

**UK PROGRESS REPORT ON CETACEAN RESEARCH, APRIL 2003 TO MAY 2004 WITH
STATISTICAL DATA FOR THE CALENDAR YEAR 2003**

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1. Species and stocks studied

Common name	Scientific name	Area/stock(s)	Items referred to
Harbour porpoise	<i>Phocoena phocoena</i>	UK – NE Scotland, W. Scotland;	2.1.1, 2.1.2, 4.2, 4.4, 5, 7.1, 9
Common Bottlenose dolphin	<i>Tursiops truncatus</i>	UK- NE Scotland; W Scotland, USA-Florida; Croatia; Azores; Saint Helena; Portugal	2.1.1, 2.1.2, 2.2, 3.1.1, 3.2, 4.1, 4.4, 5, 9
Striped dolphins	<i>Stenella coeruleoalba</i>	UK	4.3, 5
Shortbeaked Common dolphin	<i>Delphinus delphis</i>	UK	2.1.1, 2.2, 5, 7.1
Atlantic white-sided dolphin	<i>Lagenorhynchus acutus</i>	UK	4.3
White-beaked dolphin	<i>Lagenorhynchus albirostris</i>	UK	4.3
Sowerby's beaked whale	<i>Mesoplodon bidens</i>	UK	4.3
Pan-tropical spotted dolphins	<i>Stenella attenuata</i>	St Helena & Ascension Island	2.1.1
Rough-toothed dolphins	<i>Steno bredanensis</i>	St Helena & Ascension Island	2.1.1
Mesoplodon spp.	<i>Mesoplodon spp.</i>	Sea of Abaco, Bahamas	3.1.1
Fin whales	<i>Balaenoptera physalus</i>	Southern Ocean	2.2
Humpback whales	<i>Megaptera novaeangliae</i>	Southern Ocean, NW Atlantic, Gulf of Maine	2.2, 3.1.1, 3.2,
Peale's dolphins	<i>Lagenorhynchus australis</i>	Chile	2.1.1, 3.1.1
Chilean dolphins	<i>Cephalorhynchus eutropia</i>	Chile	2.1.1, 3.1.1
Killer whales	<i>Orcinus orca</i>	Western Scotland, NE Pacific	3.1.1, 3.2,
Minke whale	<i>Balaenoptera acutorostrata</i>	Western Scotland, Southern Ocean	2.1.1, 2.2, 3.1.1,
North Atlantic Right whales	<i>Eubalaena glacialis</i>	NW Atlantic	2.2
Northern Bottlenose whales	<i>Hyperoodon ampullatus</i>	Eastern Canada	5
Sperm whales	<i>Physeter macrocephalus</i>	Mediterranean, UK	2.1.1, 4.3, 9
Boto	<i>Inia geoffrensis</i>	Brazilian Amazon	2.1.1, 3.1.2
Indo-Pacific humpback dolphin	<i>Sousa chinensis</i>	East Malaysia	9
Irrawaddy	<i>Orcaella brevirostris</i>	East Malaysia	9
Tucuxi	<i>Sotalia fluviatilis</i>	Brazilian Amazon	2.1.1, 3.1.2

2. Sightings data

2.1 Field work

2.1.1 SYSTEMATIC

UAZD is carrying out small-scale systematic boat surveys and coastal surveys for bottlenose dolphins in and around Aberdeen, NE Scotland (contact: Sarah Canning: s.canning@abdn.ac.uk).

UAZD (Lighthouse Field Station) continued to conduct boat-based photo-ID surveys in Northeast Scotland for bottlenose dolphins. They also conduct land-based visual studies of fine-scale behaviour and distribution of *Tursiops* in core areas within the inner Moray Firth.

HWDT is engaged in a 3-year programme of standardised surveys in western Scotland between the Small Isles and the Kintyre peninsula. Standardised surveys of western Scotland started in 2002. The HWDT research vessel undertakes monthly 10 day cruises from March through to October throughout the area. Standard line transect methods are employed as well as audio band and high frequency porpoise acoustic surveys

HWDT is conducting dedicated land-based surveys from the Ardnamurchan peninsula (W. Scotland) to investigate, in particular, minke whale habitat use and behaviour with respect to boat traffic. Preliminary studies showed changes in habitat use through the summer and autumn as well as some evidence of boat traffic affecting minke whale behaviour. This work is ongoing for 2003 to 2004.

