, in the South Atlantic. Fish. Bull., U.S., 77: 871-890.

NOTE ON THE FIRST RECORDED STRANDING OF A HUMPBACK WHALE *Megaptera novaeangliae* ON THE PORTUGUESE COAST

F. Reiner

Rua da Nogueira, 19, 1
2750 Cascais,
Portugal

A 695 cm long (young) male was the first recorded stranding of a humpback whale *Megaptera novaeangliae* , on the Portuguese coast. The animal stranded near Figueira da Foz (8° 54' N, 40° 03' W) , in January 1986, and it was found in an advanced state of decay.

We present photographs and measurements of the animal, as well as photographs of two species of ectoparasites collected from the posterior throat grooves. These were identified as *Coronula diadema* and *Conchoderma auritum*.

SOME NEW MATING BEHAVIOUR ELEMENTS OF FREE-RANGING BOTTLENOSE DOLPHINS

M. E. dos Santos* and St. Harzen**

* Instituto Superior de Psicologia Aplicada,
Rua Jardim do Tabaco, 44
P-1100 Lisboa, Portugal

** Department of Ethology,
University of Bielefeld,
P.O. Box 8640, D-4800 Bielefeld,
Federal Republic of Germany

We are observing the bottlenose dolphin, *Tursiops truncatus*, in the Sado estuary, Portugal, and are particularly interested in the social behaviour and social organisation of this population.

Our observations are conducted from (1) a shore vantage point, using binoculars and a theodolite monocular; and (2) from a boat. During one of our boat surveys we followed two mating animals at close range, and photographed the behavioural sequence visible at the surface.

The observed mating behaviour includes various elements, such as leaping, swimming side by side and rolling at the surface, commonly described in the literature. We also observed a repeated and conspicuous pattern, so far unreported, that we call head raising. It was noted that in all instances the mating animals were separated from the rest of the group by more than one kilometre. The different behavioural elements can be consistently attributed to each of the two animals and might reflect the specific sexual roles in mating behaviour.

NEW DATA ON THE PRESENCE OF *Balaenoptera acutorostrata* IN THE NORTHWEST MEDITERRANEAN BASIN

Amelia Giordano

Via Ugdulena 7,
90143 Palermo,
Italy

Since 1979, we have been carrying out a project to investigate the distribution, abundance and etho-ecology of different species of cetaceans in the Mediterranean. This research is accomplished by annual and periodic cruises on French C.N.R.S. Musée Oceanographique Monaco and Italian C.N.R. research vessels. Our study area is the northwest Mediterranean.

During our research, eight different species of cetaceans have been recorded, among which the observation at sea of minke whales *Balaenoptera acutorostrata* , is of particular interest, since this species is considered to be rare in the Mediterranean.

We observed the minke whale at sea during the course of two cruises, in August 1986 (two specimens) and April 1987 (one specimen). Figure 2 shows the vessels' courses and the positions of the sightings.

It is interesting to note that considering the whole area investigated (Fig. 1), the sightings of minke whales occur in a very restricted sector, despite their occurrence in different years. Parallel to the field work, we analysed strandings of cetaceans along the French Mediterranean coasts (the La Rochelle C.E.M.M. publishes an annual list) in the period corresponding to our research at sea.

Between 1979 and 1986, 216 cetaceans belonging to nine different species were found stranded on the French Mediterranean coasts. The minke whale appears in this list with only one stranding in eight years. This was a female specimen 360 cm long, weighing 300 kg, found stranded near St. Raphael (Var) by J. Besson in December 1982 (Duguy, 1983). Despite the inherent biases in the strandings data, the location of the stranding coincides with those of the sightings reported above, and suggest a restricted distribution for this species in the western Mediterranean.

On the basis of the numbers both of our observations at sea and of strandings, the minke whale appears to be a relatively rare species in the Mediterranean. However, even as only a preliminary consideration, these first data seem to indicate the possible existence of a preferred zone frequented by the minke whale in the northwest Mediterranean. Like the fin whale *Balaenoptera physalus* (Giordano, 1985, 1986, 1987), the minke whale would also appear to perform seasonal migrations in the Mediterranean and to frequent a zone that is trophically suitable.

REFERENCES

Duguy, R. 1983. Rapport annuel sur les Cétacés et Pinnipedes trouvés sur les côtes de France, - Année 1982. Annales Societé Sciences Naturelles Charente-

Maritime.

Giordano, A. 1985. Creation d'un fichier "Cétacés de Mediterranée" et premiers resultats du traitement cartographique de leur repartition. Rapp. Comm. int. Mer Médit., 29: 8.

Giordano, A. 1986. Nouvelles données sur *Balaenoptera physalus* en Méditerranée Occidentale. Rapp. Comm. int. Mer Médit., 30: 2.

Giordano, A. 1987. Cetacean ethoecology in the Mediterranean. Cetus, 7: 2.

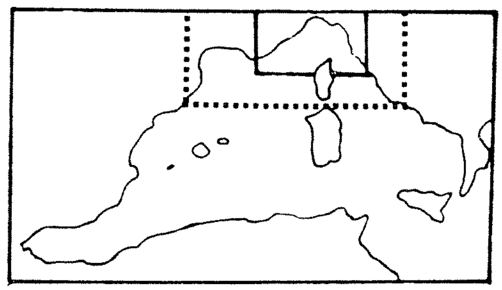


Fig. 1. Overall area studied containing field research zone of this work

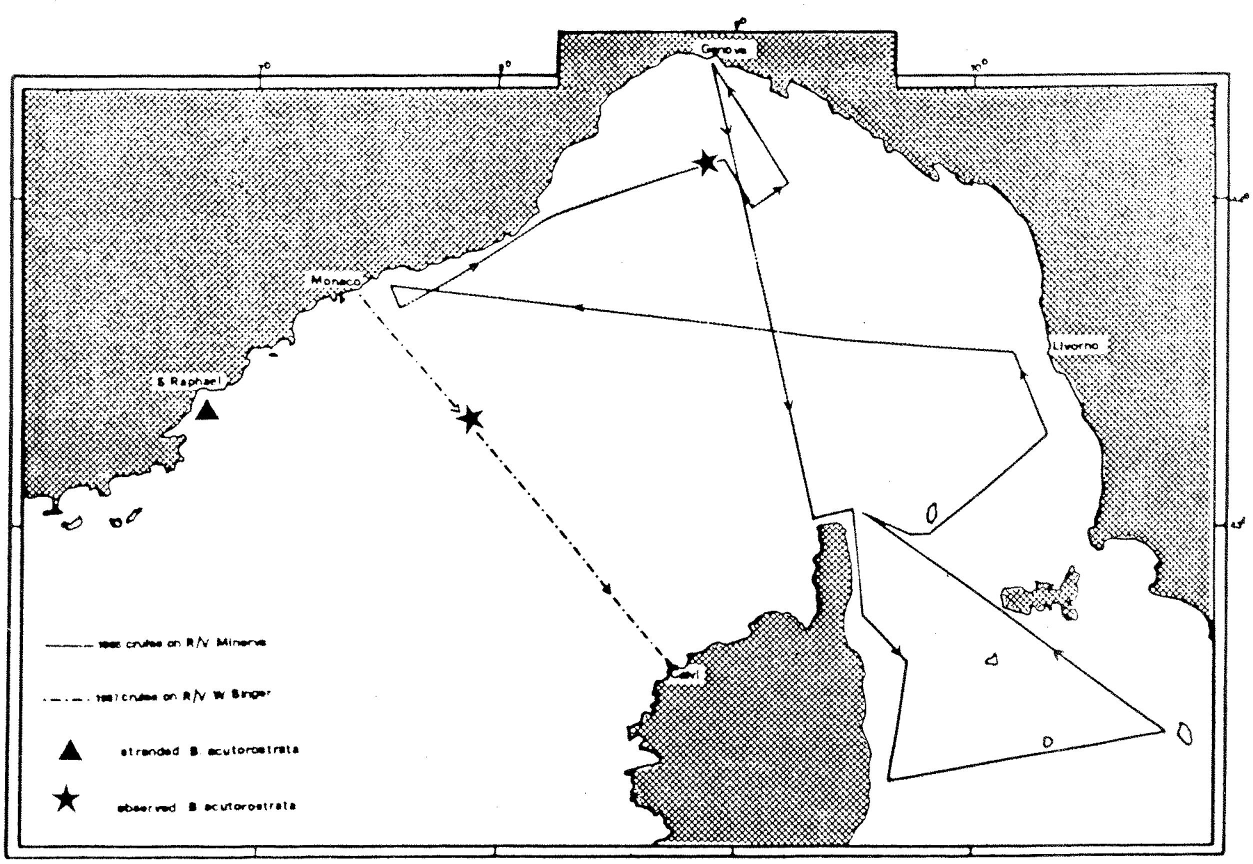


Fig. 2. Vessels' courses, and sighting/stranding positions of minke whale *Balaenoptera acutorostrata.*

CETACEANS IN UK & IRISH WATERS: A CHECKLIST

Peter G.H. Evans, Mary-Rose Lane, & Gina Scanlan

Zoology Department,
University of Oxford,
South Parks Road,
Oxford 0X1 3PS, UK

In 1973, the Cetacean Group was formed within the UK Mammal Society to improve our knowledge of the status, distribution and ecology of cetaceans in British and Irish waters, primarily from sightings of live animals. This scheme has been operating ever since, and has complemented information derived from the strandings schemes run by the British and Irish National Museums. To date, over ten thousand sightings have been reported by a network that now numbers around 700 observers. Documented records together with associated environmental information are coded in a standard format onto a computer data base, and programs (in Fortran) used for various analyses and for direct plotting of records. Earlier results have been reviewed (Evans, 1976, 1980) and a recent analysis carried out under contract to the Nature Conservancy Council (Evans *et al.*, 1986). We gratefully acknowledge the financial support provided by Greenpeace Environmental Trust allowing us to heighten public awareness of cetaceans in UK, to expand the observer network to its present level, and to carry out a historical review of cetacean records (results to be reported elsewhere).

Twenty-four cetacean species have been recorded in British and Irish waters over the last fifty years. A summary of the status and distribution of each species is given below.

CHECK LIST

Minke whale *Balaenoptera acutorostrata:* Widely distributed along the Atlantic seaboard of Britain and Ireland, often close to the coast. This is the whale species most likely to be observed from land. Seasonal movements to coastal waters in summer.

Fin whale *Balaenoptera physalus:* Probably the commonest large whale in the region, although clearly much rarer than earlier this century. Regularly recorded in summer in coastal waters of the Atlantic seaboard, mainly in northern and northwest Scotland, and southwest Ireland.

Sei whale *Balaenoptera borealis:* Uncommon Atlantic species, though probably under-recorded, with six documented sightings and one stranding since 1975, all in northwest Scotland (three in mid Atlantic). Some records of sei/fin whales in western Ireland are probably of this species.

Blue whale *Balaenoptera musculus:* Very rare deepwater Atlantic species with one record (in 1977) since 1950, northwest of Ireland. Population clearly depleted by over-hunting in the last hundred years.

Humpback whale *Megaptera novaeangliae:* Very rare Atlantic species but possibly recovering slightly from previous over-hunting, with four sightings and two strandings records since 1966 in coastal waters, from northwest Scotland, Northern Isles and southwest Ireland, and three in mid North Atlantic. All but one record occurred between June and August.

Northern right whale *Eubalaena glacialis:* Very rare Atlantic species but with three recent well documented records (all since 1970) in coastal waters, from northwest Scotland and southwest Ireland, and two in mid North Atlantic. This is another species that was clearly reduced to very small numbers, by hunting in previous centuries.

Pygmy sperm whale *Kogia breviceps:* Deep-water Atlantic species sometimes coming into inshore waters of western Britain and Ireland, and occasionally into the northern North Sea. There have been two strandings on the Atlantic coasts of British Isles, both since 1966, and three sightings.

Sperm whale *Physeter macrocephalus:* Regular, usually singly, in deep waters of North Atlantic, west of Ireland and Scotland, occasionally coming into inshore waters (for example Northern Isles, Outer Hebrides), mainly in late summer to early winter. Apparently increasing.

Narwhal *Monodon monoceros:* Vagrant from the arctic, last recorded from Britain (Orkney) in 1949.

White whale *Delphinapterus leucas:* Vagrant from the arctic, with three records since 1960 from northern Britain, one in West Scotland in late summer 1964, and two from North Sea (possibly same individual) off northeast England, in May 1987 and March 1988.

Northern bottlenose whale *Hyperoodon ampullatus:* Mainly deep-water Atlantic species, but which occurs probably regularly in summer in coastal waters of northern and western Britain and Ireland. Occasionally recorded in northern North Sea. Has apparently decreased.

Cuvier's whale *Ziphius cavirostris:* Probably more common than records suggest since it is an inconspicuous and mainly deep-water North Atlantic species. Three documented sightings (all since 1980) and 15 strandings since 1963, mainly from the Atlantic coasts (north and west Scotland, and western Ireland), but with occasional records from the northern North Sea.

Sowerby's beaked whale *Mesoplodon bidens:* Probably more common than records suggest since inconspicuous and mainly deep-water species. One documented sighting and 23 strandings since 1963, mainly in the Northern Isles and along the coast of eastern Britain, but also from Channel coast and southwest Ireland.

True's beaked whale *Mesoplodon mirus:* Very rare deep-water North Atlantic species recorded only seven times (six from western Ireland; one record from Outer Hebrides).

Harbour porpoise *Phocoena phocoena:* The most commonly recorded cetacean in British and Irish waters, partly because of its inshore distribution; populations concentrated in northern and western Britain and Ireland, rare in the Channel and southernmost part of the North Sea. Seasonal inshore movements in late summer and autumn. Has decreased particularly in southern Britain over the last fifty years.

Common dolphin *Delphinus delphis:* Common in the western approaches to the Channel, and the Atlantic seaboard of southwest Britain and Ireland, sometimes entering the southern Irish Sea and occasionally the North Sea. Occurs mainly offshore.

Striped or Euphrosyne dolphin *Stenella coeruleoalba:* Rare (8 strandings since 1963, and 9 sightings since 1977), mainly in offshore waters southwest of Britain and south of Ireland. The species has also been recorded in mid Atlantic west of Scotland, probably associated with the Gulf Stream.

Bottle-nosed dolphin *Tursiops truncatus:* Generally uncommon, with small semi-resident populations in scattered localities in bays and estuaries around Britain; commoner in north and west. Has decreased particularly in southern Britain over last fifty years.

Atlantic White-sided dolphin *Lagenorhynchus acutus:* Fairly common mainly in offshore waters northwest of Britain and Ireland, but extending to the northern North Sea; seasonal inshore movements particularly in late summer and autumn.

White-beaked dolphin *Lagenorhynchus albirostris:* Common in the northern North Sea and along the Atlantic seaboard of Britain and Ireland, mainly in the north. Seasonal inshore movements particularly in late summer and autumn.

Risso's dolphin *Grampus griseus:* Widely distributed in coastal waters along the Atlantic seaboard of Britain and Ireland, mainly in the north. Seasonal inshore movements in summer.

False killer whale *Pseudorca crassidens:* Deep-water species, occasionally entering coastal waters along Atlantic coasts or the northern North Sea from the Atlantic. Four sightings since 1976; no strandings since 1935.

Killer whale *Orcinus orca:* Regular in small numbers particularly along the Atlantic seaboard and in northern North Sea. Seasonal inshore movements in summer.

Long-finned pilot whale *Globicephala melaena:* Common and widely distributed, mainly offshore but enters inshore waters seasonally, mainly in late summer and autumn from north and southwest. Has apparently increased greatly over last thirty years, though with a possible decline since 1982.

REFERENCES

Evans, P.G.H. 1976. An analysis of sightings of Cetacea in British waters. Mammal Review, 6: 5-14.

Evans, P.G.H. 1980. Cetaceans in British waters. Mammal Review, 10: 1-52.

Evans, P.G.H., Harding, S., Tyler, G., and Hall, S. 1986. Analysis of Cetacean Sightings in the British Isles, 1958-1985. Nature Conservancy Council, Peterborough. 71pp.

SHIP-BASED SURVEY OF CETACEANS IN THE DANISH WATERS - A SHORT DESCRIPTION OF THE WORK WITH SOME PRELIMINARY RESULTS

Finn Danielsen, Henrik Skov, and Jan Durinck

Ornis Consult ApS.,
Rådgivende Virksomhed Indenfor Fugle- og Naturbeskyttelse
Vesterbrogade 140,
DK-1620 Copenhagen V,
Denmark

With oil exploration planned for some areas of Danish waters, a ship-based survey is being carried out in order to map the marine avifauna and seals in the region. This survey also gives valuable information on the distribution and relative abundance of cetaceans outside the summer months in Danish waters. The work is financed by the National Forest and Nature Agency, the Ministry of Environment, the Ministry of Energy, Stena Line and WWF-Sweden.

The survey method includes systematic counts from small, dedicated fishing vessels (20-40 tonnes). Four cruises have been undertaken or are planned for the future: in October - November 1987, January - February, March - April, and August - September 1988.

During the first cruise in October - November 1987, approximately 6,000 km were sailed during which observations were made. This survey included the Danish part of the North Sea, the Skagerrak and the northern part of the Kattegat.

A total of 111 harbour porpoises *Phocoena phocoena*, were observed, indicating a preliminary estimate of some few thousands in the area at this time of year. The mean group size of harbour porpoise was 2.5 individuals. Size estimates were made for 17 harbour porpoises, and indicated that 12% were immatures.

In addition, five groups of white-beaked dolphins *Lagenorhynchus albirostris*, one group of white-sided dolphins *Lagenorhynchus acutus*, one group of unidentified cetaceans, and one individual killer whale *Orcinus orca*, were made.

In an effort to find out which factors determine the distribution of harbour porpoises at sea, data are simultaneously collected on fish, surface salinity and surface temperature. The results are not yet analysed.

SPERM WHALE PHOTOIDENTIFICATION, LOCAL FIDELITY, AND GROUP BEHAVIOUR OFF ANDENES, NORWAY

Morten Lindhard, Lars Øyvind Knutsen, Michael Calvert,

and Thomas Lyrholm

Centre for the Study of Whales and Dolphins,
Kaponjargatan 4d,
S41302 Gothenburg, Sweden

In the period 20 July - 26 August 1987, a survey of the shelf and off-shelf area (69° 20' - 69° 50' N, 15° - 16° E) proved that sperm whales *Physeter macrocephalus*, could be seen on every one of 13 days in the off-shelf area (80 encounters). Thirteen individuals were identified by photographs of their tail silhouette. Seven of these were identified between two and four times with 2 - 22 day intervals. The average distance between re-identification positions was 5 nautical miles with a maximum distance of 11 nautical miles covered in two days. There was no uniform swimming direction, according to re-sightings. This was in agreement with the variable swimming directions observed during the encounters. These observations suggest a high degree of fidelity to the area during the study period.

The sperm whales were generally seen in dispersed groups with individuals swimming 1-2 nautical miles apart. Thus one could see a maximum of 5-6 whales within the range of sight at any one time, although the groups may have been larger. The whales would often all initiate a deep dive at the same time (± 3 minutes), and by use of a hydrophone, one could always hear several whales clicking at the same time even if only one whale was seen. This supported the impression that the whales formed a group in acoustic contact with one another. Only once was a group observed, when five sperm whales were seen swimming less than one body length from one another. On five occasions, pairs of whales were observed. However, these pairs did not necessarily comprise the same individuals. Whale no. 5 swam with whale no. 12 on 26 August, but with another individual (identity unconfirmed) some days later. On two other occasions, it was alone, indicating only short term associations.

PRELIMINARY STUDIES OF PILOT WHALES FROM FAROESE WATERS SINCE 1986: REPRODUCTION AND FOETAL GROWTH

A.R. Martin* and G. Desportes**

* Sea Mammal Research Unit,
c/o British Antarctic Survey,
Madingley Road, Cambridge CB3 0ET, UK

** Natural History Museum,
FR-100 Tórshavn, Faroe Islands

Complete pods of whales were sampled in all months of the year in the Faroese drive fishery. Age at first ovulation in the female is estimated at 9-10 years, and corpora are accumulated at an average rate of about one every 2.9 years thereafter. The maximum number of corpora found in any pair of ovaries was 20, suggesting that at least some females may be reproductively active at 60 or more years of age. Many older females appeared to have ceased ovarian activity.

Annual reproductive output was estimated at 10-11% using a novel technique which overcomes temporal sampling bias within the study period, but would be sensitive to any synchronised cycle in pregnancy rate within the population over a period of many years. The average inter-birth interval is 3.7 years or 44.5 months, but it is likely that most females adhere to a reproductive cycle of either 3 or 4 complete years.

Conceptions and births are broadly seasonal but may take place in almost any month of the year. Gestation lasts 14.4 months. Conceptions peak between April and July while births occur most often between July and September. Calves are born at about 1.75 m on average and a weight of 60-80 kg.

Males reach puberty at about 5 m in body length and an age of 15-20 years. Testis growth changes markedly at this point, from 0.28 kg to 6.9 kg per metre of body length.

GENETIC DIFFERENCES AMONG LOCAL POPULATIONS OF THE LONG-FINNED PILOT WHALE *Globicephala melaena*, OFF THE FAROE ISLANDS, AND ITS KARYOTYPE

Liselotte W. Andersen

Department of Ecology and Genetics,
University of Aarhus,
Building 550, 8000 Aarhus C,
Denmark

INTRODUCTION In connection with an international research programme on the long-finned pilot whale *Globicephala melaena* in the Faroe islands, samples of tissue and blood were collected to examine the population structure and, if possible, the school structure in genetic terms. This was conducted by measuring genetic differences using both starch gel electrophoresis of enzymes and chromosome analysis.

THE ELECTROPHORETIC STUDY For the electrophoretic investigation, 628 specimens were analysed, representing nine different schools (Fig. 1). Of the 29 enzyme systems examined (representing 41 loci), three were found to be polymorphic at the 99% level (Andersen, 1988). The three loci were esterase, mannose phosphate isomerase, and superoxide dismutase.

The allele frequencies obtained were tested pairwise between the schools by a multi-locus G-test (Sokal and Rohlf, 1981) (see Table 1).

RESULTS Using those herds where all animals were included, 13 out of 36 comparisons showed significance at the 5% level indicating that the schools belonged to a non-homogeneous population. In particular, the Vidvik school deviated from seven other schools. This could be due to the low number of individuals sampled from this school, the whales not being representative of the whole school.

