

**AUSTRALIA. PROGRESS REPORT ON CETACEAN RESEARCH, JANUARY 2003 TO DECEMBER 2003, WITH
STATISTICAL DATA FOR THE CALENDAR YEAR 2003**

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This report summarises information obtained from: Applied Marine Mammal Ecology Unit, Australian Antarctic Division (AAD) – TAS; Department of the Environment and Heritage (DEH), Canberra – ACT; Australian Fisheries Management Authority (AFMA), Canberra – ACT; New South Wales Department of Environment and Conservation, Parks and Wildlife Division – NSW; New South Wales Fisheries – NSW; Taronga Zoo, Sydney – NSW; The Australian Museum (AM), Sydney – NSW; Southern Cross University Whale Research Centre (SCUWRC), Byron Bay – NSW; Graduate School of the Environment, Macquarie University, Sydney – NSW; School of Biological Science, University of New South Wales, Sydney – NSW; Pacific Whale Foundation – NSW; Oceania Project, Byron Bay – NSW; University of Newcastle – NSW; Northern Territory Parks and Wildlife Commission (PWC) – NT; Environmental Protection Agency (EPA), Brisbane – QLD; Queensland Parks and Wildlife Service (QPWS) – QLD; Queensland Department of Primary Industries Shark Control Program (QDPI SCP), Brisbane – QLD; Great Barrier Reef Marine Park Authority (GBRMPA), Townsville – QLD; Museum of Tropical Queensland, Townsville – QLD; James Cook University, Townsville – QLD; The Ecology Centre, University of Queensland, Brisbane – QLD; Queensland Museum, South Brisbane – QLD; South Australian Museum, Adelaide – SA; Department for the Environment and Heritage, Adelaide – SA; Department of Primary Industries (Fisheries) – SA; Nature Conservation Branch (NCB), Department of Primary Industries, Water and Environment (DPIWE), Hobart – TAS; Department of Sustainability and Environment (DSE) – VIC; Whale Ecology Group – Southern Ocean, School of Ecology and Environment, Deakin University, Warrnambool – VIC; Museum of Victoria, Melbourne – VIC; Australocetus Research, Warrnambool – VIC; Southern Ocean Cetacean Ecosystem Program (SOCEP), Deakin University – VIC; Dolphin Research Institute (DRI), Hastings – VIC; Western Australian Museum, Perth – WA; Western Australian Humpback Whale Project, Centre for Whale Research (CWR), Fremantle – WA; Department of Conservation and Land Management (CALM) – WA; World Wide Fund for Nature (WWF); Population Genetics and Evolution Group, School of Biological Science, University of Auckland – New Zealand; New Zealand Department of Conservation – New Zealand; South Pacific Whale Research Consortium.

Abbreviations are used for all States and Territories: Australian Capital Territory (ACT), New South Wales (NSW), Northern Territory (NT), Queensland (QLD), South Australia (SA), Tasmania (TAS), Victoria (VIC), and Western Australia (WA).

1. Species and stocks studied

Common name	Scientific name	Area/stock(s)	Items referred to
MYSTICETI			
Southern right whale	<i>Eubalaena australis</i>	SE coast, TAS, SA coast, S coastline, Timor, WA, VIC, Southern Ocean, NSW coast	2.1.1, 2.1.2, 3.1.1, 4.3, 8, 9, 10, 11.1, 11.2
Pygmy right whale	<i>Caperea marginata</i>	S Aust	4.3, 9
Humpback whale	<i>Megaptera novaeangliae</i>	Groups B and C, Groups IV and V, TAS, VIC, SA coast, Fiji, QLD, Samoa, Timor, Antarctic/Southern Ocean	2.1.1, 2.1.2, 2.2, 3.1.1, 3.1.3, 3.2, 4.1, 4.3, 4.4, 6.2, 8, 9, 10, 11.1, 11.2
Common minke whale	<i>Balaenoptera acutorostrata</i>	S Hemisphere, N QLD, Southern Ocean, NSW coast	2.1.1, 2.1.2, 3.1.1, 4.3, 8, 9, 11.1, 11.2
Dwarf minke whale	<i>Balaenoptera acutorostrata</i>	N QLD	2.1.2, 2.2, 3.1.1, 3.2, 6.2, 9, 11.1, 11.2
Antarctic minke whale	<i>Balaenoptera bonaerensis</i>	Antarctic/Southern Ocean	2.1.1
Bryde's whale	<i>Balaenoptera edeni</i>	Indian Ocean, E coast	2.1.1, 4.3,
Blue whale	<i>Balaenoptera musculus</i>	S Hemisphere, SA coast, W coast, S Aust, California USA, VIC	2.1.1, 2.1.2, 3.1.1, 3.1.3, 4.1, 9, 11.2
Pygmy blue whale	<i>Balaenoptera musculus</i>	S Hemisphere	2.2, 3.1, 3.1.3, 9