HWDT continues to conduct boat-based photo-ID and land-based sightings surveys of various bottlenose dolphin groups occurring in Western Scotland. This is ongoing for 2004.

CRRU conducts dedicated surveys during the summer between Lossiemouth and Fraserburgh on the southern side of the Moray Firth, Northeast Scotland, using both visual and acoustic methods. Harbour porpoises, bottlenose dolphins and minke whales are the most frequently sighted species.

IFAW (www.ifaw.org/sotw) conducted an acoustic survey for sperm whales in the Ionian Sea and the area incorporating the Sicilian and Malta Channels. Data were also collected on passage through the western Mediterranean. A total of 8967km of acoustic effort were conducted over a period of 814 hours between 10 August and 17 October 2003 from the IFAW research vessel Song of the Whale. The aim of this survey was to act as a pilot study to develop and test an appropriate survey protocol that could subsequently be used for the proposed ACCOBAMS basin-wide survey of sperm whales. The objective was to use cost effective methods that could provide adequate 'snap shot' abundance estimates while at the same time allowing data to be collected that could contribute to longer-term studies. The selected protocol involved a passive acoustic line transect survey conducted in both 'passing' and 'closing' modes. The acoustic survey techniques were based on those used successfully elsewhere and involved automated detection and location of sperm whales using a two element towed hydrophone. In 'passing mode' the survey vessel continued on pre-determined track lines regardless of whether sperm whales were detected. In 'closing mode' the survey was suspended according to a strict protocol when whales were detected to allow close approaches for photo-identification, behavioural observations, collection of sloughed skin and visual estimates of group size. A preliminary report has been presented to ACCOBAMS (Lewis *et al.*, 2004).

In collaboration with the Brazilian National Institute of Amazonian Research (INPA), SMRU carried out daily boat-based surveys of botos and tucuxis in the Mamirauá Reserve, Brazil. This is a long-term study of marked and unmarked animals, looking at population biology and ecology.

SMRU has been conducting sightings surveys of Chilean dolphins and Peale's dolphins off Chile (Sonja Heinrich, PhD study).

The Sea Mammal Research Unit (SMRU) has been coordinating the development of the Small Cetaceans in the European Atlantic and North Sea (SCANS-II) project (see link from <http://smub.st-and.ac.uk/index.htm>) with seed funding from DEFRA. A key objective of the project is to generate precise and unbiased estimates of abundance for the harbour porpoise, short-beaked common dolphin, bottlenose dolphin and other cetaceans. The project will allow estimates generated by the Small Cetacean Abundance in the North Sea (SCANS) of 1994 (Hammond *et al.*, 2002) to be updated and generate new estimates in previously un-surveyed waters to the west of the UK, Ireland, France, Spain and Portugal. The survey area includes western European continental shelf waters from 36°- 62°N and shipboard and aerial surveys will take place July 2005. Several meetings and a workshop during the past year have addressed scientific, technical and logistical elements of this ambitious multi-national project.

UAZD also conducted surveys for cetaceans around the islands of Saint Helena and Ascension Island, South Atlantic Ocean and helped set up a programme of land and boat-based surveys in Saint Helena for local cetaceans in association with Agriculture and Natural Resources Department, St. Helena. This project primarily studies pan-tropical spotted dolphins, bottlenose dolphins, rough-toothed dolphins and humpback whales and is looking at habitat preferences, season of occurrence, changes in the spotted dolphin population since the cessation of hunting in 1979 and conducting Photo ID of all four species (contact Colin MacLeod: c.d.Macleod@abdn.ac.uk).

2.1.2 OPPORTUNISTIC, PLATFORMS OF OPPORTUNITY

UAZD has carried out opportunistic cetacean surveys on various ferry routes on the west coast of Scotland (contact Colin MacLeod: c.d.Macleod@abdn.ac.uk)

UAZD is studying the distribution of sperm whales in the Northeast Atlantic using passive acoustic techniques onboard the FRV Scotia oceanographic cruises carried out by the FRS Marine Laboratory (contact Sónia Mendes: s.mendes@abdn.ac.uk).