In Table 1, the comparison was repeated excluding the mature males. This was based on the possibility that the large mature whales may move between herds, as indicated for the short-finned pilot whale *Globicephala macrorhynchus*, by Kasuya and Marsh (1984). Their study revealed a wide variation in the proportion of mature males in breeding schools and a polymodal age-frequency of the mature males, suggesting migration between groups. When mature males were excluded, the deviation of the Vidvik school from others became even more obvious although the Vidvik school was only reduced by one individual. Nevertheless, the observation could be due to the low sample size. Another explanation might be that the whales from Vidvik did in fact represent the whole school as reported by the existing catch figures, and the result could then reflect some degree of reproductive isolation.

The results from the multi-locus G test gave similar results for the genetic relationship between the schools, with the Vidvik school constituting a separate entity (Fig. 2). Again, the deviation is very small but still at the level of values commonly found for sub-populations. The observation was supported by the fact that the Vidvik school came from the northernmost locality, and the finding that the whales appeared different in their morphology from other schools (Desportes, *pers. comm.*). On the other hand, the length distribution of the whales from the different schools could not explain the observed deviation of the Vidvik school, and no obvious correlation can be seen between the genetic identity of the schools and the geographic distribution of the whale-bays.

Current morphometric studies of the dorsal fin, the flipper and tail flukes may shed further light on the apparent genetic differences.

If this observation of the Vidvik school is not due to low sample size, does the Vidvik school then represent a reproductively isolated sub-population or stock? If so, does this stock or sub-population belong to a separate northern population of the species or maybe to the known Newfoundland population? As yet, the answers to these questions are not known.

The conclusions so far are: (1) the multi-locus G-test indicated that the whales belonged to a non-homogeneous population; (2) the G-test and the genetic identity revealed that the northernmost school, the Vidvik school, might represent a sub-population or stock, reproductively isolated from other schools; (3) this hypothesis was supported by the observation that the whales appeared different in their morphology; (4) the length distribution of the whales from different schools did not reveal anything; (5) no correlation was found between the genetic identity and the geographic distribution of the whale-bays.

A final conclusion to this question of stock identity requires an extension of the study on the pilot whale. This should be combined with tagging experiments, pollutant loads, the comparative analysis of putative stocks, and a comparison between the life history of these stocks.

CHROMOSOME ANALYSIS The cetacean karyotype is well known and described by Arnason (1974). The general chromosome number for cetaceans is 44, but in two odontocete families, the *Physeteridae* and the *Ziphiidae* .

The karyotype of the long-finned pilot whale has not previously been investigated, although the karyotype of the closely related short-finned pilot whale has been studied by Walen and Madin (1965) and Arnason (1974).

The aims of the present study were: (1) to investigate the chromosomes of *G. melaena* by using a single method applicable in the field; (2) to compare the karyotypes of *G. melaena* and *G. macrorhynchus* ; (3) to evaluate the C-band heterochromatin as a marker in family- and population studies; (4) to examine the sex-chromatin in small foetuses (<12 cm), where sex determination is not possible on the basis secondary sex characters.

Conclusions of the chromosome analysis were: (1) the method was difficult to handle. This could be due either to infections of bacteria and fungi, or to the occurrence of high concentrations of stress hormone in the blood (Andersen & Friedrich, 1988); (2) the karyotype of *G. melaena* closely resembles that of *G. macrorhynchus* , although a species-specific C-band pattern was observed in the comparison (Andersen & Friedrich, 1988); (3) the Q- and C-band markers might be possible to use in family- and population studies, if a good technical quality can be achieved (Andersen & Friedrich, 1988); (4) it may be possible to use the method of staining for sex-chromatin to determine the sex of small foetuses (<12 cm) (Andersen & Friedrich, 1988). Because of difficulties concerning the method and the resulting low sample size, no distinctions could be made within or between different schools.

REFERENCES

Andersen, L.W. 1988 Electrophoretic differentiation among local populations of the long-finned pilot whale, *Globicephala melaena*, at the Faroe Islands. Canad. J. Zool., in press.

Andersen, L.W. and Friedrich, U. 1988. The karyotype of the long-finned pilot whale, *Globicephala melaena* . Hereditas, 109: in press.

Arnason, U. 1974. Comparative chromosome studies in Cetacea. Hereditas, 77: 1-36.

Kasuya, T. and Marsh, H. 1984. Life history and reproductive biology of the short-finned pilot whale, *Globicephala macrorhynchus*, off the Pacific coast of Japan. Rep. Int. Whal. Commn (special issue 6): 259-310.

Sokal, R.R. and Rohlf, F.J. 1981. *Biometry*. W.H. Freeman & Co., San Francisco.

Walen, K.H. and Madin, S.H. 1965. Comparative chromosome analysis of the bottlenosed dolphin (*Tursiops truncatus*) and the pilot whale (*Globicephala scammoni*). Amer. Natur., 99: 349-354.

FIG. 1 Map of the Faroe Islands.

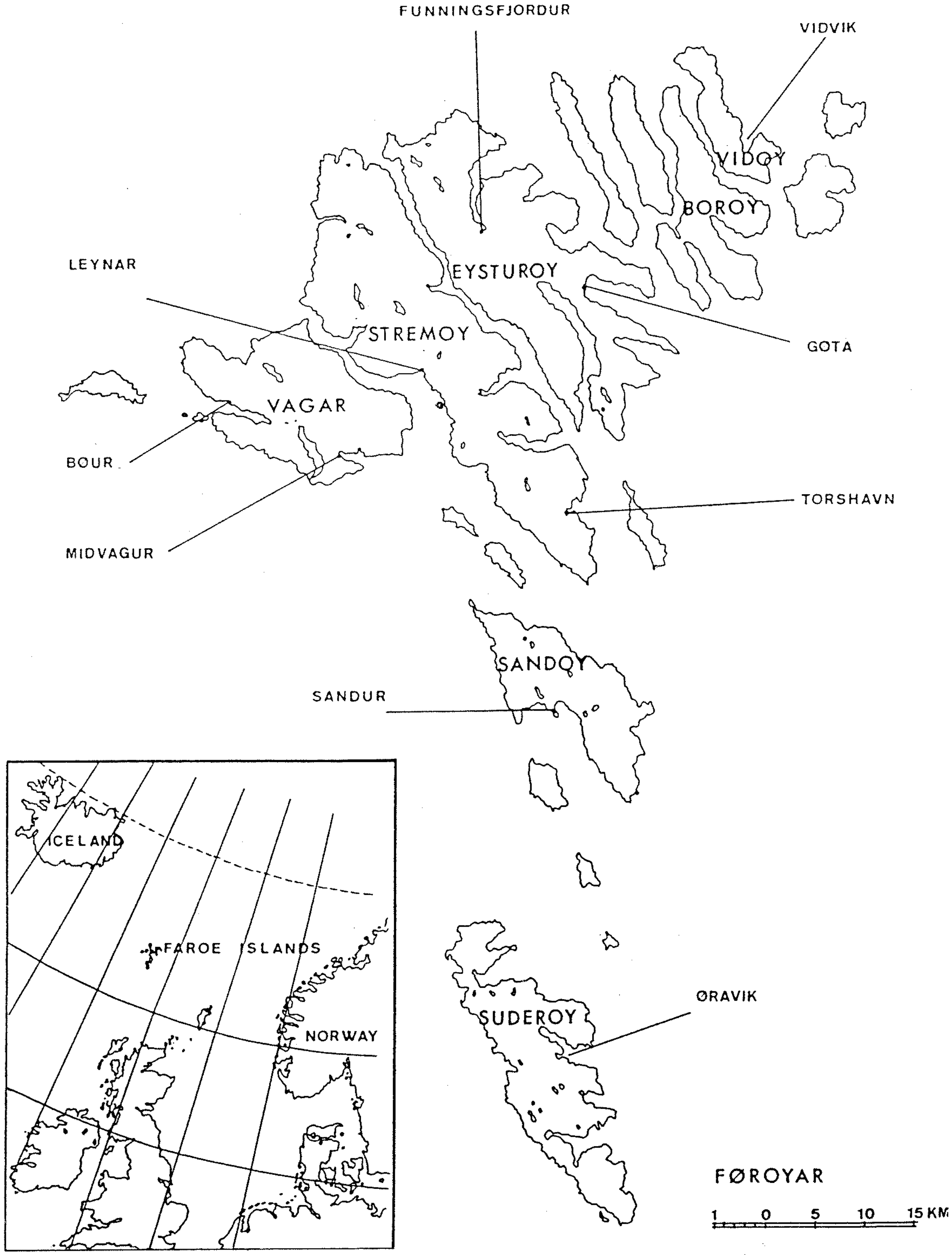


Figure 2 . The genetic identity of the 9 different schools of pilot whales based on 41 loci.

GENETIC IDENTITY.

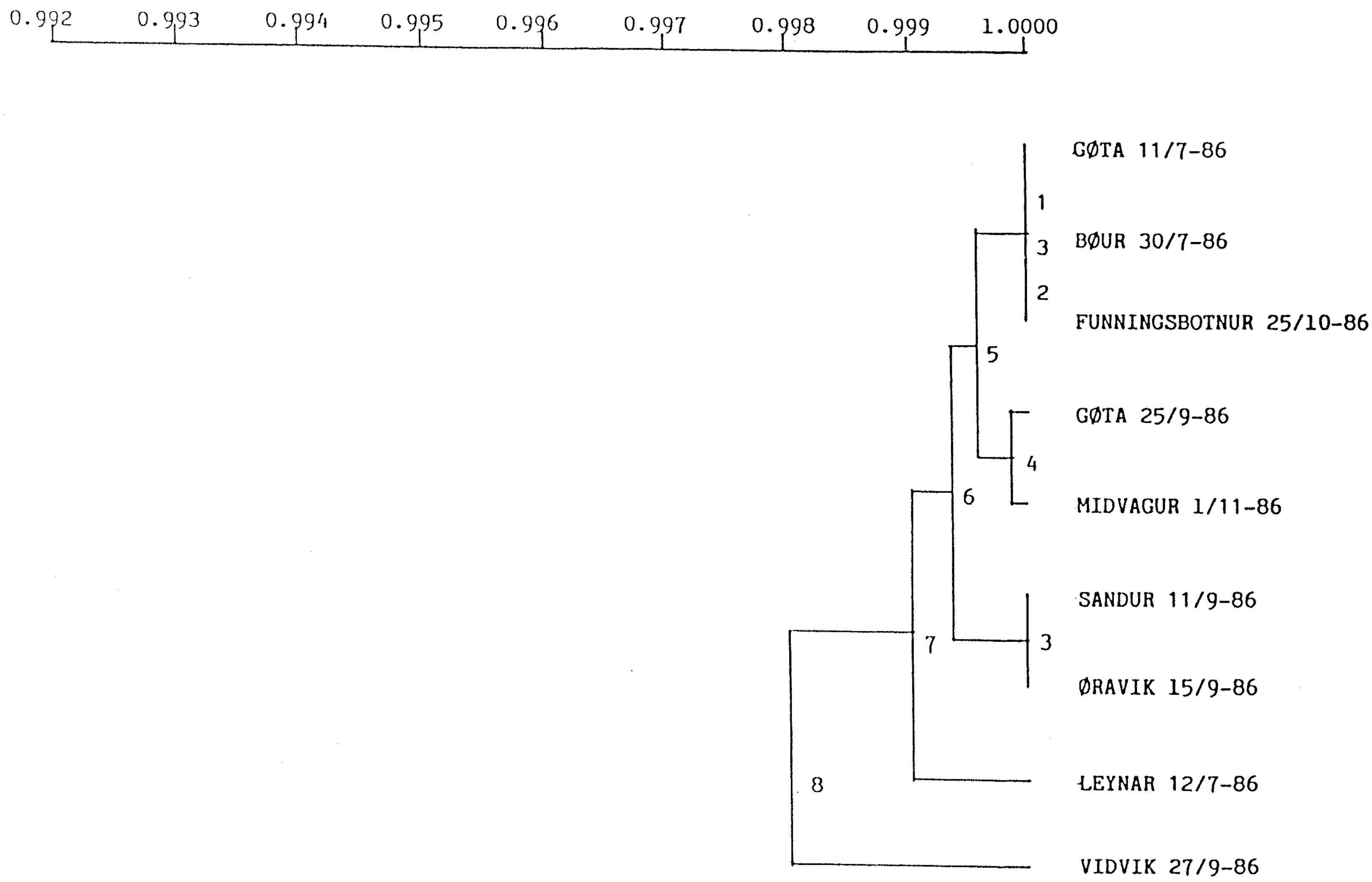


TABLE 1: Multi-locus G-test values (d.f.=3) for the pairwise comparison among the 9 different schools of pilot whales.

LOCALITY	GØTA 11/7-86	LEYNAR 12/7-86	BØUR 30/7-86	SANDUR 11/9-86	ØRAVIK 15/9-86	GØTA 25/9-86	VIDVIK 27/9-86	FUNNINGSBOTNUR 25/10-86
LEYNAR	6.715 (6.023)							
BØUR	0.654 (0.348)	7.021 (7.594)						
SANDUR	8.132* (5.110)	7.903* (7.071)	9.382* (9.052)*					
ØRAVIK	7.596 (5.163)	7.660 (6.417)	8.140* (8.980)*	0.314 0.541				
GØTA 25/9	3.187 (1.644)	10.388* (7.477)	2.771 (3.065)	4.427 (2.104)	4.057 (2.282)			
VIDVIK	9.094* (14.460)*	16.299* (13.501)*	19.310* (19.135)*	7.698 (8.082)*	9.774* (10.243)*	13.818* (12.693)*		
FUNNINGSBOTNUR	0.607 (0.860)	3.325 (5.073)	0.690 (0.036)	7.422 (6.649)	6.353 (5.957)	4.293 (2.417)	16.417* (17.131)*	
MIDVAGUR	2.571 (1.631)	15.532* (16.031)*	2.787 (3.499)	5.119 (5.121)	6.444 (7.199)	0.821 (0.283)	12.962* (15.947)*	4.073 (0.912)

* significant at the 5% level

(nnnn)= G-test values when mature males (> 470 cm) are excluded.

PRELIMINARY RESULTS ON THE DIET OF THE PILOT WHALE EXPLOITED OFF THE FAROE ISLANDS

G. Desportes, R. Mouritson and D. Bloch

Natural History Museum,
FR-100 Tórshavn,
Faroe Islands

INTRODUCTION In connection with an international research programme on the long-finned pilot whale *Globicephala melaena* off the Faroe Islands, the feeding ecology of the species was examined, both qualitatively and quantitatively, to obtain information on (1) age-related and seasonal changes in the diet; and (2) pilot whale movements from the distribution of the prey species.

The preliminary results presented here are mostly qualitative but give an idea of the feeding pattern of the pilot whale in this area.

METHODS These results are based on analyses of the contents of stomachs collected in the Faroes between July 1986 and December 1987.The usual procedure is as follows:

- Stomachs from all the whales of 3 metres length or below, and from approximately ten larger animals, are sampled in each drive (i.e. around 20% of the whales).

- Prey species are mostly identified from the hard remains found, i.e. squid beaks and fish otoliths or vertebrae.

- Size and weight of ingested prey are derived from the lower rostral length of squid beaks and weight or length of fish otoliths (Desportes, 1985; Clarke, 1986a, b; Hårkønen, 1986).

RESULTS and DISCUSSION The list of items identified to date is given in Table 1. It includes 9 genera of cephalopods, 17 genera of fishes, shrimps and miscellaneous. Most of the prey are known to be quite common around the Faroes, with diverse habits. They can be typically pelagic (blue whiting *Micromesistius poutassou*) or more demersal (the octopus *Eledona*). They can be found above a rocky bottom (ling *Molva molva*) as well as soft muddy or sandy bottoms (silvery pout *Gadiculus argenteus*). They include inshore species (saithe *Pollachius virens*) and typically oceanic species (the squid *Gonatus*). Some are deep-water species (rat-tail *Coryphanoides rupestris*), others are shallow-water species (whiting *Merlangius merlangius*). They can be gregarious species (cod *Gadus morhua*) or solitary (torsk *Brosme brosme*).

Cephalopods are much more frequent and numerous in the diet than fishes, particularly in summer, whilst prey diversity in the stomachs is usually much greater in winter than in summer.

In order to estimate the relative importance of different prey in the diet, we calculated their frequency of occurrence "F%" (percentage of stomachs examined found to contain the prey considered), and their importance by number "Cn%" (number of individuals of the prey considered, given as a percentage of the total number of prey items found). These two coefficients are presented in Table 1, for July, August and September 1986 and 1987, combined.

Seasonal movements of the pilot whale around the Faroes have been related to inshore movements of the squid *Todarodes sagittatus*. We made a preliminary comparison of the diet over three years for the months of August and September when *T. sagittatus* is thought to be close to the Faroese coast. For this exercise, we have added data from 1984 (Desportes, 1985). The results are illustrated in Figure 1, and show the following:

- 1984 was an exceptional year for the Faroese *Todarodes* fishery, and *Todarodes* dominates as the main prey.

- In 1986 when no *Todarodes* were landed and their presence was not recorded in the fjords but at deeper levels than usual. Again, the pilot whales preyed mainly upon the species although a greater diversity of prey was recorded in the stomachs.

CONCLUSIONS The pilot whale appears to be mainly a squid feeder, as noted in earlier works (Sergeant, 1962; Tomilin, 1967; Desportes, 1985; Clarke, 1986b; Evans, 1987; Martin *et al.*, 1987). As suggested by Desportes (1985), it has a strongly opportunist behaviour. If its favourite prey, *Todarodes todarodes,* is available, the diet is centred upon this species, despite the availability of other possible prey. If it is not available, pilot whales may switch to a large range of items including fish. This appears clearly from comparisons of the diet of pilot whales between August and September 1984, 1986, and 1987.

Pilot whales do not appear to confine their diet to either pelagic or oceanic prey species, and may feed on a range of types. They probably dive to relatively great depths but can feed upon species at a wide variety of water depths, though possibly mainly between 30 and 300 metres depth.

As this study progresses, it is likely that the number of prey items recorded in pilot whale stomachs will increase, and it will be a nice opportunity to determine the main factors that influence prey selection and changes in diet.

ACKNOWLEDGEMENTS This analysis is made possible by the great help of the staff of the Faroese Natural History Museum who help in the field sampling or the opening of the stomachs, or at least share the delicacy of the smells. We would like to specially thank M. Debes-Dahl, S. Skaaning and E. Stefansson. Great thanks also go to all the other people involved in the sampling, notably J. Balbuena, F. Jean-Caurant and L. Venturino.

REFERENCES

Clarke, M.R. 1986a. *A handbook for the identification of Cephalopod beaks.* Clarendon Press, Oxford.

Clarke, M.R. 1986b. Cephalopods in the diet of odontocetes. Pp. 281-322. In Bryden, M.M. and Harrison, R.J. (editors). *Research on Dolphins.* Clarendon Press, Oxford.

Desportes, G. 1985. La Nutrition des Odontocetes en Atlantique Nord-Est. Doctoral thesis, University of Poitiers, Poitiers.

Evans, P.G.H. 1987. *The Natural History of Whales & Dolphins..* Christopher Helm Ltd., Bromley, Kent.

Hårkønen, T. 1986. *Guide to the Otoliths of the Bony Fishes of the northeast Atlantic*. Danbiu ApS. Biological consultants, Denmark.

Martin, A.R., Reynolds, P. and Richardson, M.G. 1987. Aspects of the biology of Pilot whales (*Globicephala melaena*) in recent mass strandings on the British coast. J. Zool., Lond., 211: 11-23.

Sergeant, D.E. 1962. The biology of the pilot or pothead whale *Globicephala melaena* (Traill) in Newfoundland waters. Bull. Fish. Res. Bd Can., 132: 1-84.

Tomilin, A.G. 1967. *Cetacea*. Israel Program for Scientific Translations, Jerusalem.

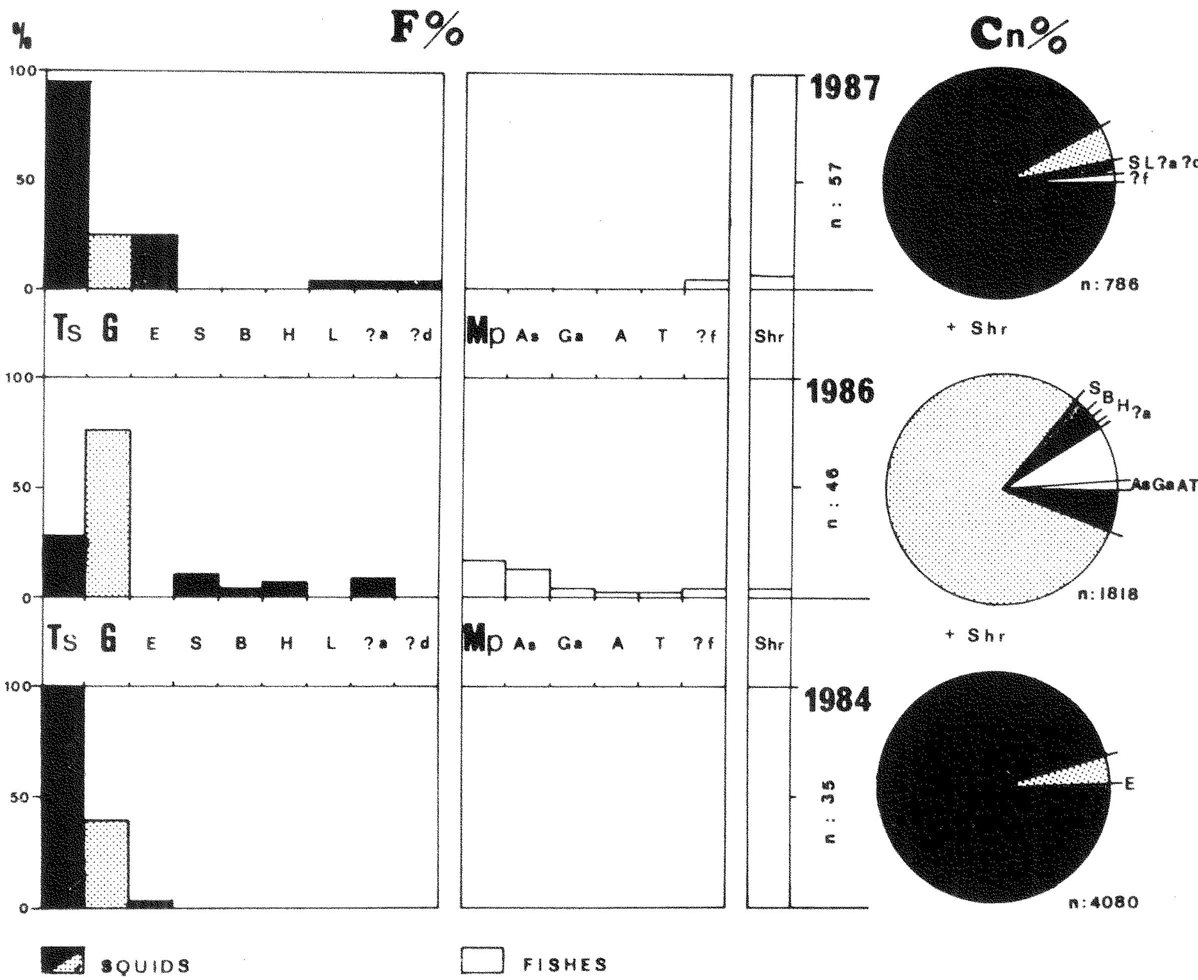


Fig. 1. Comparison between the relative importance of different prey species of the long-finned pilot whale, in Aug-Sept 1984, 1985 & 1986.

Table 1. List of Food Prey of Long-finned Pilot Whale

Family	Species	Abbreviation
CEPHALOPODS		
Ommastrephidae	*Todarodes sagittatus*	Ts
Brachiteuthidae	*Brachioteuthis* sp.	B
Gonatidae	*Gonatus* sp.	G
Histioteuthidae	*Histioteuthis* sp.	H
Cranchiidae	*Teuthowenia* sp.	
	Taonius sp.	
Loliginidae	*Loligo* sp.	L
Sepiolidae	*Sepiola* sp.	S
Octopodidae	*Eledona* sp.	E
Unidentified spp. A, D, F		a? d?
FISHES		
Argentinidae	*Argentina silus* (greater argentine)	As
Gadidae	*Micromesistius poutassou* (blue whiting)	Mp
	Gadus morhua (cod)	
	Pollachius virens (saithe)	
	Merlangius merlangus (whiting)	
	Melanogrammus aeglefinus (haddock)	
	Molva molva (ling)	
	Molva dypterigia (blue ling)	
	Trisopterus sp. (pout)	T
	Gadiculus argenteus (silvery pout)	Ga
	Brosme brosme (torsk)	
	Enchelyopus cimbrius (four-bearded rockling)	
Macrouridae	*Coryphanoides rupestris* (rat tail)	
Ammodytidae	*Ammodytes* sp. (sand eel)	A
Scombridae	*Scomber scombrus* (mackerel)	
Pleuronectidae	*Hippoglossus hippoglossus* (halibut)	
	Reinhardtius hippoglossoides (Greenland halibut)	
	Glyptocephalus cynoglossus (witch)	
Unidentified fish		?f
CRUSTACEANS		
Shrimps		Shr
MISCELLANEOUS		
Aphrodite aculeata		
Nereis sp. (mandibles)		
Feathers		
Algae		
NON-FOOD ITEMS		
Stones (size of a nut or smaller)		

Table 2. Frequency, F%, and importance by number, Cn%, of various prey found in long-finned pilot whale stomachs from Faroes, for July, August & September 1986 and 1987 combined.

Prey Species	F%	Cn%
CEPHALOPOD		
Todarodes sagittatus	77.4	50.8
Gonatus sp.	36.3	40.4
Eledona sp.	10.7	8.7
Sepiola sp.	3.0	1.6
Brachioteuthis sp.	8.9	1.1
Histioteuthis sp.	2.4	0.3
Loligo sp.	0.6	0.03
Unidentified sp. A	5.4	1.2
Unidentified sp. D	0.6	0.03
Unidentified sp. F	0.6	0.03
FISHES		
Argentina silus	5.4	0.5
Micromesistius poutassou	5.4	3.4
Trisopterus sp.	0.6	0.03
Gadiculus argenteus	1.2	0.08
Ammodytidae	0.6	0.05
Unidentified fish	3.6	0.1
CRUSTACEANS		
Shrimps	4.2	?
TOTAL NO. OF STOMACHS :	168	
TOTAL NO. OF PREY ITEMS:	3802	

PRELIMINARY REPORT ON PARASITOLOGICAL RESEARCH ON PILOT WHALES IN THE FAROE ISLANDS

J.A. Raga, J.A. Balbuena and E. Abril

Department of Animal Biology,
Faculty of Biological Sciences,
University of Valencia,
Dr. Moliner 50,
46100 Burjasot,
Valencia, Spain

INTRODUCTION On the basis of opportunistic sampling of long-finned pilot whales, *Globicephala melaena* (Traill, 1809), driven ahore and stranded in the Faroe Islands, a program of parasitological investigations was started. This programme forms part of an international research project on the biology of the pilot whale in the Faroe Islands.

METHODS During six months, from July to December 1987, an exhaustive parasitological survey has been carried out. Over this period, nine schools have been studied and a total of 125 whales surveyed for parasites. At least ten individuals have been examined per school stranded. These specimens were selected in each stranding so as to give a good representation of each age class. The field work consisted, in the first place, of a survey of the skin, natural openings and wounds of the whales to look for ectoparasitic crustaceans. These ectoparasites were collected and their location on the host was noted. The blubber, mesenteries, lungs, liver, pancreas, gonads and mammary glands were then examined for endoparasites. Stomachs and intestines were also systematically collected for further examination in the laboratory. The air sinuses, tympanic bulla and penis could be examined only in some individuals. In each case, the presence or absence and microhabitat of the various parasites was recorded, following their total or partial collection.

The parasitological study of the digestive tract was particularly exhaustive. All stomach compartments were examined, any parasites found were collected, and samples taken of possible lesions. Furthermore, all intestines were completely surveyed, with the number and location of parasites recorded before collection.

RESULTS and DISCUSSION So far, a total of 15 parasite or commensal species have been recorded in the 125 pilot whales examined (Table 1).

Two crustacean species have occurred on the skin: *Isocyamus delphini* (Guérin-Menéville, 1837) in natural openings and wounds, and *Xenobalanus globicipitis* (Steenstrup, 1851) on the edge of dorsal fin and tail flukes.

Among the parasitic helminths, three digenetic trematodes have been identified. *Pholeter gastrophilus* (Kossack, 1910) was found in stomach cysts, particularly within the walls of the main and pyloric stomach. The remaining digenids belong to the family Campulidae: *Leucasiella* sp. and *Odhneriella* sp.. Both occurred along the intestine, particularly in the first eight metres.

Four cestode species have been recorded. Two occurred at larval stage and two at adult stage. Those plerocercoids located within the blubber, mainly in the urogenital zone, were *Phyllobothrium delphini* (Bosc, 1802), while those situated in the body cavity, usually in the intestinal mesenteries, were the species *Monorygma grimaldii* (Moniez, 1899). The adult forms belong to the family Tetrabothriidae (*Trigonocotyle* sp.) and Diphyllobothriidae (*Diphyllobothrium* sp.) respectively. The former species occurred primarily in the first few metres of the intestine, while the latter species occurred in the last few metres.

Five species of nematodes have been recorded. The species *Anisakis simplex* (Rudolphi, 1809) (family Anisakidae) is the most frequent and appears with the highest intensity. It usually occurs in the stomach, exceptionally in the duodenal ampulla. Three nematode species were metastrongylids of the family Pseudaliidae: *Stenurus* sp. found in the lungs; *Stenurus globicephalae* (Baylis & Daubney, 1925) in the air sinuses; and another *Stenurus* sp. in the tympanic bullae. The fifth nematode species belongs to the family Tetrameridae. It was identified as *Crassicauda* sp. and found within the mammary glands.

Finally, one acanthocephalan species was located in the intestine. It was identified as *Bolbosoma* sp. (family Polymorphidae).

The frequency of occurrence of each parasite species is shown in Table 1. The frequency of crustaceans was low. However, the highest frequencies occurred among nematodes, with *Stenurus* sp. in the tympanic bulla occurring in 100% of hosts examined. This figure may not be very reliable since it is based on only a small number of specimens examined for this parasite. *Anisakis simplex* was also very common, with a frequency of occurrence of 88%.

In future studies, it is intended to establish whether there are differences in parasite composition among the various schools of whales and with respect to sex or age. A comparative quantitative and qualitative analysis of the parasite fauna of *Globicephala melaena* from other localities will be attempted since some parasites may serve as potential biological tags for different populations. Likewise, a study of microhabitat preferences and competitive relationships between parasites will also made.

Table 1 Parasites of *Globicephala melaena* in the Faroe Islands

Species	Microhabitat	No. hosts examined	No. hosts examined	Frequency %
CRUSTACEA				
Isocyamus delphinus	skin	112	33	29.5
Xenobalanus globicipitis	skin	112	2	1.8
TREMATODA				
Pholeter gastrophilus	stomach	112	74	59.2
Leucasiella sp.	intestine	125	9	7.2
Odhneriella sp.	intestine	125	26	20.8
CESTODA				
Phyllobothrium delphini	blubber	114	7	6.1
Monorygma grimaldii	blubber	114	4	3.5
Trigonocotyle sp.	intestine	125	15	12.0
Diphyllobothrium sp.	intestine	125	5	4.0
NEMATODA				
Anisakis simplex	stomach + duod.	125	110	88.0
Stenurus sp.	lungs	26	12	46.15
Stenurus sp.	tympanic bullae	3	3	100.0
Stenurus globicephalae	air sinus	28	23	82.1
Crassicauda sp.	mammary gland	216	1	0.5
ACANTOCEPHALA				
Bolbosoma sp.	intestine	125	66	52.8

FIRST DATA OF STOMACH PARASITES OF PILOT WHALES, *Globicephala melaena* (Traill, 1809), STRANDED IN THE FAROE ISLANDS (EUROPEAN NORTH ATLANTIC)

G. Desportes*, J.A. Balbuena** and J.A. Raga**

* Natural History Museum,
FR-100 Tórshavn,
Faroe Islands

** Department of Animal Biology,
Faculty of Biological Sciences,
University of Valencia, Dr. Moliner 50,
46100 Burjasot, Valencia, Spain

INTRODUCTION The nematode *Anisakis simplex* (Rudolphi, 1809) and the trematode *Pholeter gastrophilus* (Kossack, 1910) are among the most frequent stomach parasites of odontocetes, including the long-finned pilot whale *Globicephala melaena*. Both worms are rather unspecific and have been recorded in a relatively high number of hosts. *A. simplex* nematodes can be found at 4th larval stage or as adults either free in the stomach cavity or with the cephalic end attached to ulcers on the stomach wall. *P. gastrophilus* trematodes always occur within cysts on the gastric submucosa at adult stage.

This study is based on opportunistic sampling of pilot whales driven ashore and eventually stranded by Faroese fishermen. The large number of whales surveyed for stomach parasites allows us to obtain reliable data on frequencies and intensities of infection by the parasites.

METHODS From 10 July 1986 to 20 October 1987, 669 whales were surveyed for stomach parasites in 32 different strandings. In each stranding, the stomachs were collected from selected animals. The approximate number of *A. simplex* nematodes, ulcers caused by *A. simplex*, and *P. gastrophilus* cysts in each stomach was recorded. The whale's length, sex and the presence of milk and/or solid items (squid beaks, fish-bones, otoliths, flesh, shrimp fragments, etc.) in the stomach were also noted. Parasite frequencies were related to the length and sex of the host, while intensities of infection were related to stomach contents. Some worms were collected to check their specific identification.

RESULTS and DISCUSSION Two species of helminth have been recorded parasitising the stomachs: the nematode *Anisakis simplex* and the digenetic trematode *Pholeter gastrophilus*.

The stomachs containing milk were collected from whales whose length ranged from 163 cm to 340 cm (mean 221.9 cm). Those whales containing a mixture of milk and solid remains ranged in length from 177 cm to 391 cm (mean 257.0 cm). Finally, the stomachs having only solid remains were from whales 203 cm to 610 cm long (mean 402.6 cm).

All parasite frequencies show an increase as the hosts begin to feed for themselves. Infection by *A. simplex* is highly correlated with the occurrence of ulcers, each having similar frequencies for particular size classes (see Figure 1a, b). Whales of both sexes follow the same pattern of increase in intensity. It is apparent that these cetaceans become infected with *A. simplex* early in life when still unweaned, and at body lengths of 201-250 cm. However, the frequencies of *A. simplex* and ulcers remain low in this size class. In the next class (251-300 cm), infection with this worm increases greatly with a frequency of around 80% or higher in both sexes. Whales over 300 cm length have a very high frequency of *A. simplex*, and ulcers ranging from 88.6 to 100% frequency. Thus an *A. simplex* infection can be considered usual in weaned whales.

The trematode *P. gastrophilus* shows lower frequencies than *A. simplex* and undergoes an irregular increase with size class. Frequencies of infection by *P. gastrophilus* cysts follow a similar pattern for both sexes of whale. This worm is relatively infrequent in young whales with length ranges of 201-250 cm. When compared with *A. simplex*, it seems that the frequency of *P. gastrophilus* increases more slowly since infection with this trematode only appears to be common at whale lengths of over 300 cm. However, like *A. simplex*, the frequencies of infection reach higher values in weaned animals (Fig. 2a, b). Intensities of infection also seem to increase as the hosts begin feeding for themselves. Infections with *A. simplex* tend to be slight, particularly in unweaned animals. Indeed, even in weaned whales, heavy (from 301 to 400 nematodes) or mass (over 500 nematodes) infections do not seem to be common, together occurring in only 8.3% of animals (Fig. 3).

Ulcers caused by *A. simplex* are rare in unweaned whales. However, as squid and fish become the main food resource, their numbers increase. Thus 39.8% of weaned whales have a moderate number (6-15) of ulcers and a substantial percentage (25.75%) have a high number (more than 15) of ulcers (Fig. 4). This is likely to be a consequence of the increase in intensity of infection by *A. simplex*.

Intensities of infecticn by *P. gastrophilus* appear to be low, particularly in unweaned whales. Furthermore, most unweaned animals are free from this trematode as is the case for a significant proportion of weaned whales (42.9%) (Fig. 5).

To summarise, long-finned pilot whales become infected with these two worms when still unweaned, as soon as they begin taking solid foods, and when less than one year old according to the minimum size class infected. Despite their high frequency, these stomach parasites and the lesions they produce do not seem to seriously affect the health of the whales since they mostly occur in small to moderate numbers. Data on the age of the hosts should be available soon. This should result in the frequency and intensity of infection being more clearly related to age class, sex and among the different schools.

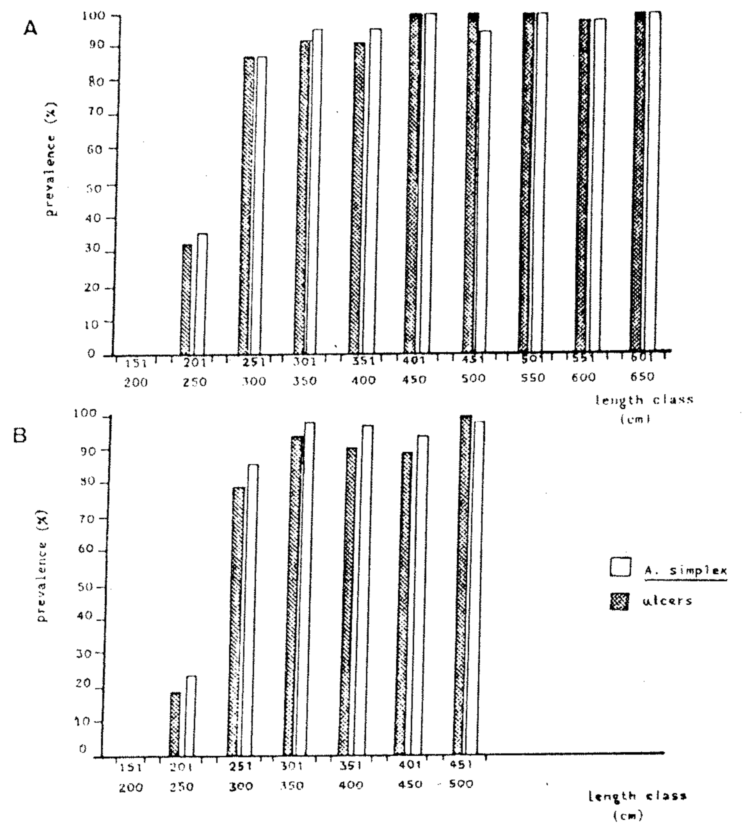


Fig. 1. *Anisakis simplex* and ulcer frequencies in relation to size classes of long-finned pilot whales. a - males; b - females.

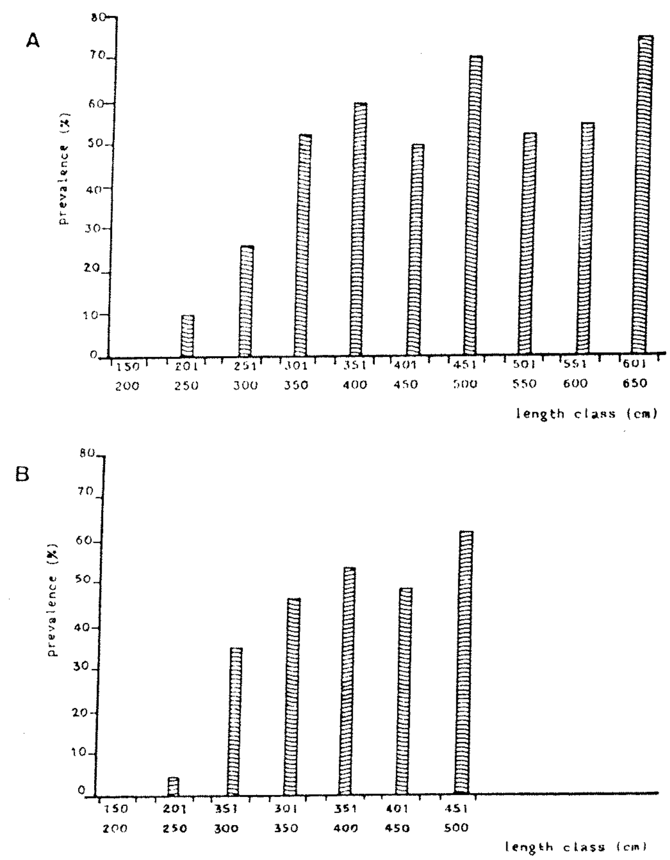


Fig. 2. *Pholeter gastrophilus* cyst frequencies in relation to size classes of long-finned pilot whales. a - males; b - females

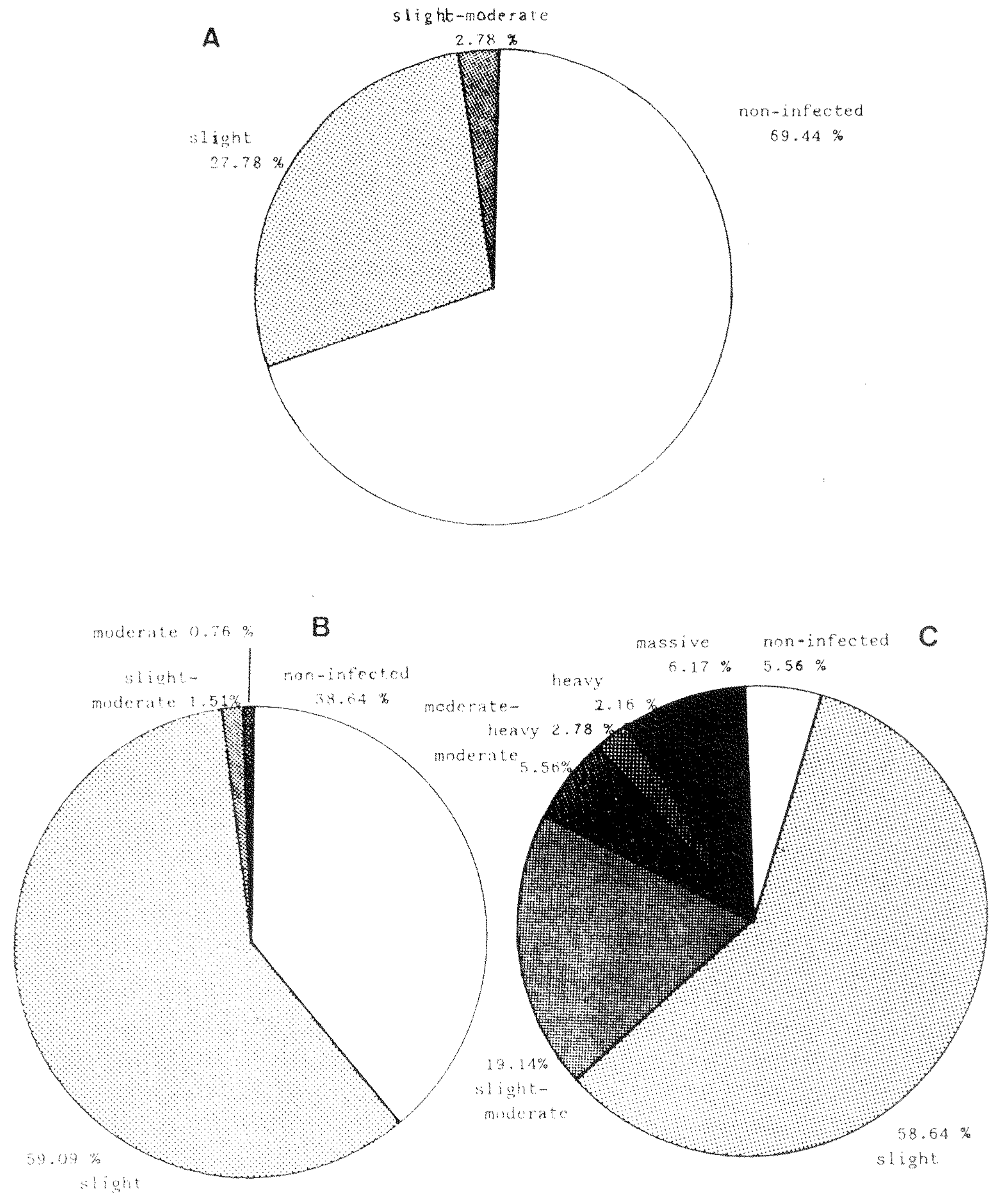


Fig. 3. The frequency of whales with different intensities of infection by *Anisakis simplex*, related to the three groups of stomach considered: A - stomachs containing only milk; B - stomachs containing both milk and solid items; C - stomachs containing only solid items. Non-infected: no parasites observed; slight infection: 1-100 nematodes detected; slight - medium: 101-200 nematodes; moderate: 201-300 nematodes; moderate - heavy: 301-400 nematodes; heavy: 401-500 nematodes; massive: over 500 nematodes.