Whale-watching vessels continue to be utilised as platforms of opportunity by HWDT to investigate how hydrographical factors affect bottlenose dolphin distribution in the coastal waters of the Isle of Islay, Scotland. HWDT also continues to use passenger ferries as platforms of opportunity, in 2004 in collaboration with University of Aberdeen.

The SMRU has also been conducting visual and acoustic surveys of the cetacean fauna of the west of Scotland from several platforms of opportunity (Clare Embling, PhD Study).

Organisation Cetacea (ORCA) (www.orcaweb.org.uk) have conducted opportunistic surveys from ferries, primarily from Southern England to Northern Spain, since 1995. The 2003 data will contribute to ORCA's database, currently with over 3,500 effort-related cetacean sightings. Experienced observers are encouraged to collect distance-sampling data as on standard line transect surveys.

Falklands Conservation in collaboration with JNCC conducted 4 seabird cruises in South Georgia waters during which opportunistic cetacean observations were recorded. The South Georgia Government funded this work. Unpublished trip reports are held by JNCC.

2.2 Analyses/development of techniques

IFAW continued to work on development of algorithms for detection of North Atlantic right whale vocalisations (Gillespie, 2003; Matthews, 2003; Moscrop et al., 2003).

SMRU (Rob Williams, PhD study) has been examining the relationships between recorded and true distance measurements in distance estimation experiments to inform analyses of data from sightings surveys, and has also been investigating the use of spatial modelling to estimate abundance of minke, fin and humpback whales in the Southern Ocean using data collected on ships of opportunity.

SMRU (Caterina Fortuna, PhD study) has been analysing habitat preferences of bottlenose dolphins in Croatian waters.

ORCA has collaborated with CRMM, La Rochelle to analyse cetacean relative abundance in the English Channel and Bay of Biscay in relation to bathymetry (Kiszka *et al.*, 2004). The ORCA database has also been used to highlight potential common dolphin-fisheries interactions through seasonal relative abundance data in the western Channel and Bay of Biscay (Macleod and Walker, 2004).

UAZD is investigating the ecological niches occupied by sperm whales in the North Atlantic through the analysis of the distribution of sperm whales in relation to oceanographic variables using JNCC data (contact: Sonia Mendes: s.mendes@abdn.ac.uk). Also, UAZD is performing similar work in relation to beaked whales in association with JNCC. UAZD is also aiding in the compilation of a global database of beaked whale records (contact: Colin MacLeod: c.d.macleod@abdn.ac.uk).

In response to the conclusion of the EC Habitats Committee meeting in December 2000, SNH commissioned UAZD (Lighthouse Field Station) in collaboration with the University of St-Andrews, Sea Mammal Research Unit, to review and analyse bottlenose dolphin sighting data in the Moray Firth. The goal of this analysis was to determine the technique best suited to monitor the abundance of bottlenose dolphins utilising the candidate Special Area of Conservation.

JNCC in collaboration with the Sea Watch Foundation and the SMRU has published an Atlas of cetacean distribution for NW Europe, the culmination of many years work in synthesising several disparate sightings databases (Reid et al. 2003).

3. Marking data

3.1 Field work

3.1.1 NATURAL MARKING DATA

Opportunistic photo ID is carried out for minke whales, bottlenose dolphins and killer whales by the HWDT around Mull in western Scotland.

CRRU has collected over 3000 images of 196 bottlenose dolphins in the Moray Firth. UAZD (Lighthouse Field Station) continued to collect photo-ID data in Northeast Scotland for bottlenose dolphins. UAZD (Lighthouse Field Station) is also conducting boat-based photo-ID surveys of *Mesoplodon spp.* in the Sea of Abaco, Bahamas.

The SMRU is also conducting photo-identification studies of Chilean and Peale's dolphins in Chile, of humpback whales in the Gulf of Maine, and of bottlenose dolphins in the Azores under three studentships.

Photo ID of pan-tropical spotted dolphins, bottlenose dolphins, rough-toothed dolphins and Humpback whales around Saint Helena. Catalogues are currently under construction for the first three species.