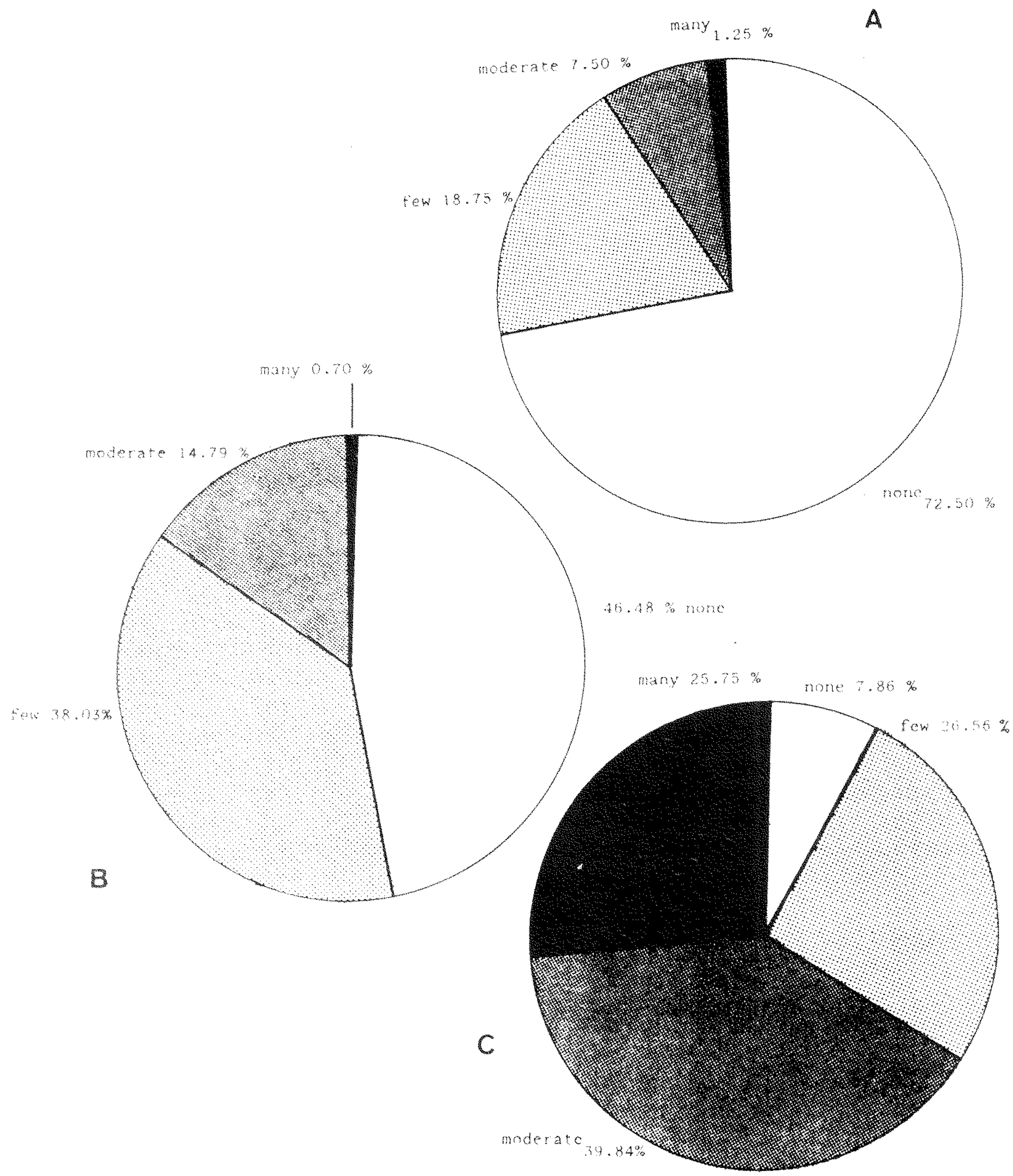


Fig. 4. The frequency of whales with different numbers of ulcers caused by *Anisakis simplex*, related to the three groups of stomachs considered: A - stomachs containing only milk; B - stomachs containing both milk and solid items; C - stomachs containing only solid items. None: no ulcer was observed; few: 1-5 ulcers detected; moderate: 6-10 ulcers; many - over 15 ulcers.

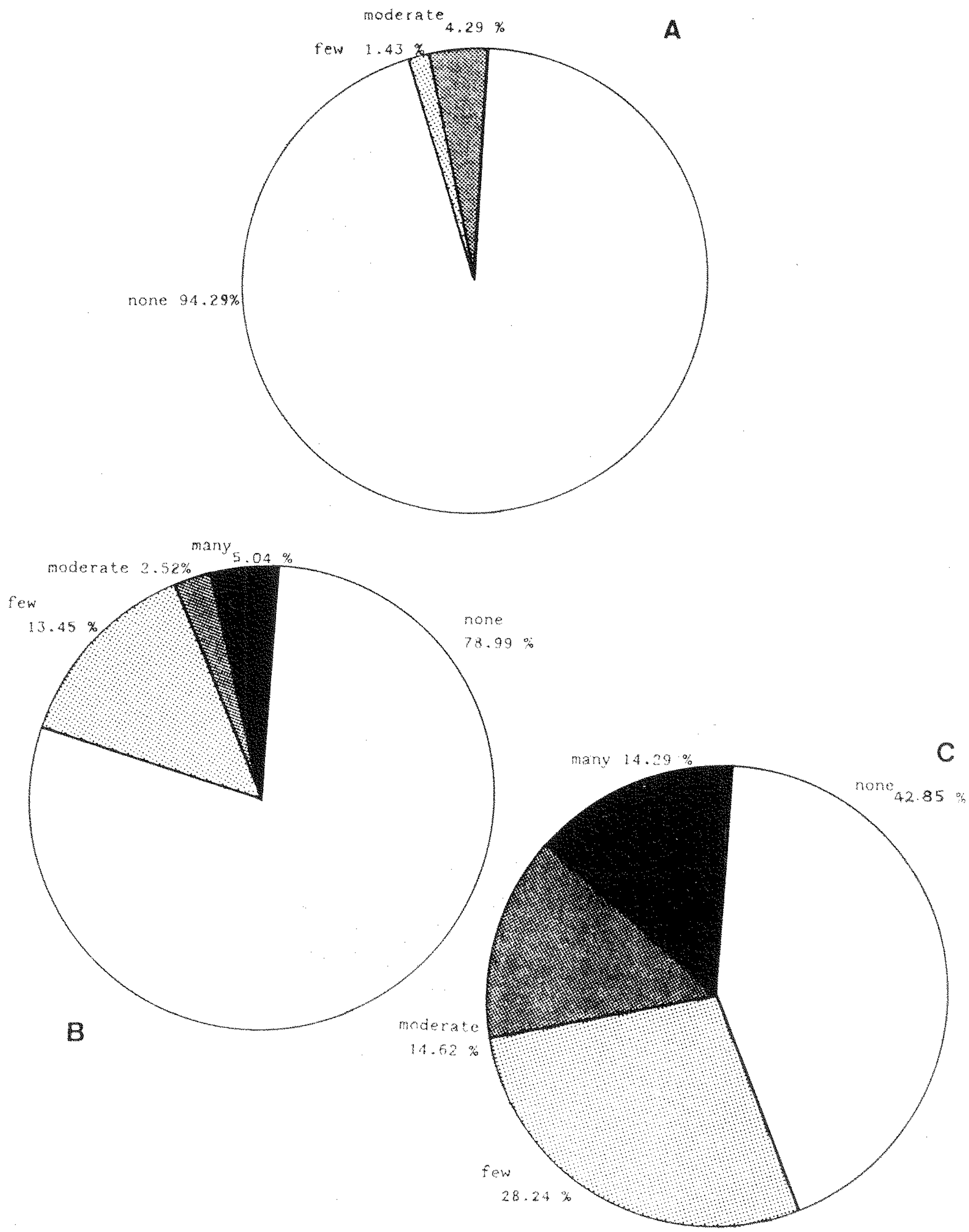


Fig. 5. The frequency of whales with different numbers of *Pholeter gastrophilus* cysts related to the three groups of stomachs considered: A - stomachs containing only milk; B - stomachs containing both milk and solid items; C - stomachs containing only solid items. None: no cysts were observed; few: 1-5 cysts observed; moderate: 6-15 cysts ; many: over 15 cysts.

Xenobalanus globicipitis (CRUSTACEA: CIRRIPEDIA) ON CETACEANS IN THE NORTHEAST ATLANTIC AND THE MEDITERRANEAN: A REVIEW

Guido Rappé* and Koen Van Waerebeek**

* Kapelstraat 3, 9890 Ursel, Belgium

** Laboratorium voor Morfologie en Systematiek
der Dieren - Museum voor Dierkunde,
State University, K.L. Ledeganckstraat 35,
9000 Gent, Belgium

Xenobalanus globicipitis is a balanomorph cirriped with an unusual external appearance. A rudimentary star-shaped shell is embedded in the skin of whales and dolphins. The elongated peduncle-shaped body rises from the middle of the star. The upper part of this pseudo-peduncle has a membranous reflexed collar or hood. At first sight the animal looks more like a lepadomorph barnacle. The species is not a parasite, as sometimes stated, but simply an epizoan.

The species was discovered simultaneously by Steenstrup and by Darwin (the latter, apart from being the father of evolutionary theory, also wrote a monograph on cirripeds that is still valuable reading). The odd thing about its description is that its type locality, the Faroes, lies in an area where the animal has been proven to be rare. In the northeast Atlantic, *Xenobalanus globicipitis* has been recorded on the following occasions:

- on long-finned pilot whales *Globicephala melaena* in the Faroes, in 1850 and 1884 (Steenstrup, 1852; Kinze *pers. comm.*), and in 1987 (Raga *et al.*, this volume).

- on a blue whale *Balaenoptera musculus* off Shetland, Scotland, in 1906 (Boxshall, *in litt.*).

- on a sei whale *Balaenoptera borealis* in Finnmark, northern Norway (Boxshall, *in litt.*) and Ingöy, Norway, without date (Broch, 1924). These two records may apply to the same record.

There are additional records upon unspecified whales from the east coast of Greenland and from the Faroes (might refer to the above mentioned pilot whale records - Broch, 1924). Nilsson-Cantell (1978) also includes the Bay of Biscay as a locality for this cirriped, but without further information on host or date.

In a dissection report on a common dolphin *Delphinus delphis* , stranded on the Belgian coast in 1986, an acorn barnacle embedded in the skin of the tail is mentioned. The specimen is lost, but it very probably was *Xenobalanus* , as no other barnacles of a comparable size are known from dolphins (Rappé, 1988).

In the Mediterranean, *Xenobalanus globicipitis* has been recorded more frequently, all records being restricted to the western part:

- on common dolphins, *Delphinus delphis* off Cape Ferrat, Algeria in 1894 (Gruvel, 1920) and off Gibraltar in 1966 (Pilleri, 1970).

- on killer whales, *Orcinus orca* off Monaco in 1896 and off Gibraltar in 1902 (Gruvel, 1920).

- on long-finned pilot whales, *Globicephala melaena* off Alicante in 1908, off Cape Palos (Spain) in 1910, and near the Balearics in 1911 (Gruvel, 1920).

- on a fin whale, *Balaenoptera physalus* (originally published as *B. borealis*) in Tunis in 1949 (Heldt, 1950).

- on striped dolphins, *Stenella coeruleoalba* off Gibraltar in 1966 and 1967 (Pilleri, 1970), on two occasions between 1974 and 1981, on the Spanish coast (Raga *et al*.. 1982), and near Mallorca in 1978 (Boxshall, *in litt.*).

- on bottle-nosed dolphins, *Tursiops truncatus* in the Strait of Gibraltar in 1966 and 1967 (Dollfus, 1968; Pilleri, 1970).

There is an additional record on an unidentified dolphin in the Ligurian Sea in 1978 (Relini, 1979).

Xenobalanus globicipitis was always attached to the edge of the flippers or the tail flukes, very seldom to the tail stock. The infestation rate is poorly documented, as most authors ignore the number of unaffected cetaceans. A few exceptions are Pilleri (1970) for *Delphinus delphis* (one affected out of 25 dolphins, i.e. 4%) and *Stenella coeruleoalba* (four affected out of 12 dolphins, i.e. 33%), Raga *et al.* (1982) for *S. coeruleoalba* (two affected out of 7 dolphins, i.e. 28%), and Raga *et al.* (this volume) for *Globicephala melaena* (two affected out of 112 whales, i.e. 2%). Most of those samples, however, are very small.

DISCUSSION *Xenobalanus globicipitis* is rare in European waters. It may be considered an inhabitant of tropical and warm temperate waters. From the records documented above, it would appear that its occurrence in the northeast Atlantic and Mediterranean is erratic, being separated by great lapses of time. It is possible that these are related to sporadic incursions from adjacent tropical - warm temperate waters. As such, *Xenobalanus globicipitis* might be useful as a biological indicator. The same may be true for whale lice (Cyamidae) (Rappé, in prep.).

Any additional data on this species from personal experience, from zoological collections, or from the literature that may have been overlooked, would be most welcomed.

ACKNOWLEDGEMENTS We are indebted to Dr Boxshall (British Museum (NH), London) and Dr Kinze (Zoological Museum, Copenhagen) for museum collection data and help with literature, and to Dr Smeenk (Leiden) for reading this note.

REFERENCES

Broch, H. 1924. *Cirripedia thoracica* von Norwegen und dem Norwegischen Nordmeere. Skr. Vidensk Selsk. Christiana, mat. naturv. Kl., 17: 1-121.

Dollfus, R.P. 1968. *Xenobalanus globicipitis* Steenstrup (*Cirripedia thoracica*) récolté sur *Tursiops truncatus* (Montagu) à proximité de la côte Nord du Maroc. Bull. Inst. Pêches maritimes Maroc, 16: 55-60.

Gruvel, A. 1920. Cirrhipèdes provenant des campagnes scientifiques de S.A.S. le Prince de Monaco. Résultats des Campagnes Scientifiques accomplies sur son yacht par Albert Ier Prince souverain de Monaco, 53: 1-

Heldt, J.H. 1950. Note au sujet de *Xenobalanus globicipitis* Steenstrup sur *Balaenoptera borealis* Lesson en Méditerranée. Bull. Soc. Hist. Nat. nat. Tunisie, 3: 25-28.

Nilsson-Cantell, C.A. 1978. *Cirripedia horacica* and *Acrothoracica*. Universitets-forlaget, Oslo. 135 pp.

Pilleri, G. 1970. *Xenobalanus globicipitis* Steenstrup on *Delphinus delphis*, *Stenella styx*, *Tursiops truncatus* in the Western Mediterranean. Investigations on Cetacea, 2: 248-249.

Raga, J.A., Carbonell, E. and Raduan, M.A. 1982. Incidencias de parasitos en los Cetaceos varados en las costas Espanolas del Mediterraneo. Memorias do Museo do Mar, série zoologica, 2(19): 1-

Rappé, G. 1988. Een vondst van *Xenobalanus globicipitis* in de Noordzee? Strandvlo, 8(2): 100-101.

Relini, G. 1979. Remarks on Cirripeds of the Ligurian Sea. Rapp. Comm. int. Mer Médit., 25/26(4): 131-132.

Steenstrup, J. 1852. Om *Xenobalanus globicipitis*, en ny Cirriped-Slaegt af Coronulafamilien. Vid. Med. Naturh. For., (1852): 62-64.

VARIATION IN BLUBBER LIPID RESERVES IN FIN WHALES OFF SPAIN

Alex Aguilar and Asuncîon Borrell

Department of Animal Biology (Vertebrates),
Faculty of Biology,
University of Barcelona,
Barcelona 08071,
Spain

The blubber of cetaceans serves many different functions: thermoregulation, enery storage, transmission of sound in the head region, etc.. However, in large whales with strong seasonal feeding and migratory habits, such as the fin whale, blubber is especially important for the deposition of fat stores.

During Spanish commercial whaling operations in 1984, blubber was collected from 82 fin whales (31 males and 51 females) in order to study the pattern of variation in fat reserves. The population studied inhabits the temperate waters of the eastern North Atlantic, and it is believed that its distribution ranges from the north of the British Isles to southern Moroccan coasts. Surface water temperatures at the whaling grounds during the peak of the season typically range 16 - 20° C (mean 17.8° C).

The blubber samples, of about 30-50 g, included a whole section of the tissue, and were excised from the region posterior to the dorsal fin. Each of these blubber sections was divided into three strata (external, mid and internal) which were separately analysed for lipid content. Samples were wrapped in aluminium foil, labelled, and preserved deep frozen until the time of analysis. For the lipid content determination, subsamples of about 3 g each were chopped into small pieces, ground in a mortar with anhydrous sodium sulphate, and their lipids extracted in a 125 ml Soxhlet apparatus with n-hexane over a period of 4 hours (about 40 cycles). The extract containing the lipidic phase was evaporated under a cold air stream, and its lipid content determined by gravimetry.

Following these procedures, lipid content was determined for each strata from each whale. The average lipid content of the whole blubber tissue (i.e. for the three strata combined) for any given whale was calculated as the mean of the values for its three strata, combined.

In both sexes, lipid reserves built up from early May until the second fortnight of August, but tended to decrease afterwards. This agrees with previous information on migration and feeding patterns of Spanish fin whales, which suggest a maximum in the feeding upon the euphausiid *Meganyctiphanes norvegica*, the main prey species for the fin whale, during the central months of the summer (Aguilar 1985).

In males, total lipid content did not vary in relation to reproductive state, but significantly decreased with age ($p < 0.05$). In females, it varied strongly with reproductive status. In adult females, the most important source of variation in lipid content was reproductive status, and fat reserves were highest in pregnant whales and lowest in lactating ones. However, in immature females, the only reproductive group with a sample size large enough to test age-related trends, lipid content increased also with age ($p < 0.05$).

The three individual blubber strata also showed definite patterns of variation. The lipid content of the external stratum was very stable and showed no apparent variation with age, reproductive status or date of capture in either of the sexes. The internal stratum, on the contrary, was very variable, clearly reflecting the situation of the nutritional reserves of the specimen (see Fig. 1). In general, the mid stratum was a transition zone between the external and the internal ones. In males of all ages and in immature, resting and lactating females, there was a progressive decrease in lipid content from the external stratum to the internal one, the trend being more dramatic in those whales with lowest nutritional reserves. In pregnant (very fat) females, on the contrary, lipid content increased from the external to the internal stratum.

REFERENCE

Aguilar, A. 1985. Biología y dinámina poblacional del rorcual común (*Balaenoptera physalus*) en las aguas atlánticas ibéricas. PhD. thesis, Faculty of Biology, University of Barcelona. 487pp.

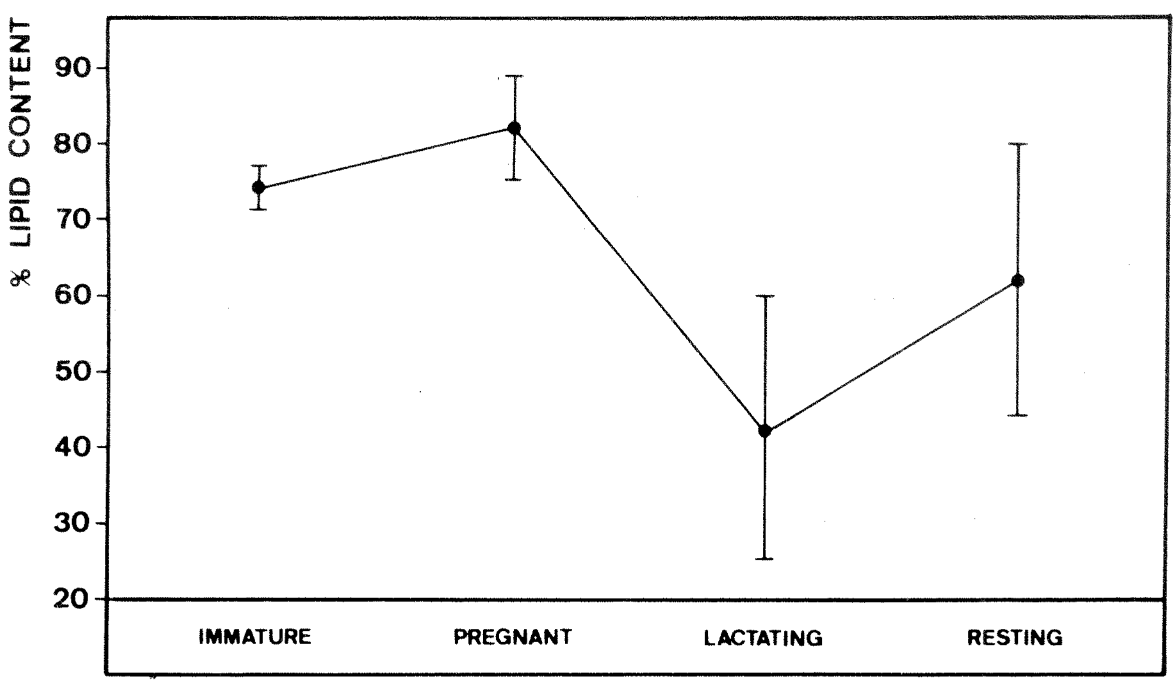


Fig. 1. Variation (mean and ranges) of lipid content in the internal stratum of the blubber in the different female reproductive classes.

HOW DO ODONTOCETES PERCEIVE THEIR OWN SOUNDS?

Günther Behrmann

Alfred-Wegener Institut für Polar- und Meeresforschung,
Columbusstrasse,
D-2850 Bremerhaven,
Federal Republic of Germany

INTRODUCTION Nobody can confirm whether a dead person has been able to hear. One can only assume that he/she was able to hear if auditory organs were present. Very much the same holds true for dead cetaceans. I have to rely upon similar indications when trying to demonstrate with which sense organs odontocetes are able to perceive and use the sounds they emit.

Basing himself on studies of the middle ear, Lange (1922) concluded that cetaceans must be deaf. Yamada (1953) assumed a reduced hearing capacity, and supposed that odontocetes could register certain frequencies by means of their free-swinging bullae. In the light of the morphology of the inner ear, Reysenbach de Haan (1957), Fraser & Purves (1960), Dudok van Heel (1962, 1966), Purves (1966), and Fleischer (1982) all assume that odontocetes can indeed hear.

THE STUDY The free-swinging bullae of odontocetes are very massive, their specific weight being twice that of the other skull bones. This feature led Yamada (1953) to his theory that the heavy bullae would function like seismographs, and that differences in oscillation between the lighter and heavier bones would be registered through the sense of touch. Yamada's theory, however, was ignored since he could not find the required receptive organs.

In the harbour porpoise *Phocoena phocoena*, I have now discovered sense organs between the occipital bone and the bulla, which would enable odontocetes to perceive just such oscillations (Behrmann, 1987; see Fig. 2).

The organ in question is situated in a groove of the occipital, which has always been regarded as an air-sac (peribullary sac: Purves, 1966). This groove contains bell-shaped vacuoles with an opening pressed against the bulla. The vacuoles are filled with fluid and contain sense cells, viz. corpuscles of Vater-Pacini, which are connected with the occipital by nerves (Fig. 3). The fluid in the vacuoles is thus influenced by oscillations of the bulla, the sense cells by those of the occipital. The oscillations of the heavier bullae differ from those of the lighter skull bones, and the differences are registered by the sense cells. Since this organ is situated far backwards, one may assume that it perceives only such frequencies as are able to penetrate deep into the head, i.e. frequencies below 900 Hz.

High frequencies do not penetrate very deep into the body and are mainly used for locating food. If the prey consists of soft-bodied animals, the echoes would no doubt be weak. Therefore, for any organ to register such frequencies, it would have to be at the front of the head.

The rostrum of the odontocete skull in its central part has a long, cartilaginous structure: the rostral cartilage (cartilago rostralis: Figs. 4-8). Purves & Pilleri (1983) suppose that this might serve for echolocation. Laterally and ventrally, the rostral cartilage is surrounded over its entire length by an organ which possibly could perceive quite weak sound waves (Fig. 5).

This rostral organ consists of long vessels filled with liquid, the walls of which are covered with ciliate cells (Fig. 8). These are stereocilians, and are surrounded by the fluid just like those in the equilibrium organ in mammals. Throughout this rostral organ there is a network of nerves leading to the nervus trigeminus below the base of the skull (Fig. 7). By means of this sense organ, odontocetes might perceive very weak oscillations. Since the entire organ, moreover, is situated in a long cavity formed by the rostral bone, it could be directed with great precision. This structure shows a striking similarity to a directional microphone. Through this organ odontocetes might be able to register all frequencies that are above their hearing capacity, and which would only give a very weak echo.

DISCUSSION and THEORY Odontocetes orientate themselves by means of echoes of the sounds they emit. Since the animals modify their frequencies according to circumstances, recordings of these show a wide range of variation. Frequencies of up to 300 kHz have been registered to date (Evans, 1973).

Odontocetes have a reduced cochlea and strongly modified earbones. On account of these attributes, some authors have expressed doubt as to whether those animals have any ability to hear and utilize their sounds.

In the head of the harbour porpoise, however, sense organs have now been discovered that might be able to register certain frequencies. According to their morphology and location, these organs would either be sensitive to very low, or to very high frequencies. Since the rudimentary cochlea is still completely functional, one may assume that intermediate frequencies are perceived by the sense of hearing.

The orientation system of odontocetes (Fig. 9) is based on emitting (A) and receiving (B) sounds, commonly called echolocation. The sounds are produced by the Eustachian tubes (A1), acoustic membranes (A2) and air-tubes (A3). They are received by the rostral (B1) and caudal (B2) sense organs as well as the auditory organ (B3). Sounds are generated by waves (frequencies), the nature of which is expressed by the number of oscillations per second (Hz or kHz). These oscillations can be made visible by means of an oscillograph. Such graphs are called sonagrams and show which frequencies are emitted within a certain period of time. Three characteristic sonagrams from the harbour porpoise, are figured here:

1. (C) For short-distance orientation, a harbour porpoise uses very high frequencies, of up to 300 kHz. These have a short range but can be concentrated in powerful bundles. They are emitted at very short intervals of only a few thousandths of seconds, and hence are called clicks.

2. (D) Busnel *et al.* (1966) recorded a harbour porpoise during courtship. The animal communicated using whistles and squeaks, sounds that can be produced by the air-tubes. Given the structure of the cochlea, such tones would be within the hearing range of odontocetes, i.e. between 800 and 100,000 Hz.

3. (E) For long-distance orientation, low tones are produced by the sound membranes, since frequencies of up to 300 Hz range very far in seawater. Given their short cochlea, the animals are unable to hear such sounds. The echoes of these penetrate deep into the body, causing oscillations of the bony structures. These oscillations are transmitted to the caudal sense organs, where they are perceived through the sense of touch.

Since high frequencies have such a short range, their echoes may be quite weak, particularly when reflected by soft-bodied prey. Thus it would be useful if these weak echoes, inaudible to odontocetes and unable to penetrate far into the body, could be received by the rostral sense organ. In this way, harbour porpoises would be able to perceive and utilize all sounds they emit, inaudible tones being registered through the senses of touch. It might, however, prove difficult to determine the range over which the various sense organs could operate.

Since other odontocetes (with the exception of sperm whale *Physeter macrocephalus* and bottlenose whale *Hyperoodon ampullatus*) are similar to the harbour porpoise morphologically, one may assume that their system of orientation is essentially similar.

REFERENCES

Behrmann, G. 1987. Die Funktion von Sinnesorganen caudal der Ohrkapseln (Bulla tympanica) bei Zahnwalen (Odontoceti). Lutra, 30: 113-122.

Busnel, R.-G. and Dziedzic, A. 1966. Acoustic signals of the pilot whale *Globicephala melaena* and of the porpoises *Delphinus delphis* and *Phocoena phocoena*. Pp. 607-646. In K.S. Norris (editor) *Whales, dolphins, and porpoises* . University of California Press, Berkeley/Los Angeles.

Dudok van Heel, W. H. 1962. Sound and Cetacea. Netherlands Journal of Sea Research, 1: 407-508.

Evans, W.E. 1973. Mechanisms of sound production in delphinid cetaceans, a review on some anatomical considerations. Amer. Zool., 13: 1205-1213.

Fleischer, G. 1982. Hörmechanismen bei Delphinen und Walen. Deutsche Gesellschaft für Hals, Nasen-Ohrenheilkunde, 30: 123-130.

Fraser, F.C. and Purves, P.E. 1960. Hearing in cetaceans. Bull. Brit. Mus. (Nat. Hist.), Zool., 7: 1-140.

Hyrtl, J. 1845. *Vergleichende anatomische Untersuchungen über das innere Gerörorgan des Menschen und der Säugetiere.* Friedrich Ehrlich, Prag.. 139pp.

Lange, W. 1922. Zur Physiologie des Walohres. Zeitschrift für Hals, Nasen, Ohrenheilkunde, 3: 63-69.

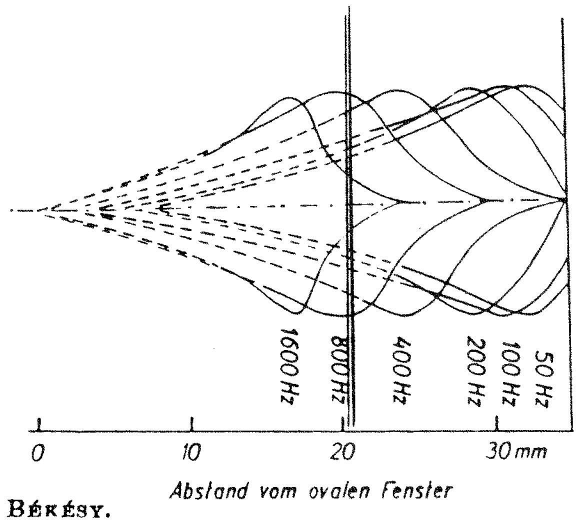
Penzlin, M. 1980. *Lehrbuch der Tierphysiologie.* Gustav Fischer, Stuttgart. 569pp.

Purves, P.E. 1966. Anatomy and physiology of the outer and middle ear in cetaceans. Pp. 320-380. In K.S. Norris (editor), *Whales, dolphins, and porpoises* . University of California Press, Berkeley, Los Angeles.

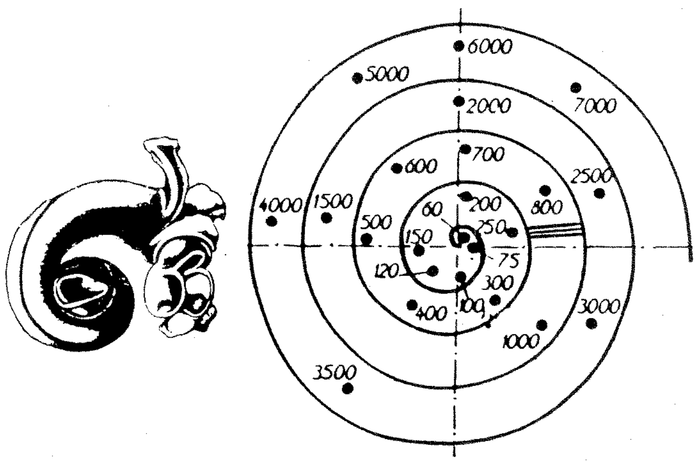
Purves, P.E. and Pilleri, G.E. 1983. *Echolocation in whales and dolphins.* Academic Press, London. 261pp.

Reysenbach de Haan, F.W. 1957. Hearing in whales. Acta Oto-Laryngologica, suppl. : 1-114.

Yamada, M. 1953. Contribution to the anatomy of the organ of hearing in whales. Sci. Rep. Whales Res. Inst., Tokyo, 8: 1-79.



Nach v. BÉKÉSY.



Nach CULLER und aus SCHÜTZ 1958.

Fig. 1. Distance of the various frequencies from the fenestra ovalis (in Hz)

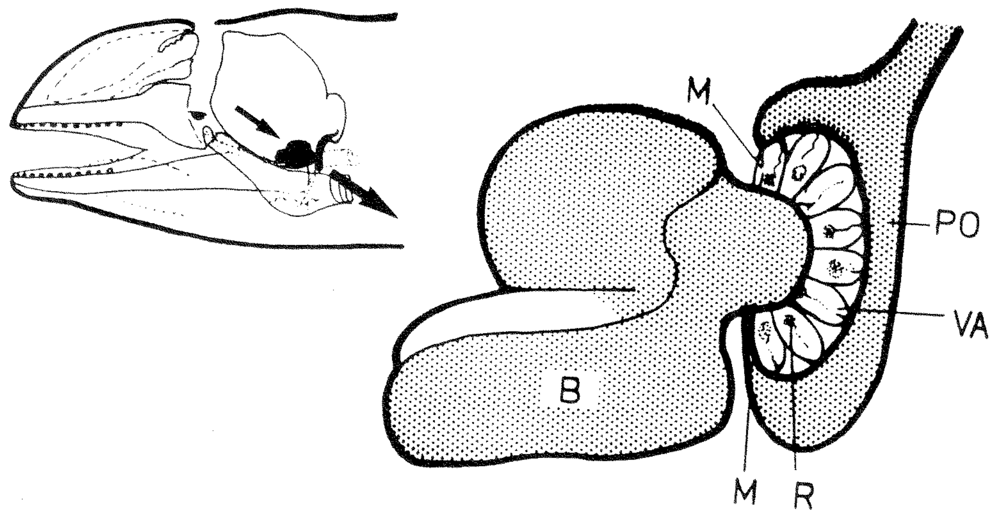


Fig. 2. Schematic longitudinal section through the bulla (B), caudal sense organ and vacuoles (V), occipital bone (PO), membrane (M), and nervous receptors (R) of a harbour porpoise.

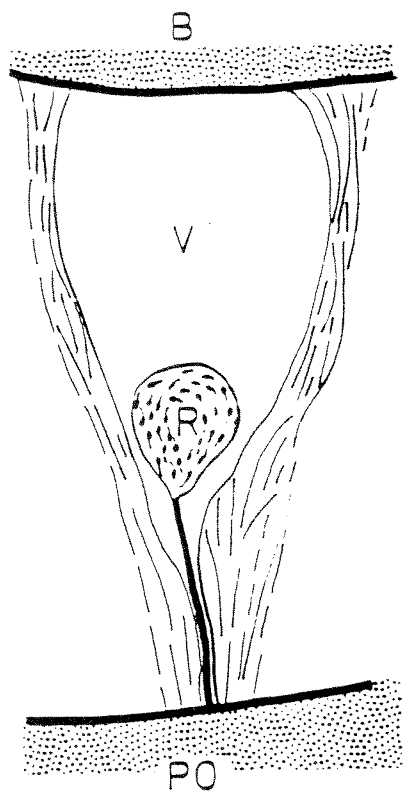


Fig. 3. Vacuole (V) with floating receptor (R), bulla (B), and occipital bone (PO).

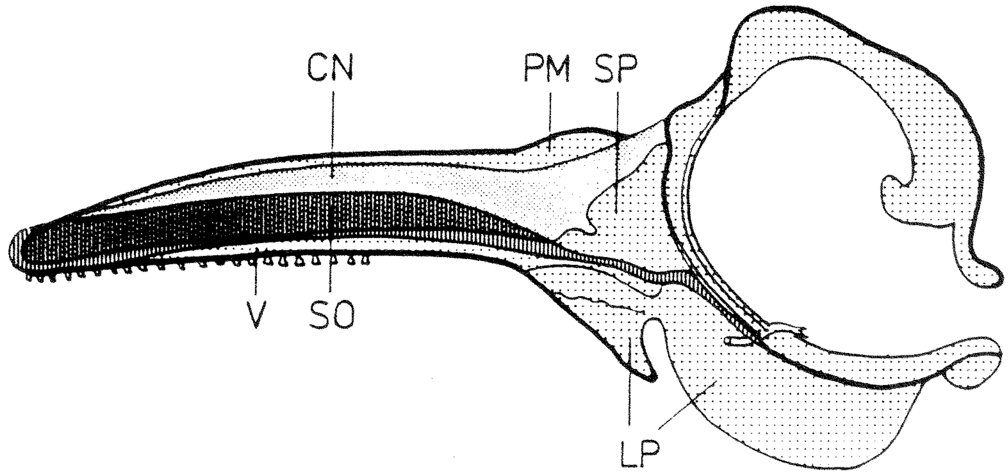


Fig. 4. Longitudinal section through the skull of a harbour porpoise: cartilago rostralis (CN), praemaxillare (PM), sphenoidale (SP), vomer (V), rostral sense organ (SO), and lamina pterygoidea (LP).

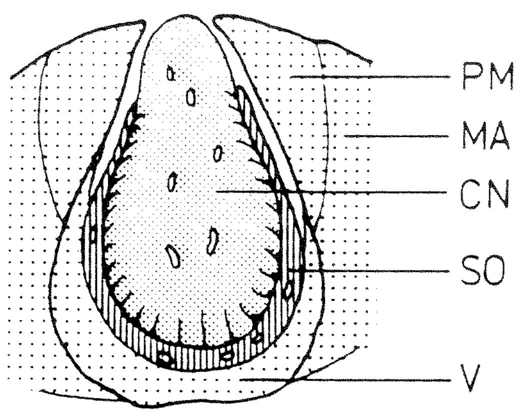


Fig. 5. Transverse section through the rostral sense organ (SO), praemaxillare (PM), maxillare (MA), cartilago rostralis (CN), and vomer (V).

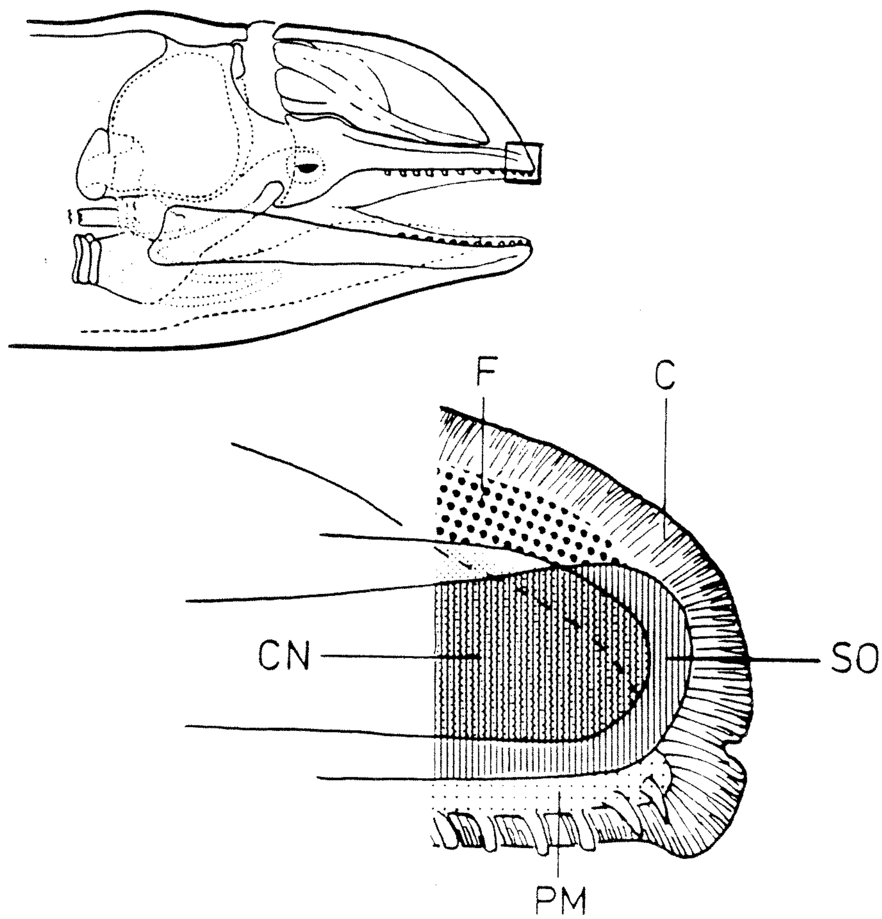


Fig. 6. Longitudinal section through the tip of the rostrum: cartilago rostralis (CN), blubber (F), cutis (C), tip of the rostral sense organ (SO), and praemaxillare (PM)

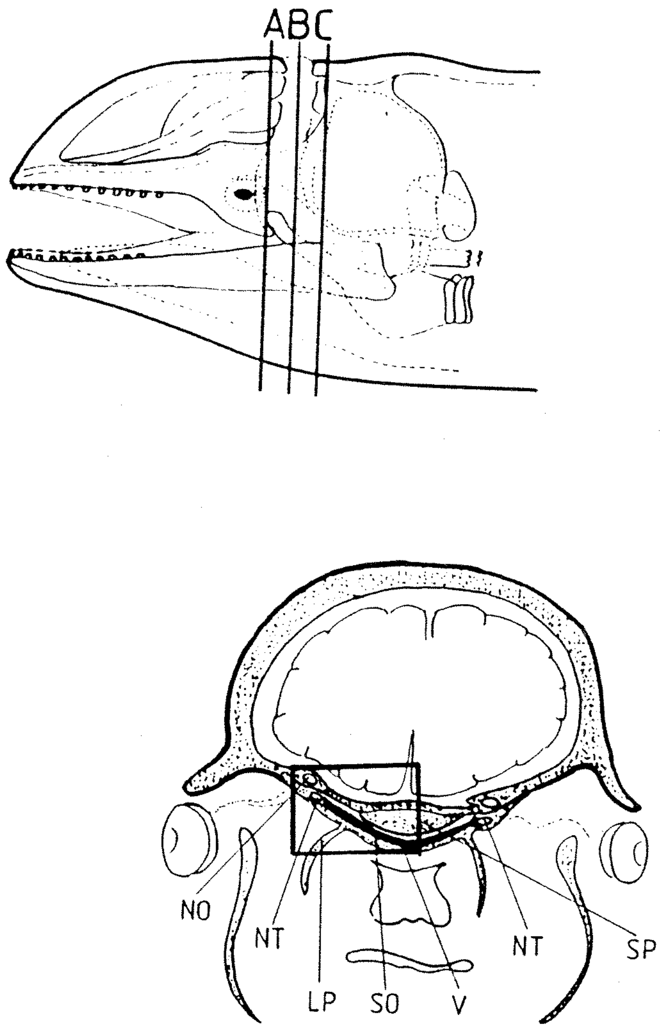


Fig. 7. Transverse section through the rostral sense organ (SO), nervus opticus (NO), nervus trigeminus (NT), lamina medialis proc. ptertygoidei (LP), vomer (V), and os sphenoidale (SP).

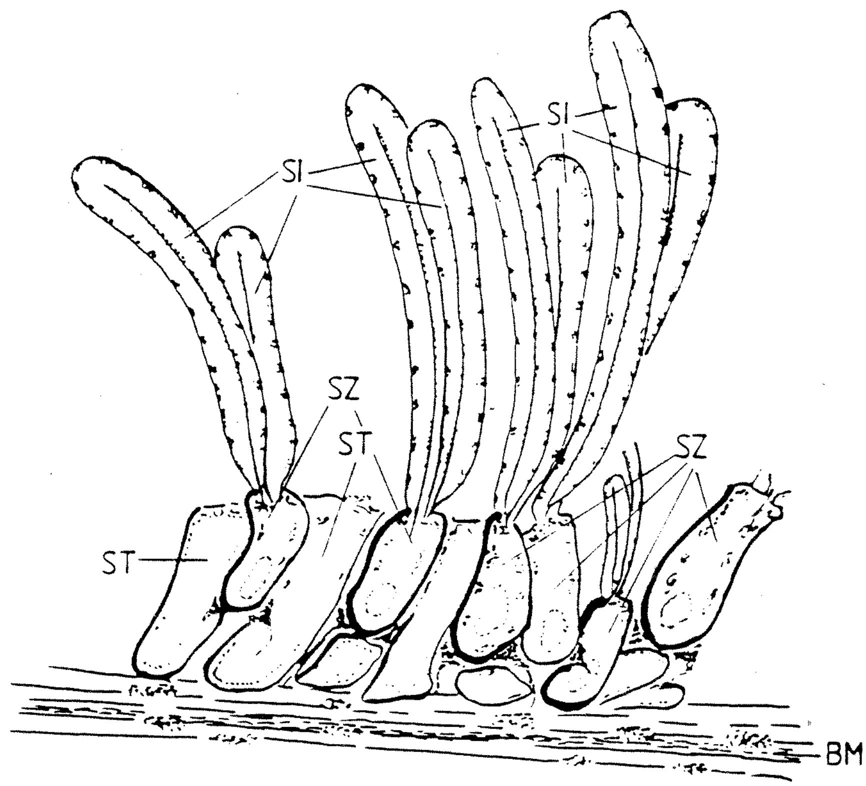


Fig. 8. Sense cells in the rostral sense organ (SZ), with stereocilians (SI) and the membrane (BM).