Two fluke shots are available for humpback whales (contact: Colin MacLeod:

c.d.macleod@abdn.ac.uk).

Species	Feature	Area/stock	Calendar year/season/no photographed	Catalogued (Y/N)	Catalogue total	Contact person/institute
Bottlenose dolphin	Dorsal fin	Moray Firth, Scotland	-	Y	196	CRRU
Bottlenose dolphin	Dorsal fin	Moray Firth, Scotland	14 years	Y	742	UAZD Lighthouse Field Station
Boto	Dorsal fin	Brazilian Amazon	175	Y	320	Tony Martin / SMRU
Tucuxi	Dorsal fin	Brazilian Amazon	5	Y	9	Tony Martin / SMRU

3.1.2. ARTIFICIAL MARKING DATA

None reported

3.1.3 TELEMETRY DATA

None reported

3.2 Analyses/development of techniques

SMRU students have addressed the estimation of survival rate of bottlenose dolphins in the Sado Estuary, Portugal using mark-recapture analyses of photo-identification data, the estimation of abundance of humpback whales in the North Atlantic using mark-recapture analyses of photo-identification data, a quantification of mother-calf association patterns in bottlenose dolphins in NE Scotland using analyses of photo-identification data, and an investigation of the potential energetic cost to killer whales of disturbance by vessels and the role of a marine protected area in British Columbian waters.

4. Tissue/biological samples collected

4.1 Biopsy samples

SMRU (Monica Silva, PhD study) has collected more than 50 biopsy samples from bottlenose dolphins in the Azores.

4.2 Samples from directed catches or bycatches

Species	Area/stock	Calendar year/season total	Archived (Y/N)	Tissue type(s)	Contact person/institute
Harbour porpoise	NORTH SEA	5	Y	Various	Paul Jepson (IoZ)

4.3 Samples from stranded animals

Species	Area/stock	Calendar year/ season total	Archived (Y/N)	Tissue type(s)	Contact person/institute
Sperm whale	UK	2	Y	Teeth	Richard Sabin (NHM)
Striped dolphin	UK	2	Y	Skulls, teeth	Richard Sabin (NHM)
Harbour porpoise	UK	111	Y	Various	Paul Jepson (IoZ)
Short beaked Common dolphin	UK	41	Y	Various	Paul Jepson (IoZ)
Striped dolphin	UK	9	Y	Various	Paul Jepson (IoZ)
Atlantic white- sided dolphin	UK	7	Y	Various	Paul Jepson (IoZ)
Minke whale	UK	4	Y	Various	Paul Jepson (IoZ)
White-beaked dolphin	UK	3	Y	Various	Paul Jepson (IoZ)
Common Bottlenose dolphin	UK	2	Y	Various	Paul Jepson (IoZ)
Sowerby's beaked whale	UK	1	Y	Various	Paul Jepson (IoZ)
Sperm whale	UK	1	Y	Various	Paul Jepson (IoZ)

4.4 Analyses/development of techniques

The IoZ, in collaboration with Cambridge University, continued developing and analysing microsatellite genetic data derived from over 500 UK-stranded harbour porpoises stranded between 1990 and 2003 to investigate population structure in UK harbour porpoises and to investigate potential relationships between indices of inbreeding and disease susceptibility.

SMRU (Monica Silva) has been analysing mitochondrial and nuclear DNA to investigate population structure in bottlenose dolphins in the Azores archipelago.

The UAZD is undertaking fatty acid analysis of blubber samples, age determination using teeth samples and establishing reproductive status from gonad samples for various cetacean species stranded in Scotland (contact: Jennifer Learmonth: j.a.learmonth@abdn.ac.uk)

UAZD is analysing bone samples from beaked whales from around the North Atlantic to investigate trophic and dietary ecology through stable isotope analysis (contact: Colin MacLeod: c.d.macleod@abdn.ac.uk).

5. Pollution studies

During 2003, eco-toxicological investigations into potential relationships between persistent organic contaminants and health status of stranded harbour porpoises were conducted by IoZ, SACVSD and CEFAS. Results consolidate previously published associations between elevated PCBs and infectious disease mortality in UK-stranded harbour porpoises but utilise significantly increased sample sizes of over 300 individuals stranded between 1989 and 2002. Case-control statistical analyses demonstrated that porpoises dying of infectious disease (n=82) had significantly higher levels of polychlorinated biphenyls (PCBs) than healthy porpoises that died of by-catch and other forms of acute physical trauma (n=175). This association, which occurred independently of a range of potentially confounding variables including age and two quantitative indices of nutritional status, is consistent with the hypothesis that chronic PCB exposure impairs immune function resulting in individual (and possibly population) level effects (Jepson 2003, Jepson et al. in press). These analyses may form the basis for future quantitative risk assessment analysis for PCB-induced mortality in harbour porpoise populations of known size and PCB exposure.

A second UK-World Wide Fund for Nature-funded collaboration between IoZ, SACVSD and CEFAS investigating relationships between potential endocrine disrupting contaminants (PCBs, organochlorine pesticides, heavy metals, butyltins) and qualitative and quantitative indices of testicular development and fertility in harbour porpoises in UK waters was completed in 2003.

Sascha Hooker, at Sea Mammal Research Unit, is collaborating with Dr Hal Whitehead, Dalhousie University, Canada, Dr Michael Moore, Woods Hole Oceanographic Institution, and Drs Chris and Tracy Metcalfe, Trent University, Canada, in a study of contaminant levels of northern bottlenose whales in the Gully, eastern Canada. Blubber contaminants and cytochrome P4501a levels in whales sampled in 1996-97 (prior to the onset of nearby oil and gas drilling) will be compared to those found in whales sampled in 2002-03 (5 years after the onset of nearby drilling), and to those found in whales off the coast of Labrador (far from any industrial activity). The Gully was declared a pilot marine protected area in 1998 (Hooker et al., 1999; 2002), and so ongoing monitoring of this population is extremely important. Support for UK participation in this work (2002 and 2003) has been obtained via two Royal Society International Exchanges. Samples were collected in 2002 during a NMFS cruise (led by Dr Phil Clapham, Woods Hole Oceanographic Institute), and samples in 2003 during a Dalhousie University research trip aboard the sailing vessel Balaena.

The UAZD co-ordinated a CEC Framework 5 project called Bioaccumulation Of Persistent Organic Pollutants In Small Cetaceans In European Waters: Transport Pathways And Impact On Reproduction (Biocet). As a part of this project, Jennifer Learmonth at the University of Aberdeen is undertaking fatty acid analysis of blubber samples and age determination using teeth and is establishing reproductive status from gonad samples from various cetacean species stranded in Scotland. Blubber samples from harbour porpoise, common, striped and bottlenose dolphins from France, Ireland, Spain and Holland will also be included in the fatty acid analysis study. [Now at the final report stage] [Graham Pierce g.j.pierce@abdn.ac.uk]

6. Statistics for large cetaceans - 2003

6.1 Direct catches - Not applicable to UK

6.2 Other non-natural mortality for the calendar year 2003

None recorded

6.3 Earlier years' statistics

None reported

7. Statistics for small cetaceans

7.1 For the calendar year 2003

Species	Area/stock	Directed catch		Incidental mortality			Live-capture
		Reported	Est. total	Reported	Est. total	Source*	Reported
Harbour porpoise	UK			11		Stranded/ Necropsy	
Shortbeaked common dolphin	UK			25		Stranded/ Necropsy	
Harbour porpoise	UK			11		Observed bycatch	
Shortbeaked common dolphin	UK			95		Observed bycatch	

7.2 Earlier years' statistics

Species	Area/stock and year for which estimate has been made	Incidental mortality			
		Reported	Est. total	Source	Reported
Harbour porpoise	UK: North Sea 2002		439 (95% CL 371-640)	Gill/Tangle net fisheries	Northridge et al 2003
Harbour porpoise	UK: West Scotland 2002		48 (95% CL 25-68)	Gill/Tangle net fisheries	Northridge et al 2003
Short beaked common dolphin	UK: Western Channel – average annual estimate 2000-2003		91 (95% CL 53-147)	Pelagic pair trawl fishery	Northridge et al 2003

8. Strandings

The NHM have collected records on all stranded cetaceans found on the coasts of the United Kingdom, since 1913. The NHM maintains a national strandings database, and has retrospectively entered all strandings data gathered since 1913. The NHM collects skeletal material, parasites, stomach contents and tissue samples from animals stranded in the UK and makes these available through its national research collections. The NHM has begun to place searchable, limited datasets on its Cetacean Strandings website.