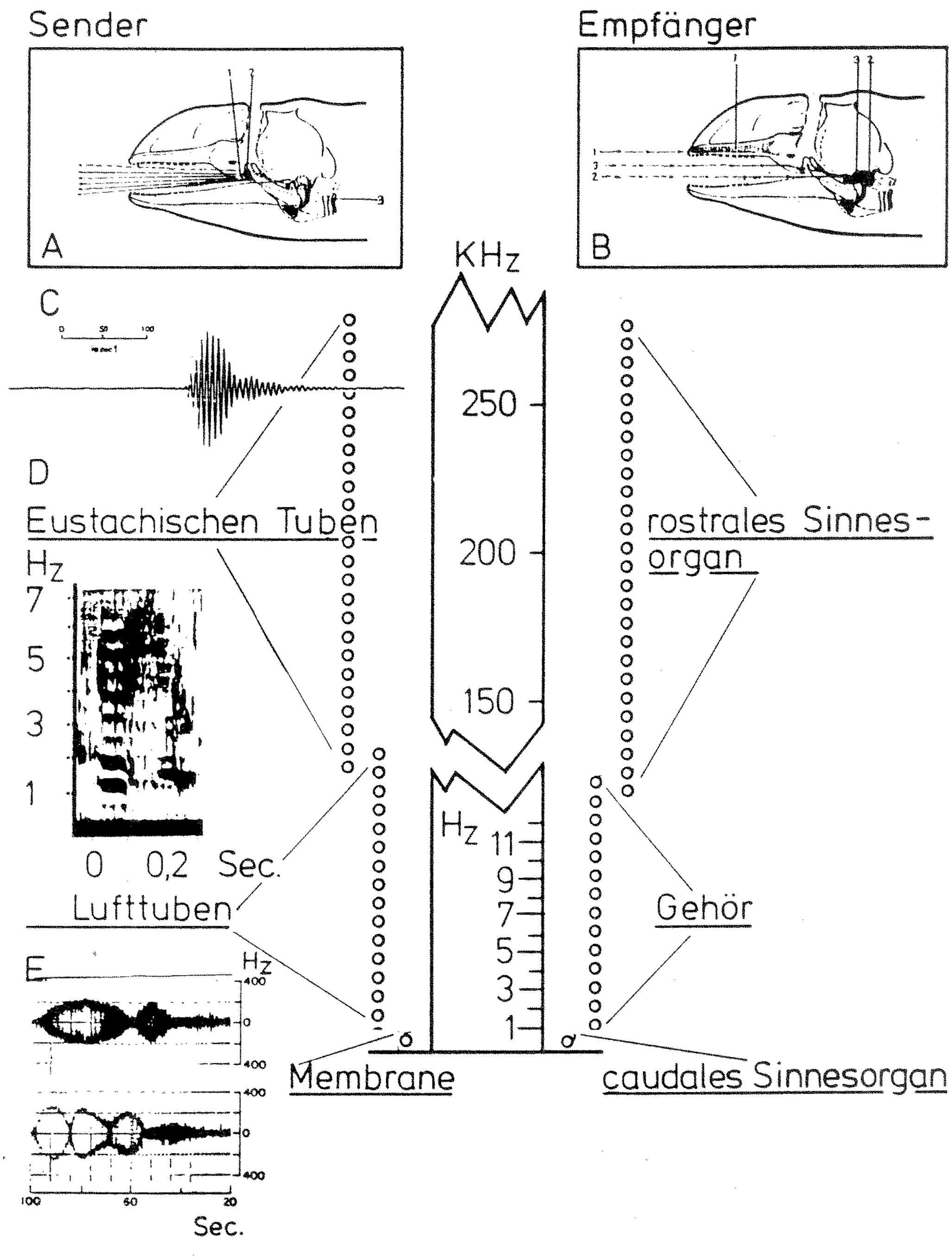


Fig. 9. The orientation system of odontocetes: the probable frequencies produced by air-tubes and membranes, and the probable frequencies perceived by the sense organs and the ear.

STUDIES ON BEHAVIOUR AND ECOLOGY OF THE HARBOUR PORPOISE (*Phocoena phocoena*): PRELIMINARY RESULTS FROM A SERIES OF SIGHTING CRUISES IN DANISH WATERS, APRIL - AUGUST 1987.

Carl Chr. Kinze

Zoologisk Museum,
Universitetsparken 15,
DK-2100 Copenhagen Ø,
Denmark

INTRODUCTION For several decades, concern has been expressed over the decline of the harbour porpoise population in the Baltic Sea (Andersen, 1982; Kinze & Sørensen, 1984). Recently, action has been taken to enlarge the basic knowledge of this population so that appropriate conservation measures can be taken. Kinze (1985a, b) reported on stock identity, present distribution, annual abundance and migrations; and initial studies by the same author (Kinze, 1986) revealed areas with frequent sightings of harbour porpoises and their calves among the waters north of Funen.

METHODS Continuing the initial studies, nine cruises were conducted in a 8.4 m sailing boat in the waters north of Funen (Fig. 1) in order to study the relative abundance, and distribution of size/age classes of the harbour porpoise, as well as their behaviour towards various types of vessels. Systematic counts were made only when wind speed was below 4 m/sec.. The relative abundance was expressed as the number of animals counted per kilometre sailed. No absolute population estimate is attempted in this paper. However, the perpendicular distance from the boat was calculated for later studies. Whenever possible, animals sighted were photographed and categorised into three size classes: adults (estim. length > 140 cm), subadults (estim. length 100-140 cm), and newborns (estim. length < 90 cm). Furthermore, notes were taken of their behaviour, the presence of boat traffic, associated birds, and certain hydrographical parameters.

RESULTS A total of 186 animals were sighted, 98 of which (52.7%) could be categorised into a particular size class. Animals were first seen mainly within 100 metres perpendicular distance from the boat. Observations lasted from a single surfacing of a few seconds to extended periods of up to 45 minutes. The relative abundance increased from April through July with a small subsequent decrease in August (Fig. 2). The proportion of calves increased markedly from the beginning of June to mid-July, remaining high during August (Fig. 3).

Habitat Harbour porpoises showed a preference for depths below 20 metres (Table 1). They were observed at current boundaries (8 out of 89 observations), and in 39 out of 89 (43.8%) cases, they were associated with birds. Eleven different bird species were observed, the two most frequent species being sandwich terns *Sterna sandvicensis*, and great black-backed gulls *Larus marinus* (Table 2).

Behaviour Subadults formed the highest percentage of animals approaching the vessel to less than 50 metres, while cows with newborn calves had the lowest percentage (Fig. 4). On several occasions, porpoises approached the boat very closely (< 50 cm) and all proved to be subadults (five animals). These animals swam beside the boat and turned their belly towards it, giving excellent opportunities for a positive sex determination and fairly good length measurement. Cows with newborn calves always positioned themselves between the approaching vessel and the calf, a behaviour that could be termed shielding. Eight encounters between harbour porpoises and various types of motor craft vessels were recorded. Animals approached these vessels readily. Only on a single occasion did an approaching speedboat cause a special reaction with a harbour porpoise breaching. In all other cases there seemed to be no differences to the behaviour shown towards sailing vessels.

The ventilation cycle showed submergence periods varying between 2 sec. and 169 sec.. Submergence periods could be divided into ultra short dives (10 sec. or less), short dives (between 10 and 20 sec.), medium dives (between 20 and 30 sec.), and long dives (more than 30 sec.). A basic pattern of four shorter dives (ultra short, short, or medium) followed by a long dive was noted. Prolonged periods without long dives occasionally occurred and, in some cases, long dives were preceded by a medium dive (Fig. 5).

DISCUSSION The highest relative abundance found in July is in good accordance with earlier findings (Kinze, 1985b). The results here indicate that the onset of the main calving season should be placed between the beginning of June and the middle of July, most probably at the end of June or beginning of July. Møhl-Hansen (1954) calculated the date of main calving to be 24 June for Danish waters. It seems, however, likely that some calves are born as early as May (as noted in UK waters - Evans *et al.*, 1986). The waters north of Funen therefore may be considered a harbour porpoise breeding and nursery area.

The behaviour towards the various types of vessels is complex and appears to be related to age. Subadults showed the greatest "curiosity" or exploratory behaviour, a well known pattern in young mammals. The turning of the belly towards the boat might be explained as a kind of play behaviour. Cows react to approaching boats and their shielding behaviour indicates insecurity. Therefore one cannot rule out the possibility that high boat density might be a stress factor for the harbour porpoise. There was no difference in the behaviour towards motor craft and sailing vessels, probably because the harbour porpoise has become accustomed to that kind of background noise. As indicated in earlier studies (Kinze, 1986), speedboats may pose an exception. They most probably do frighten porpoises, but further study is needed to determine whether it is the noise or the speed of such vessels that causes the reaction.

Harbour porpoises are known to have high metabolic rates (Yasui & Gaskin, 1986) and therefore they have to spend prolonged periods feeding. The association with seabirds and the occurrence at current boundaries indicates the presence of fish, and therefore foraging harbour porpoises (43.8% of all observations).

The ventilation cycle found in this paper shows some differences to the results of Watson & Gaskin (1983) who reported no ultra short and short submersion periods. The mean submersion for their pattern A was 24.4 ± 1.6 sec., supposed to refer to travelling animals. Although the findings of the present paper resemble pattern A, the animals observed were mainly engaged in feeding. The longest diving periods found here are in fairly good accordance with pattern B of Watson & Gaskin (1983), with mean submersion time of 1.44 min. ± 0.07 min.

REFERENCES

Andersen, S. 1982. Change of occurrence of the harbour porpoise, *Phocoena phocoena*, in Danish waters as illustrated by catch statistics from 1834 - 1970. Mammals in the Sea, vol. 4: 131-133. FAO, Rome.

Evans, P.G.H., Harding, S., Tyler, G. and Hall, S. 1986. Analysis of cetacean sightings in the British Isles, 1958-1985. Report to Nature Conservancy Council, Peterborough, England. 71 pp.

Kinze, C.C. 1985a. Intraspecific Variation in Baltic and North Sea harbour porpoises (*Phocoena phocoena* L., 1758). Videnskabelige Meddelelser fra Dansk naturhistorisk Forening, 146: 63-74.

Kinze, C.C. 1985b. Et års observationer af marsvin (*Phocoena phocoena*) fra danske færgeruter. Flora og Fauna, 91: 21-27.

Kinze, C.C. 1986. On the Distribution of the Harbour Porpoise (*Phocoena phocoena*) in Danish waters. International Council for the Exploration of the Sea, C.M. N: 12.

Kinze, C.C. and Sørensen, T.B. 1984. *Marsvinet*. Danmarks Naturfredningsforening, Copenhagen.

Møhl-Hansen, U. 1954. Investigations on Reproduction and Growth of the Porpoise (*Phocaena phocaena* (L.)) from the Baltic. Videnskabelige Meddelelser fra Dansk naturhistorisk Forening, 116: 369-396.

Watson, A.P. and Gaskin, D.E. 1983. Observations on the ventilation cycle of the harbour porpoise, *Phocoena phocoena* (L.) in coastal waters of the Bay of Fundy. Can. J. Zool., 61: 126-132.

Yasui, W.Y. and Gaskin, D.E. 1986. Energy budget of a small cetacean, the harbour porpoise, *Phocoena phocoena* (L.). Ophelia, 25: 183-197.

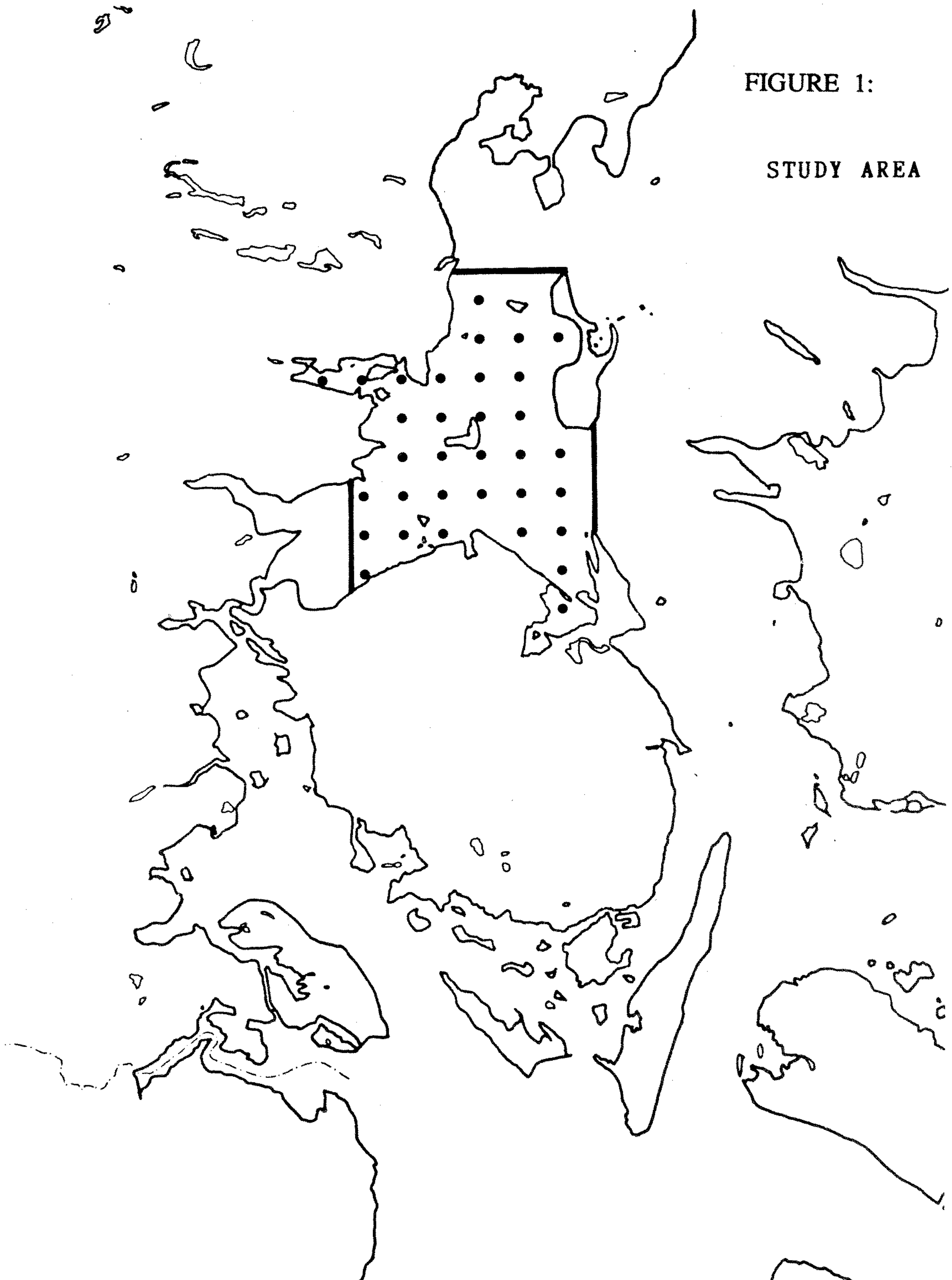


FIGURE 1:

STUDY AREA

FIGURE 2: SEASONAL ABUNDANCE

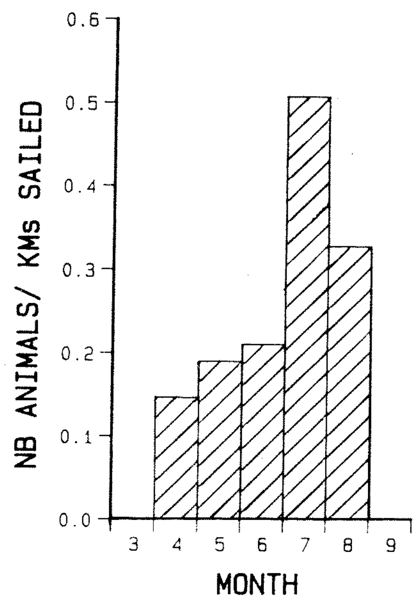


FIGURE 3: CALF OCCURRENCES

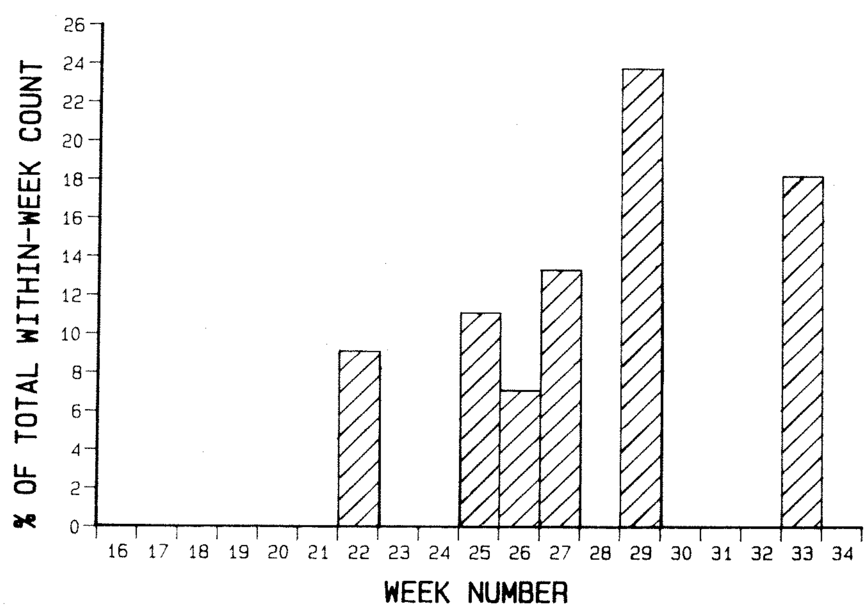


FIGURE 4: SIZE/AGE CLASS APPROACH TO THE RESEARCH VESSEL

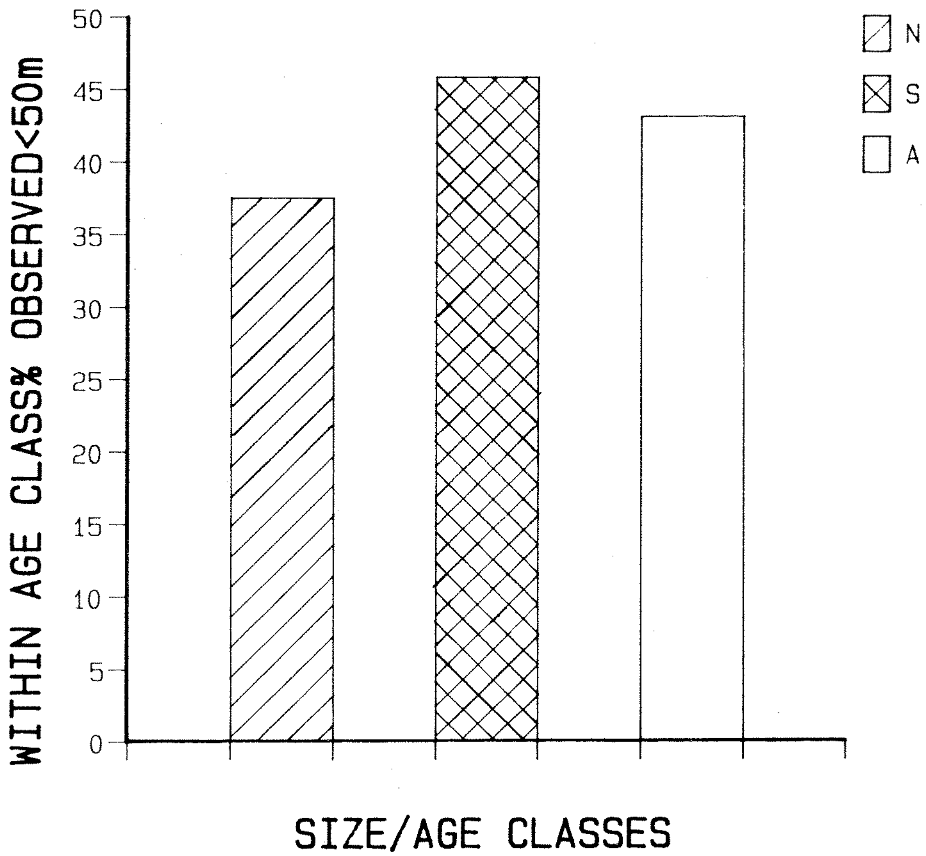


Table 1 Depth distribution of harbour porpoise

Depth	Numbers of animals	(percentage)
0 - 10 m	61	33.5%
10 - 20 m	100	55.0%
> 20 m	21	11.5%

Table 2 Associated birds

		number of sightings and frequency	
1	Sandwich tern (Sterna sandvicensis)	14	35.9% (14/39)
2	Gr. Black-backed gull (Larus marinus)	10	25.6% (10/39)
3	Common gull (Larus canus)	7	17.9% (7/39)
4	Hering gull (Larus argentatus)	5	12.8% (5/39)
5	Lesser Black-backed gull (Larus fuscus)	4	10.3% (4/39)
6	Artic tern (Sterna paradicea)	3	7.7% (3/39)
7	Glaucous gull (Larus hyperboreus)	1	2.6% (1/39)
8	Black-headed gull (Larus ridibundus)	1	2.6% (1/39)
9	Common tern (Sterna hirundo)	1	2.6% (1/39)
10	Eider (Somateria mollissima)	1	2.6% (1/39)
11	Cormorant (Phalacrocorax carbo)	1	2.6% (1/39)
	1 & 2 together	3	7.7%
	1 & 4 together	1	2.6%
	1 & & together	1	2.6%
	2 & 3 together	1	2.6%
	3 & 4 together	1	2.6%
	8 &10 together	1	2.6%
	1,2,3,4 & 6 together	1	2.6%

BY-CATCH AND HEALTH STATUS OF HARBOUR PORPOISES FROM DANISH WATERS

B. Clausen and S. Andersen

Statens Veterinære Serumlaboratorium,
8200 Aarhus N, Denmark

149 harbour porpoises *Phocoena phocoena*, were collected during the period August 1980 to February 1981. The animals were taken as by-catch by Danish fishermen and were sent for investigation from Danish harbours where they were landed.

The purpose of this survey was to determine the size of the by-catch in relation to the various types of fishery. The main tasks were to evaluate the state of health of the population including investigations on the parasite load, the reproductive status of the animals, and the tissue contents of mercury, cadmium, PCBs and DDT. The material was compared where possible with similar material collected between 1941 and 1943.

The investigation indicates that life history parameters of the population has changed since 1941-1943. The large, older animals are now only seldom found. Females are smaller now, and thus younger when they become pregnant. These results could be due to large by-catches of harbour porpoises.

The reproductive capacity of porpoises appears to be high. Those caught in 1980-1981 were no more heavily parasitised than those from 1941-1943. It is suggested, however, that parasite loads in harbour porpoises from Danish waters should be compared with loads from other European porpoise populations.

The levels of cadmium and mercury appear to be low whilst those of DDT and PCBs in the fat were also not particularly high.

Further studies should concentrate upon more accurately recording the porpoise by-catch, and upon possible ways to prevent it from occurring.