The IoZ (with assistance from NHM) and SACVSD are contracted by DEFRA to investigate diseases and causes of death in marine mammal (mainly cetacean) strandings in the UK. IoZ and SACVSD maintain national databases and tissue archives derived from those UK stranded animals that have been necropsied.

In addition to the strandings co-ordination funded by DEFRA, the National Assembly for Wales is funding the Welsh Strandings Co-ordinator in conjunction with the Countryside Council for Wales (CCW), who collaborates with the IoZ/SACVSD/NHM scheme, while The Cornwall Wildlife Trust also maintains its own strandings database, with information that also goes to the NHM.

9. Other studies and analyses

Novel pathological findings from 8 individual cetaceans stranded in the UK between 1992 and 2003 were reported for the first time in 2003 (Jepson et al. 2003, Fernandez et al. 2004). These new disease findings, involving a range of acute and chronic cavitory lesions associated with *in vivo* gas bubble formation and gas embolism, were published in conjunction with the findings derived from a University of Las Palmas de Gran Canaria investigation into a mass stranding of beaked whales in 2002 precipitated by a naval exercise using active sonar. Collectively, these findings from the UK and Canary Islands provide the first pathological evidence that cetaceans can suffer *in vivo* gas bubble formation and associated tissue injury, and that, based on the Canaries findings, acoustic exposure could be a causal factor in the pathogenesis of these lesions.

Vincent Janik (SMRU) has been conducting playback studies on bottlenose dolphins in Sarasota Bay, Florida in collaboration with Randy Wells from the Mote Marine Lab and Laela Sayigh from the University of North Carolina at Wilmington. They tested whether artificial dolphin whistles elicit the same responses as original recordings of dolphins. This study is ongoing and investigates whether identity information is carried in the frequency modulation of a whistle or in general voice features of the individual. Vincent Janik is also conducting experiments along the East coast of Scotland, using a hydrophone arrays to study functional aspects of bottlenose dolphin communication. This work involves several students who also collect Photo-ID data on bottlenose dolphins and sighting data of harbour porpoises.

Luke Rendell commenced post-doctoral research on the vocal behaviour and vocal clans of sperm whales, and their relation to population structure, at SMRU/St Andrews in September 2003. The research aims to investigate the genetic relationships between vocal clans in the South Pacific, to study vocal variation in other areas, particularly the western Mediterranean and to understand fine-scale details of vocal behaviour using acoustic localization techniques in the West Atlantic

Heriot-Watt University & UMBSM conducted a survey in major Scottish cities in order to investigate current perceptions of the public toward cetaceans and their conservation. Results showed public concern about cetacean conservation was high. Pollution-related issues were considered to be the greatest threats to cetacean populations and concern was also high about depletion of cetacean prey by over-fishing.

HWDT is initiating a small-scale study to investigate the use of seal-scarers used on fish farms in relation to porpoise activity in the Sound of Mull. This will involve land based observations and the deployment of PODs.

UAZD has been studying the distribution of cetaceans in East Malaysian coastal waters, in particular the Irrawaddy and Indo-Pacific humpback dolphins. [Saifullah A. Jaaman s.jaaman@abdn.ac.uk]. UAZD (Lighthouse Field Station) in collaboration with the University of St. Andrews has also been studying the effects of whale watching on killer whales in Johnstone Strait, Canada. (Williams et al 2004). UAZD (Lighthouse Field Station) in collaboration with the University of St. Andrews also conducted a modelling study of the effects of live-capture programs on killer whale societies (Williams & Lusseau 2004).

Whale-watching

Heriot-Watt University & UMBSM conducted a survey on to assess the awareness of the general public of whale-watching opportunities in Scotland and to assess the potential domestic market for whale-watching. The most commonly cited whale-watching location was the Moray Firth. University of Reading & UMBSM (with the help of HWDT) conducted a survey in order to investigate levels of environmental awareness and motivation in Scottish whale-watchers.

10. Literature cited

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