HARBOUR PORPOISES DEPOSITED IN SWEDISH MUSEUMS IN THE YEARS 1973 - 1986

Ingalill Lindstedt* and Magnus Lindstedt**

* Department of Ecological Zoology, University of Gothenburg, Box 250 59, 400 31 Gothenberg, Sweden

** Aschebergsgatan 38, 411 33 Gothenberg, Sweden

The harbour porpoise (*Phocoena phocoena* , L. 1758) was once a common species in Swedish waters but since the middle of the twentieth century, populations here have dramatically declined.

Swedish legislation states that the harbour porpoise becomes Crown property if killed or found dead. All such findings have to be reported to the police authorities who then arrange that the animals are transported to a public museum according to the regulations issued by the national Environment Protection Board. Animals taken as by-catch by professional fishermen can be retained by them. These regulations have been in force since 1973.

Standard biological data of the animals are recorded on arrival at the museum, together with information on where the animal was found.

We are presently compiling data on specimens which have arrived at Swedish museums since 1973, and present here some preliminary results. In the period 1973-1986, a total of 217 harbour porpoises were received by the museums. 59% of those animals were taken as by-catch in different kinds of fishing gear. There was an increase in the number of animals received over this period, from a mean of ten individuals per year between 1973 and 1979, to a mean of 21 individuals per year between 1980 and 1986. The distribution by year of death, of animals in different geographical areas, indicated an increased occurrence of harbour porpoises in coastal Swedish waters during the eighties. Porpoises were only occasionally found in the Baltic Sea in the years 1973 - 1983. Since 1984, however, between five and seven specimens per year have been found in the southern part of the Baltic Sea.

THE HARBOUR PORPOISE *Phocoena phocoena* IN THE NETHERLANDS: STRANDING RECORDS AND DECLINE

C. Smeenk

Rijksmuseum van Natuurlijke Historie,
Postbus 9517,
NL-2300 RA Leiden,
The Netherlands

Although, in the Netherlands, stranding records of cetaceans have been systematically collected since about 1915, the harbour porpoise *Phocoena phocoena*, was seriously neglected during the first half of this century. This species used to be so common, both at sea and washed up onto the beach, that nobody gave it much attention, and no account was kept of the numbers stranded per year.

In about 1930, however, regular field observations of harbour porpoises started in the western Wadden Sea and its inlet, between the northern tip of the mainland of Holland and the isle of Texel. These observations were discontinued during the war, but started again in 1945. The observer, J. Verwey, a keen field naturalist and zoologist, had the impression that the numbers of harbour porpoises in this area had decreased during or shortly after the war (Verwey, 1925). He therefore asked the organizer of the stranding record scheme, A.B. van Deinse, a biology teacher in Rotterdam, to pay more attention to the harbour porpoise. He thought it useful to try to compare the numbers counted at sea with those washed up on the shore. The result is that from 1951 we have the numbers of stranded harbour porpoises reported annually. Naturally, these figures are very incomplete, and the real numbers must have been much higher.

Van Deinse died in 1965. At the time nobody was ready to take over this private project, and thus we have virtually no records of stranded harbour porpoises from the years immediately after 1965. However, in 1970, the zoological museums of Leiden and Amsterdam started a new recording scheme, which is still operative.

Looking at the figures for the earlier period (Figs. 1 & 2), we notice a sudden decline in the annual numbers of harbour porpoises reported after 1962. This decline occurred despite the fact that the coverage of the coast had become better than during the early fifties. Moreover, it coincided with a sharp decline in the numbers of porpoises sighted in the western Wadden Sea, and elsewhere along the Dutch coast. During the early sixties, the species became quite rare in our coastal waters, and disappeared from places where it had previously been common. This simultaneous decline in numbers seen and numbers stranded, and the fact that no change had occurred in the recording scheme of stranded animals, have convinced us that the drop in porpoise strandings reported in the early sixties, does indeed reflect a decrease in the numbers of harbour porpoises living in Dutch coastal waters.

From 1970 onwards, we see a gradual increase in the average number of porpoise strandings reported annually (Fig. 2). However, this trend is deceptive, since in recent years our recording scheme has improved, so that our coverage of the coast is now much more complete than in the early seventies, let alone the fifties and sixties. There are three main reasons for this. In the first place, all Dutch beaches are being visited by an ever-increasing number of people throughout the year. Secondly, more and more people have become interested in marine mammals and are aware of the museums' activities and research. And, thirdly, the harbour porpoise became protected by law in 1973, and police officers and other coastal authorities have been instructed to report all stranded porpoises to Leiden or Amsterdam.

Therefore, the increase in reported strandings since 1970 probably only reflects an increase in observer effort, though this cannot be quantified in any reliable way. Sadly, it may not be taken as a sign that all is going to be well again with our harbour porpoises. Field observations close to our coast are still rare, despite an enormous increase in observer effort here as well. The only event that is both obvious and reliable is the sharp decline in strandings during the early sixties: this undoubtedly reflects a real population decline in our coastal waters. At the same time, however, we believe that the situation has now stabilized. Small numbers of porpoises still live near our coast. We receive a number of freshly dead animals which cannot have come from very far; we find several newly born young, and sometimes animals that have stranded alive. For further details on the Dutch stranding records, see Smeenk (1987).

Although comparable series of stranding data are available only from the British Isles, the number of animals stranded on the east coast of England has always been much smaller than on the Dutch coast, and trends are more difficult to detect. But everywhere around the southern North Sea, the harbour porpoise is now considered rare in coastal waters, or at least much less common than some decades ago. It is less clear whether a similar decline has also occurred further offshore, but the field observations collected by the British sightings scheme indicate a general decrease in porpoise numbers throughout the southern North Sea.

Much has been speculated about the possible causes of this decline, but little is really known. In coastal waters, certainly on the eastern side of the North Sea, the principal cause would seem to be pollution. The decline in Dutch waters occurred during the early sixties and, according to some reports, may have started already in the fifties. This is the time when the disastrous effects of pollution with persistent chemicals became evident, both in marine and terrestrial ecosystems. The Dutch population of the common seal *Phoca vitulina* , for example, seriously decreased during this period, and the main cause of this has been contamination with PCBs affecting the species' reproduction (Reijnders, 1980). However, little is known of the situation with respect to the harbour porpoise, and the influence of PCBs on its reproduction has not been studied at all.

But there may be more. Two other environmental factors in the southern North Sea have changed dramatically during the same period, both of which are likely to have had a negative influence on the harbour porpoise. Herring *Clupea harengus* stocks became depleted, mainly through overfishing, and fisheries in general increased tremendously, with the use of ever larger ships and nylon nets.

Herring is thought to have been an important prey species of the harbour porpoise in the North Sea. In the southern North Sea, herring supplies were nearly exhausted by the mid-sixties. Further north, this was the case by the end of the decade. Mortality of porpoises in fishing gear is also taking a heavy toll in some areas, and this must have a great impact on the populations involved.

On the other hand, overfishing of herring and mortality in nets can hardly have been the primary cause of the sudden decline of the harbour porpoise in Dutch coastal waters. These factors would first of all have operated further offshore, and their influence in coastal waters would not have become evident until some time after the early sixties. Nevertheless, we still do not know whether coastal and offshore porpoises belong to one and the same population, and pressures on the harbour porpoise in the more central parts of the southern North Sea may well be preventing a recolonisation of coastal areas. The interaction of all these maninduced negative factors seems impossible to disentangle.

It is frustrating that we still know so little about the ecology and behaviour of the harbour porpoise, the most numerous and most characteristic cetacean of the North Sea. It is a shame that those species which are considered commonplace seem to receive the attention they deserve only when they have become rare and when it seems too late for basic research in the critical areas. We do hope the harbour porpoise will one day regain its lost but rightful position in our coastal ecosystem. But to this end, it is necessary that our attitude towards the North Sea will drastically change, and that we will stop looking at her as a source of easy profit and as one of the largest rubbish dumps in Europe.

REFERENCES

Reijnders, P. J. H. 1980. On the causes of the decrease in the harbour seal (*Phoca vitulina*) population in the Dutch Wadden Sea. Thesis, Agricultural University, Wageningen, the Netherlands (collection of papers).

Smeenk, C. 1987. The harbour porpoise *Phocoena phocoena* (L., 1758) in the Netherlands: stranding records and decline. Lutra, 30: 77-90.

Verwey, J. 1975. The cetaceans *Phocoena phocoena* and *Tursiops truncatus* in the Marsdiep area (Dutch Waddensea) in the years 1931 - 1973. Netherlands Institute of Sea Research, Publikaties en Verslagen, (1975), 17a, b: 1-153.

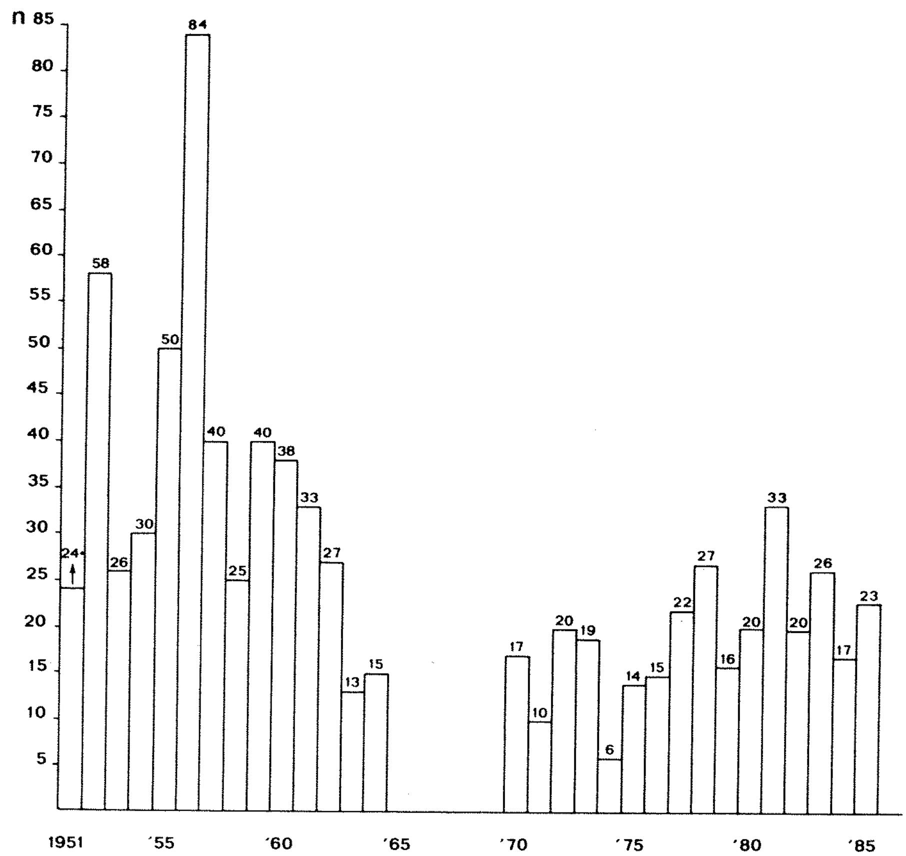


Fig. 1. The numbers of stranded harbour porpoises on the Dutch coast reported to A.B. van Deinse (1951-1964) and the zoological museums of Leiden and Amsterdam (1970-1985). No recording scheme was operative during 1965-1969. The numbers for 1984 and 1985 are preliminary.

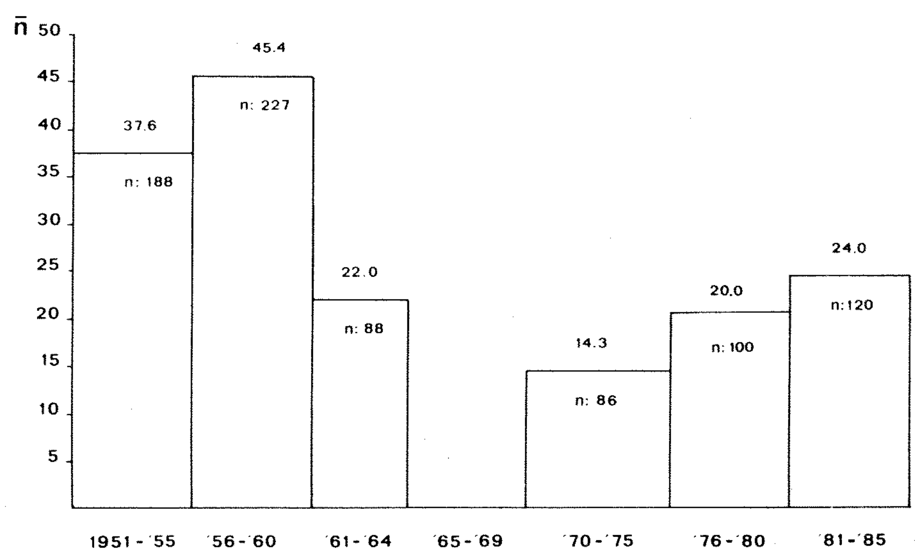


Fig. 2. Annual averages (ñ) of stranded harbour porpoises over periods of (4-)5(-6) years.

HARBOUR PORPOISE WORKING GROUP REPORT :

RECENT HARBOUR PORPOISE RESEARCH IN EUROPE

Carl Chr. Kinze (Chairman)

INTRODUCTION Much concern has been expressed over the serious decline of the harbour porpoise (*Phocoena phocoena*) populations in the Baltic and the North Sea (see, for example, Kröger, 1986a). As a consequence, a special meeting was arranged by the German World Wildlife Fund during 18 - 20 June 1986 at the Alfred-Wegener Institut in Bremerhaven, FRG (Kröger, 1986b) in order to coordinate research and conservation efforts. A follow-up meeting was held at the founding conference of the European Cetacean Society in Hirtshals, Denmark, in January 1987, and the Working Group on the Harbour Porpoise was officially set up (Broekema & Smeenk, 1987). During the year 1987, information on current and proposed projects has been collected by the chairman from questionnaires sent to working group members and cetologists at large. The results are reviewed below.

International A statement of concern was sent to the North Sea ministers' conference in November 1987, urging the involved countries to supply funding for harbour porpoise research in particular and cetacean research in general (Evans, Kinze, Kroger & Smeenk, 1987).

Belgium No special project is taking place. There are very few strandings and virtually no sightings. All accessible information is, however, recorded as accurately as possible. In December 1985, a special symposium on the harbour porpoise was organized by the Vlaamse Vereninging voor de Bestudering van de Zeegoogdieren. Contact person: G. Rappé (for addresses, see Appendix 1).

Denmark Ongoing projects: the bulk of information has been collected by the Danish Harbour Porpoise Project (Projekt Marsvin). Items covered are strandings/by-catches, sightings from ferry-boats, other types of vessels, and from special sighting cruises), and specific projects on stock identification, life history, and diet. In addition, the Danish Ornithological Society (DOF) has gathered information on the abundance of the harbour porpoise in the Danish part of the North Sea, the Skagerrak, and the Kattegat. For 1987, the Danish Harbour Porpoise Project has been jointly funded by the Danish Animal Welfare Society, WWF-Denmark, and the University of Copenhagen. The sighting cruises conducted by DOF were funded by the Ministry of the Environment. A review in Danish, treating all the aspects of the Danish project, has been published. Contact persons: Danish Harbour Porpoise Project - Carl Chr. Kinze; DOF-sightings - Sea Bird Group.

Planned projects: a joint project is scheduled for 1988 involving sightings, strandings/by-catches, etc. and will be conducted by researchers from Denmark, Norway, and Sweden. Furthermore, a number of special projects are proposed: stock identification by means of electrophoresis and DNA-techniques (Liselotte W. Andersen), pollutant levels (Bjarne Clausen & Birgitte H. Larsen), behavioural studies (C.C. Kinze). Special funding from Greenpeace-Denmark has made possible a project on porpoises in the Danish sector of the North Sea.

Eire Sightings records go to the UK Cetacean Group. A number of sites monitor porpoises on a regular basis, with effort quantified. No special project exists for strandings and by-catches although they may be reported to the National Museum in Dublin.. Contact persons: UK Cetacean Group - P.G.H. Evans; Strandings - C. O'Riordan.

Faroe Islands A pilot study was conducted in conjunction with the Natural History Museum in Tórshavn in August 1987. A collecting scheme has been initiated and some material collected. Contact persons: B. Clausen and B.H. Larsen.

Federal Republic of Germany Ongoing projects: a status report was given by Kröger (1986a), funded by WWF-Germany. Strandings are covered by several researchers and institutions at Kiel, Cuxhaven, and Bremerhaven. A special thesis on age determination has been written by Kremer (1987) giving important information on odontology in general and ecological considerations for the harbour porpoise in particular. This work is recommended as a standard for all European porpoise studies.

Planned projects: a one year pilot study is scheduled to start in 1988 covering strandings/by-catches, sightings, and the preparatory work for a longterm project. Funding will come from WWF-Germany. Contact person: Harald Benke.

France Strandings and sightings are few and are collected by the Musée Océanographique in La Rochelle. No funding is needed. Contact persons: Anne Collet and Raymond Duguy.

German Democratic Republic Strandings and sightings are recorded at the Meeresmuseum in Stralsund. Recently, the person in charge here published a monograph on the phocoenids with special emphasis on the harbour porpoise (Schulze, 1987). Contact person: Gerhard Schulze.

Greenland At present the only available information comes from catch statistics. No project is solely conducted on the harbour porpoise in this country. For July and August 1988, a pilot study on the life history and stock identification is planned. Funding has been given to this project by the Commission for Scientific Investigations in Greenland. Contact person: C.C. Kinze.

Netherlands Ongoing projects: strandings and some by-catches are administered by the Rijksmuseum van Natuurlijke Historie in Leiden. An aerial survey has provided new information on the harbour porpoise distribution in the Dutch sector of the southern North Sea. Pollutant levels have been screened by the University of Leiden and the Rijksinstituut voor Natuurbeheer. Two papers published in *Lutra* are of special interest: Baptist (1987) and Smeenk (1987). Funding has so far come from institution budgets and the Ministry of Transport and Waterworks. Contact persons: Strandings - Chris Smeenk; Sightings (aerial surveys) - Henk Baptist; Pollutant levels - Chris Smeenk (University of Leiden) and Peter Reijnders (Rijksinstituut voor Natuurbeheer).

Planned projects: the Rijksinstituut voor Natuurbeheer intends to conduct a project on pollutant concentrations in by-caught and stranded animals. Certain aspects of reproduction and incidental by-catch will be dealt with in an additional project. Contact person: K. Lankester. The funding situation is still unsettled.

Norway Ongoing projects: a sighting scheme has been in operation for about a year, but no special project on the harbour porpoise has been conducted so far. Contact person: Viggo Ree.

Planned projects: a joint-project will be conducted together with Sweden and Denmark in the Kattegat. Other areas are also under consideration. Contact person: Arne Bjørge.

Portugal No present work on the harbour porpoise. Data have recently been compiled by Reiner (1985). According to this author, a decline has also taken place in Portuguese waters. Contact persons: F. Reiner and A.M.A.P. Teixeira.

Spain No work on the harbour porpoise is being conducted. Stranding and sighting networks collect all information on the species as accurately as possible. Contact persons: G. Garcia-Castrillo Riesgo (Cantabria), Carlos Nores (Galicia).

Sweden Ongoing projects: based on Kröger's 1986 report, the framework for a Swedish Harbour Porpoise project was set up in 1987, covering strandings/by-catches, sightings, and specific aspects such as reproduction, life history and diet. Funding was provided by WWF-Sweden and the National Swedish Environmental Protection Board. Contact person: Bernt Dybern.

Planned projects: a joint-project in the Kattegat with Denmark and Norway. Funding is provided by a special WWF-project ("Living Kattegat").

United Kingdom Ongoing projects: strandings are covered by the British Museum (Natural History). Sightings (from land and at sea from oil rigs, merchant shipping, sailing vessels and dedicated cruises) are dealt with by the UK Mammal Society's Cetacean Group which has a network of around 700 observers providing opportunistic records, whilst a small number of these operate on a systematic & regular basis, monitoring seasonal and annual changes in numbers. Coverage is most intensive in coastal waters but extends to offshore regions in the NE Atlantic and North Sea. The results are reviewed in Evans *et al.*, (1986). The Cambridge-based International Dolphin Watch, collecting records worldwide, mainly from mariners, also covers European waters. By-catches have been briefly reviewed by Simon Northridge in ECS Newsletter No. 2, and a more detailed review has been produced by him for Wildlife Link (UK). In September 1987, a special boat survey was carried out in the southern North Sea. An historical review by the Cetacean Group of status changes has been funded by Greenpeace-UK whilst the sighting scheme has been funded by Nature Conservancy Council and Greenpeace-UK. Contact persons: Martin Sheldrick (strandings), Peter Evans (sightings - Cetacean Group, & dedicated cruises), Denis McBrearty (sightings - International Dolphin Watch), Simon Northridge (by-catches and boat survey).

Planned projects: a special project is planned in the Shetland Isles to run from summer 1988, but further funding is still urgently needed (P.G.H. Evans, Cetacean Group). The Sea Mammal Research Unit in Cambridge plans to try radio-tagging by-caught animals in northeast England.

STATE OF FUNDING None of the countries involved can boast a satisfactory funding situation. In the short term, things may be considered acceptable in the Scandinavian countries. Matters are also improving in the Federal Republic of Germany. In the Netherlands, lack of funding now allows only small scale projects to take place, aerial surveys are in danger of ceasing, and in the future the stranding scheme may also be in financial difficulties. For the United Kingdom, the stranding scheme regretfully has lost the institutional support it received in the past and material is no longer collected systematically. There is urgent need for funding and encouragement here. Private funds (through organizations such as WWF and Greenpeace) cannot support all these activities. It seems very important to lobby European governments and international bodies to give funds for longterm studies.

NEW INFORMATION BADLY NEEDED The Working Group would very much welcome researchers from Iceland and all Black Sea countries from where no recent information is available on the status of the harbour porpoise.

SUMMARY OF WGHP MEETING, TRÓIA The Working Group met informally and reviewed the current harbour porpoise situation in Europe and the state of funding. Recommendations for standards in the collection of material were given, and special workshops on reproduction, age determination, parasites, etc. are planned for a future meeting. Detailed information on how to collect material for various studies, are to be published in forthcoming newsletters. Studies on pollutants were a matter of some discussion, but since no specialists were present, no useful conclusions could be reached.

REFERENCES

Baptist, H.J.M. 1987. Waarnemingen van zeezoogdieren in de Nederlandse sector van de Nordzee. Lutra, 30: 93-104.

Broekema, J.W. and Smeenk, C. (editors) 1987. The European Cetacean Society Report of the 1987 meeting Hirtshals, Denmark. ECS Newsletter, 1: 1-77.

Evans, P.G.H., Harding, S., Tyler, G. and Hall, S. 1986. Analysis of cetacean sightings in the British Isles, 1958 - 1985. Report to Nature Conservancy Council, Peterborough, England. 71 pp.

Evans, P.G.H., Kinze, C.C., Kröger, R.H.H. and Smeenk, C. 1987. Statement of Concern. The Decline of the Harbour Porpoise in the North Sea. Unpubl. Report to North Sea Ministers. 5 pp.

Kinze, C.C. 1987. Hvad ved vi om marsvinet? Økologisk status over Danmarks truede ynglehval. Kaskelot, 75: 14-23.

Kremer, H. 1987. Untersuchungen zur Altersbestimmung am Schweinswal (*Phocoena phocoena*, Linné, 1758). MSc. thesis, University of Kiel. 232 pp.

Kröger, R.H.H. 1986a. The decrease of harbour porpoise populations in the Baltic and North Sea. Final report to WWF-Sweden and WWF-Germay, Hamburg.

Kröger, R.H.H. 1986b. Report of the international meeting: the harbour porpoise in the Baltic and North Sea. Alfred Wegener Institute for Polar and Marine Research, Bremerhaven.

Reiner, F. 1985. Mammifères de l'Atlantique Portugais et le Phoque Moine de Madère. Doctoral thesis, University of Marseille. 244 pp.

Schulze, G. 1987. *Die Schweinswale*. Wittenberg-Lutherstadt, Neue Brehm-Bücherei no. 583: 1-167.

Smeenk, C. 1987. The Harbour Porpoise, *Phocoena phocoena* (L., 1758) in the Netherlands: stranding records and decline. Lutra, 30: 77-90.

APPENDIX 1: List of addresses

Liselotte W. Andersen, Silkeborgvej 112, 2tv, DK-8000 Århus, Denmark.

Harald Benke, Zool. Institut, poppelsdorfer Schloss, D-5300 Bonn 1, B.R. Deutschland.

Bjarne Clausen, Statens Veterinære Serumlab., Hangøvej 2, DK-8200 Århus N, Denmark.

DOF/Sea Bird Group, Vesterbrogade 140, DK-1620 Copenhagen V, Denmark.

Peter G.H. Evans, Cetacean Group, Zoology Dept., University of Oxford, South Parks Road, Oxford 0X1 3PS, UK.

Carl Chr. Kinze, Zoological Museum, Universitetsparken 15, DK-2100 Copenhagen Ø, Denmark.

Kees Lankester, University of Leiden, Institute of Theoretical Biology, Groenhovenstraat 5, NL-2311 BT Leiden, Nederland.

Henk J.M. Baptist, Brugweg 6, NL-4756 SM Kruisland, Nederland.

Arne Bjørge, Biologisk Institutt, Postboks 1064 Blindern, N-0316 Oslo 3, Norway.

Anne Collet/Raymond Duguy, Musée Océanographique, Port de Minimes, F-17000 La Rochelle, France.

Bernt Dybern, Fishery Board, Institute of Marine Research, P.O. Box 4, S-45300 Lysekil, Sweden.

G. Garcia-Castrillo Riesgo, Museo maritimo del Cantabrico, San Martin de Abajo, E-39004 Santander, Spain.

Hartwig Kremer, Feldstrasse 43, D-2300 Kiel 1, B.R. Deutschland.

Birgitte Heje Larsen, Nyringen 70, DK-8240 Risskov, Denmark.

Denis A. McBrearty, School of Anatomy, University of Cambridge, Downing Street, Cambridge, UK.

Simon Northridge, Centre for Environmental Technology, Imperial College, 8 Prince's Gardens, London SW7 1NA, UK.

Guido Rappé, Kapelstraat 3, B-9890 Ursel, Belgium.

Francisco Reiner, Rua das Nogueiras, P-2750 Torro-Cascais, Portugal.

Gerhard Schulze, Meeresmuseum Stralsund, Katharinenberg 14a, DDR-2300 Stralsund, German Democratic Republic.

Chris Smeenk, Rijksmuseum van Natuurlijke Historie, Postbus 9517, NL-2300 Leiden, Nederland.

Carlos Nores Queseda, Universidad de Oviedo, Departamento de Biología de Organismos y Sistemas, E-33071 Oviedo, Spain.

Colm O'Riordan, Natural History Section, National Museum of Ireland, Dublin, Eire.

Viggo Ree, Kasa, Maridalen, N-0890 Oslo 8, Norway.

Peter J.H. Reijnders, Rijksinstituut voor Natuurbeheer, Postbus 59, NL-1790 AB Den Burg, Nederland.

Martin Sheldrick, Marine Mammals, British Museum (Natural History), Cromwell Road, London SW7 5BD, UK.

Antonio M.A.P. Teixeira, Serviço Nacional de Parques Reservas e Conservação da Natureza, Rua Filipe Folque, 46-5º, 1000 Lisboa, Portugal.

STRANDINGS WORKING GROUP REPORT

Luca Magnaghi & Michela Podestà

(Chairpersons)

During the session reviewing activities of the Working Groups, on 5 February 1988, it was announced that Christina Lockyer regretfully had to resign chairmanship of the Strandings Working Group due to her impending departure to the United States for at least one year. We feel highly honoured to have been chosen to substitute her in this difficult job and we hope we will be able to start a profitable collaboration with all the European countries involved in the study of cetacean strandings.

On the 6th of February, we met informally with all the members interested in the subject, to organize the future work. The first fact which emerged during the meeting has been the heterogeneity of the working methods in the different countries; in some of them there are national networks, while in others the collection of data is organized by different institutions. Furthermore, data collection and management are carried out in different ways. Consequently, the necessity for a precise review of the situation for each country was highlighted. This should help to make the collection of information from strandings as uniform as possible. In this respect, we decided to ask one person in each country to take responsibility, and act as its contact person, dealing with any problems that arise relating to its national strandings scheme(s), and who would try to coordinate researchers working on cetacean strandings in that country. Those who are interested in this Working Group can contact their national coordinator. The list of national coordinators is included at the end of this note.

During the informal meeting, we decided to prepare a detailed questionnaire, which will be sent to all national contact persons so that they can report the situation with respect to stranding studies in their own country. When we have received this information from all the countries, we shall collate the data and send them to all the national coordinators. We will then be ready to start our data management, as Christina Lockyer had earlier suggested.

List of contact addresses

Belgium Guido Rappé, Kapelstraat 3, B-9890 Ursel.

Denmark Carl Chr. Kinze, Zoologisk Museum, Universitetsparken 15, DK-2100 Copenhagen Ø.

France Anne Collet & Raymond Duguy, Musée Océanographique, Port des Minimes, F-17000 La Rochelle.

Eire Colm O'Riordan, National Museum of Ireland, Dublin 2.

Italy Michela Podestà & Luca Magnaghi, Museo Civico di Storia Naturale, Corso Venezia 55, I-20121 Milano.

Portugal Marina Sequeira, Servicio Nacional de Parques, Reservas e Conservção de Natureza, Rua Filipe Folque 46-5º, P-1000 Lisboa.

Spain (Atlantic) Carlos Nores, Departamento de Biología de Organismos y Sistemas, Facultad de Biología, Universidad de Oviedo, 33071 Oviedo.

Spain (Canaries) Robert Vonk, S.E.M.M.A.C., E-38200 Tenerife.

Spain (Mediterranean) Alex Aguilar, Department of Animal Biology, Facultad de Biología, Universidad de Barcelona, Diagonal 645, E-08028 Barcelona.

Sweden S. Lundberg, Natural History Museum, P.O. Box 50007, S-10405 Stockholm.

The Netherlands Chris Smeenk, Rijksmuseum van Natuurlijke Historie, Postbox 9517, NL-2300 RA Leiden.

United Kingdom Martin Sheldrick, Department of Zoology, British Museum (Natural History), Cromwell Road, UK-London SW7 5BD.

West Germany Roland Lick, Institut fur Hanstierkunde, Universitat Kiel, Biologiezentrum, Am Botanischen Garten 9, D-2300 Kiel.

BY-CATCH WORKING GROUP

Simon Northridge

(Chairman)

An informal meeting of the By-catch Working Group was held on the 6th of February, during which we attempted to gather together information about by-catches in different parts of Europe, and to determine any current schemes in operation monitoring such catches. A summary of what was heard is presented below, together with some notes on the discussions

COUNTRY BY COUNTRY SUMMARY

Iceland Nobody from Iceland was present at the meeting, but we heard that occasional large by-catches had been reported and that porpoises had also been taken deliberately in the past.

Norway There was nobody present at the meeting from Norway, nor any information on by-catches by Norwegian boats beyond the fact that they do exiist. There was some suggestion that Norway may have taken a large number of harbour porpoises in 1987, but no details were available.

Sweden We heard that Magnus Lindstedt was monitoring by-catches in Sweden; Magnus and Ingalill Lindstedt had also presented a poster at the meeting, which suggested that a high proportion of harbour porpoises deposited with Swedish museums between 1973 and 1986, had come from fishing operations.

Denmark Bjarne Clausen had collected 149 harbour porpoises from fishermen in 1980 with no difficulty, including seventy from one port in November of that year alone. High catch rates are also suspected in the wreck net fishery operating from West Zeeland. Carl Kinze has been operating a collection scheme for harbour porpoises caught in fishing gear from two ports in Zeeland, and has had over 70 animals returned to port in 1987.

Faroes Bjarne Clausen reported that there dod not appear to be any by-catch in the gill-net fishery in the Faroe Islands since the nets are set too deep. However, there was some suggestion that small cetaceans of various species including killer whales *Orcinus orca*, may sometimes be included in the drive fishery, or occasionally be shot for food and bait.. Catches of harbour porpoises may number about 20-40 per year, and about 180 dolphins were taken in 1987. Morten Lindhardt also reported that at least one boat had a harpoon mounted on deck, and that some bottlenose whales *Hyperoodon ampullatus* may be killed.

Greenland The drift net fishery for salmon was thought to still take some hundreds of porpoises per year, and directed kills also continue.

Finland, USSR, Poland, German Dem. Rep. No information.

German Fed. Rep. No by-catch reporting scheme exists as such, but Ronald Kröger knew of several (13?) porpoises which had been collected by a doctor from a gill net fishery in the Baltic. More details are being sought.

United Kingdom Simon Northridge has recently completed an initial survey to try to determine how extensive by-catches are in Britain. They appear to occur in almost all types of fishery, but in most they are very rare. Gill net fisheries probably take greatest numbers of cetaceans, generally harbour porpoises in inshore gill net fisheries, and dolphins, probably mainly common dolphins, in gill net fisheries operating further offshore off the south coast. Some dolphins and porpoises may also be taken in mid-water gear. By-catches reported to Peter Evans by the Cetacean Group's observer network also include long-finned pilot whales *Globicephala melaena* off southwest England, white-beaked dolphins *Lagenorhynchus albirostris* (eastern England), and bottle-nosed dolphins *Tursiops truncatus* (southwest England). It is hoped to start shortly a collection scheme similar to the one Carl KInze operates in Denmark.

Eire Greenpeace have been monitoring by-catches when they are reported in the press and have a record of 17 dolphins taken in one net by an Irish boat. Peter Evans and Simon Northridge have both received reports of dolphins (white-beaked or bottle-nosed dolphins where identified) being caught in the salmon drift net fishery.

Netherlands There is no official reporting scheme in the Netherlands, but some of the strandings records of van Deinse before 1965 and after 1951 included by-caught animals. Dutch midwater trawlers are known to catch some dolphins, and there is also a gill net fishery which may catch small cetaceans. No figures are available yet, but there are some plans to try to start collecting more information.

Belgium Claude Joiris reported that according to the fisheries department there were officially no by-catches by Belgian boats. The fisheries are largely demersal trawl fisheries which may make catches less likely than in other types of fishery. There are also plans in Belgium to try to start collecting more information.

France Anne Collet did a preliminary study a few years ago and found that catches may total a few thousand a year, including several hundred in the tuna purse seine fishery. Dolphins are also still taken illegally for food on some fishing boats. Genevieve Desportes reported that the tuna purse seine fleet operates mainly from the Atlantic ports of France, with the largest boats fishing in the Indian Ocean and tropical Atlantic, based at Concarneau in Brittany. These boats had tried setting their nets on dolphins in the fashion of the American tuna purse seiners of the tropical Pacific, but had little success with the method in the Atlantic. However, they had found that tuna sometimes school under baleen whales in the Indian Ocean, and would set nets around baleen whales to try to catch a tuna school; baleen whales normally escape from the net over the float line or break through the net, leaving a hole to be repaired, which did not seem to bother the fishermen unduly. There is no reporting scheme as such in France at present, although Anne Collet obtains some records opportunistically.

Spain Like France, Spain has a large fleet of tuna purse seiners, operating in tropical waters. One estimate by ICCAT (the International Convention for the Conservation of Atlantic Tuna) had put the catch by boats operating off West Africa at about 3,000 dolphins per year, with Spain taking up to half of these. The fleet is still operating but now largely in the Indian Ocean with the French fleet, where catch rates are unknown. There is also a Spanish midwater trawl fleet operating off Namibia. Midwater trawling is known to catch small cetaceans elsewhere, but Alex Aguilar reported, is illegal in Spanish waters. There is some inshore gill net fishing in Spain, which evidently takes some small cetaceans, at least in northern Spain. Small purse seiners also operate in the Spanish

Mediterranean, and are thought to take some striped dolphins *Stenella coeruleoalba*, and common dolphins, and may on occasion sell them illegally as bait to the long-line fishery there. Long-liners themselves may also take dolphins for bait. In the Balearic Islands there is a bottle-nosed dolphin population which had been persecuted by gill net fishermen.

Canaries Greenpeace has some reports of small cetacean catches in the Canaries. Robert Vonk reports that there is a tuna drive fishery in the Canaries which sometimes catches small cetaceans but usually lets them go. Canary Islanders set drift nets off Spanish Sahara. Fishermen report that dolphins are usually well treated (i.e. there is little deliberate killing). Dynamite is used to catch fish in remote areas, and Robert Vonk suggests that this may be one cause of the strandings of Cuvier's whales *Ziphius cavirostris*, which he reported in his presentation at the conference.

Portugal There is no official reporting scheme, but small cetaceans are caught in some fisheries, sometimes deliberately for food. The Portuguese fishing fleet is enormous, and is apparently little documented.

Azores There is little by-catch reported in the Azores, but some intentional capture of small cetaceans occurs for bait or food. Jonathan Gordon reported one long-liner had taken four dolphins in as many days in summer 1987, and Chris Smeenk reported that his institute had received a Risso's dolphin *Grampus griseus*, which had been taken as a by-catch and bought in a fishmarket. Although some cetaceans are protected by law in the Azores, enforcement is nearly impossible because of problems in identification.

Italy There is a purse seine fishery of about 30 boats in Italy, operating in the Mediterranean. Boats are from Sicily and northern Italy. There had been observers on board one of the boats from the northern fleet for a period of four years, during which time only one by-catch incident had been recorded (Luca Magnaghi and Michela Podestà), but Luca Magnaghi reported that there was some suspicion that the Sicilian boats took dolphins illegally to eat. There is also an extensive (legal and illegal) drift net fishery for sharks and other large fish in southern Itailian waters, with nets of 20 km and more set at a time. This fishery may also take small cetaceans, but information is lacking at present. The fishery may also contribute to a ghost net problem, which can be a hazard to navigation in some areas. There may be some illegal harpooning of small cetaceans in the eastern Mediterranean.

Yugoslavia, Albania No information.

Greece We heard that there may be some dynamite fishing in Greece, which could affect cetaceans. Allan Thornton reported that in eastern regions dolphins at least were well respected, and therefore unlikely to be hunted deliberately. Boris Adloff reported that a fisherman in the Pelloponnese had told him about harpooning dolphins. Gill nets are used extensively, and are known to catch some monk seals *Monachus monachus*.

Turkey Allan Thornton reported that a recent investigation of the Turkish Black Sea ports had found no evidence for any continued dolphin or porpoise catches after the ban on this fishery, nor any evidence of by-catches in other fisheries.

DISCUSSION

The meeting heard that it is often difficult to separate by-catches from deliberate catches, especially in southern Europe, and that fishermen in many areas still deliberately kill cetaceans for food or bait. It was therefore decided that the Working Group should extend its interest to cover any information on deliberate kills which became available.

It was agreed that the type of fishing gear being used in a country greatly influenced the frequency at which cetaceans were caught. It was suggested that it would be useful to try to gather information on a fishery by fishery basis, across national fleets, wherever this was possible. The gill net fishery in the North Sea, for example, is operated by three or four nations, and it would make sense to consider by-catches by such a fishery collectively.

It was also found that technical terms for gear types were often difficult to translate, so that misunderstandings were easily encountered in discussing by-catch problems throughout Europe.

Although the issue of non-European fleets operating in European waters was raised, it was felt that there were probably very few, if any, non-European boats still operating in the area. North African vessels in the Mediterranean were one possible exception.

The collection of information on by-catches was reported to be difficult in many countries because of the fact that any capture of cetaceans was illegal, so that the reporting of incidents by fishermen was effectively discouraged.

A questionnaire was proposed which would seek to find out more about the usage and extent of different fisheries in Europe, and cetacean capture in these fisheries. It would also include a glossary of fishing gear types, and a request for information on the legal situation with regard to the capture of cetaceans in different European countries.

The aims of the Working Group are to provide a forum for information on cetacean captures, and to facilitate co-operative research on incidental capture of cetaceans. Anyone wishing to contribute is encouraged to write to Simon Northridge at the Centre for Environmental Technology, Imperial College, 8 Prince's Gardens, London SW7 1NA, UK.

EUROPEAN CETACEAN SOCIETY

The **European Cetacean Society** was formed in January 1987 at a meeting of eighty cetologists from thirteen European countries. A need was felt for a society that brought together people from European countries studying cetaceans in the wild, allowing collaborative projects with international funding.

AIMS (1) to promote and coordinate the scientific study and conservation of cetaceans;

(2) to gather and disseminate information to members of the society and the general public.

ACTIVITIES The society has set up six international Working Groups concerned with the following subject areas: sightings schemes; strandings schemes; by-catches of cetaceans in fishing gear; computer data bases that are compatible between countries; the harbour porpoise (a species in apparent decline in Europe, and presently causing serious concern); and a regional agreement for the protection of small cetaceans in Europe (in cooperation with the United Nations Environment Program/Convention on the Conservation of Migratory Species of Wild Animals Secretariat in Bonn, Federal Republic of Germany). The names and addresses of chairpersons for all the Working Groups are given at the end of this notice.

Contact persons have been set up in each European member country to facilitate the dissemination of ECS material to members, where appropriate carrying out translations into the language of that country. Their names and addresses are also given at the end of this note.

A newsletter is produced three times a year for members, reporting current research in Europe, recent publications and abstracts, reports of working groups, conservation issues, legislation and regional agreements, local news, and cetacean news from other parts of the world.

There is an annual conference with talks and discussion sessions on various projects, and at which the annual general meeting is held. The results are published as annual proceedings. The contents of the 1987 conference, held at Troia, Portugal, form this year's proceedings.

Membership is open to *anyone* with an interest in cetaceans. The annual subscription is **30 HFl** for members over 25 years, or **15 HFl** for those who are 25 years of age or younger, full-time students or unwaged.

Payment should be made in Dutch Guilders (HFl) either in the form of cash or by any type of cheque made payable to *The European Cetacean Society* (Bank Account no. 49.65.83.646, Amro Bank, Leiden, the Netherlands). Subscriptions should be sent to the Treasurer, **Dr. C. Smeenk, c/o Rijksmuseum van Natuurlijke Historie, P.O. Box 9517, 2300 RA Leiden, the Netherlands.** Payment in excess of the membership fee will be gratefully received as a donation.

Officers & Members of Council

Chairman Carl Kinze

Secretary Peter Evans

Treasurer Chris Smeenk

Council Alex Aguilar

Anne Collet

Genevieve Desportes

Ronald Kröger

Michela Podestà

Working Group Chairpersons

Strandings Michela Podestà and Luca Magnaghi, Museo Civico di Storia Naturale, Corso Venezia 55, 20121 Milano, Italy.

Sightings Peter Evans, Cetacean Group, c/o Zoology Dept., University of Oxford, South Parks Road, Oxford 0X1 3PS, UK.

By-catches Simon Northridge, Centre for Environmental Technology, Imperial College, 8 Prince's Gardens, London SW7 1NA, UK.

Computers Jan Willem Broekema, Wergrope ZeeZoogdieren, Klipperwerf 16, 2317 DZ Leiden, the Netherlands.

Harbour Porpoise Carl Kinze, Zoologisk Museum, Universitetsparken 15, 2100 Copenhagen Ø, Denmark.

UNEP/CMS Agreement Kees Lankester, Institute of Theoretical Biology, University of Leiden, Groenhovenstraat 5, 2311 BT Leiden, the Netherlands.

National Contact Persons

Belgium Anne-Catherine Lescrauwaet, Nachtegaalweg 24, B-8458 Oostduinkerke.

Denmark Carl Chr. Kinze, Zoologisk Museum, Universitetsparken 15, DK-2100 Copenhagen Ø.

Faroe Islands Genevieve Desportes, Náttúrugripasavn, FR-100 Tórshavn.

Federal Republic of Germany Ronald Kröger, Max-Planck-Institut für biologische Kybernetik, Spemannstrasse 38, 7400 Tübingen.

France Anne Collet, Musée Océanographique, Port des Minimes, 17000 La Rochelle.

German Democratic Republic Gerhard Schulze, Meeresmuseum Stralsund, Museum fur Meereskunde und Fischerei der DDR, Katharinenberg 14a, 2300 Stralsund.

Italy Michela Podestà, Museo Civico di Storia Naturale, Corso Venezia 55, 20121 Milano.

Netherlands Chris Smeenk, Rijksmuseum van Natuurlijke Historie, Postbus 9517, 2300 RA Leiden.

Norway Arne Björge, The Ministry of Environment, Myntgaten 2, Oslo 1.

Portugal Antonio Teixeira, Serviço Nacional de Parques, Reservas e Conservação da Natureza, Rua Filipe Folque, 46-5º, 1000 Lisboa.

Spain Alex Aguilar, Catedra de Zoologia (Vertebrados), Facultad de Biologia, Universidad de Barcelona, Diagonal 645, 08071 Barcelona.

Sweden Bernt Dybern, Institute of Marine Research, Box 4, 45300 Lysekil.

Turkey B. Mursaloglu, Ankara University, Fen Fakültesi, TR-06100, Ankara.

United Kingdom Peter G.H. Evans, Cetacean Group, c/o Zoology Department, South Parks Road, Oxford 0X1 3PS.