Common name	Scientific name	Area/stock(s)	Items referred to
Fin whale	<i>Balaenoptera physalus</i>	WA, Antarctic/Southern Ocean	2.1.1, 2.2, 3.1.1, 4.1
Sei whale	<i>Balaenoptera borealis</i>	Antarctic/Southern Ocean	2.1.1
Baleen whales	<i>Mysticeti sp</i>	S Aust, TAS, NT	2.1.1, 4.3, 6.2, 8
ODONTOCETI			
Sperm whale	<i>Physeter macrocephalus</i>	S Hemisphere, TAS, SW VIC, S Aust, Antarctic/Southern Ocean, QLD coast, Fiji, Jervis Bay NSW	2.1.1, 2.1.2, 4.3, 8, 11.1
Pygmy sperm whale	<i>Kogia breviceps</i>	S Hemisphere, SA coast, TAS	2.1.2, 4.1, 4.2, 4.3, 7.1, 8
Long-finned pilot whale	<i>Globicephala melas</i>	TAS, Antarctic/Southern Ocean	2.1.1, 4.3, 8, 11.2
Short-finned pilot whale	<i>Globicephala macrorhynchus</i>	S Hemisphere, QLD coast, Fiji, Samoa, Southern Ocean	2.1.1, 2.1.2, 3.1.1, 4.1, 4.3, 8
Pilot whale sp.	<i>Globicephala sp.</i>	SA coast, Southern Ocean, TAS	2.1.2, 4.3, 6.2, 8
Killer whale	<i>Orcinus orca</i>	SW VIC, SA coast, TAS, Antarctic/Southern Ocean	2.1.1, 2.1.2, 3.1.1, 9
False killer whale	<i>Pseudorca crassidens</i>	S Hemisphere, QLD coast, NT, Fiji, Southern Ocean, Timor	2.1.1, 2.1.2, 4.1, 4.3, 8
Melon-headed whale	<i>Peponocephala electra</i>	S Hemisphere	8
Blainsville's beaked whale (Dense beaked whale)	<i>Mesoplodon densirostris</i>	Lord Howe Island, Samoa	2.1.1, 4.3
Gray's beaked whale	<i>Mesoplodon grayi</i>	SA coast	4.3, 8
Strap-toothed beaked whale	<i>Mesoplodon layardii</i>	SA coast	4.3, 8
Shepherd's beaked whale	<i>Tasmacetus shepherdi</i>	TAS	4.3, 8
Cuvier's beaked whale	<i>Ziphius cavirostris</i>	TAS	4.3, 8
Ziphiidae	Ziphiidae	Antarctic/Southern Ocean	2.1.1
Beaked whales	<i>Mesoplodon sp</i>	Indian Ocean, Southern Ocean	2.1.1, 2.1.2
Indo-Pacific humpback dolphin	<i>Sousa chinensis</i>	Indian Ocean, NSW coast, QLD coast, Timor	2.1.2
Dusky dolphin	<i>Lagenorhynchus</i>	TAS	4.3, 8
Hourglass dolphin	<i>Lagenorhynchus</i>	Antarctic/Southern Ocean	2.1.1
Common bottlenose dolphin	<i>Tursiops truncatus</i>	Australia, TAS, SA coast, SW VIC, NSW coast, Port Phillip Bay VIC, QLD, Samoa	2.1.1, 2.1.2, 2.2, 4.1, 4.2, 4.3, 5, 7.1, 8, 9, 11.1, 11.2
Indo-Pacific bottlenose dolphin	<i>Tursiops aduncus</i>	NSW coast, QLD, SA coast, Timor	2.1.1, 3.1.1, 4.2, 4.3, 7.1, 8, 9, 11.1, 11.2
Bottlenose dolphin sp.	<i>Tursiops sp.</i>	SA coast, Perth WA, NSW coast, Samoa, NT, QLD	2.1.2, 3.1.1, 4.3, 7.1, 8, 9, 11.1, 11.2
Risso's dolphin	<i>Grampus griseus</i>	Indian Ocean, E Aust	2.1.1, 4.3
Pantropical spotted dolphin	<i>Stenella attenuata</i>	Fiji	2.1.1, 2.1.2, 3.1.1, 4.1
Striped dolphin	<i>Stenella caeruleoalba</i>	NSW coast	4.3
Long-snouted spinner dolphin	<i>Stenella longirostris</i>	Fiji, Samoa, Timor	2.1.1, 2.1.2, 3.1.1, 4.1
Spinner dolphin	<i>Stenella coeruleoalba</i>	Australia, QLD, WA	2.1.1, 4.3, 7.1, 8
Rough-toothed dolphin	<i>Steno bredanensis</i>	Samoa	2.1.1, 3.1.1, 4.1
Common dolphin	<i>Delphinus delphis</i>	NSW coast, QLD coast, SA coast, TAS, SE coast	2.1.1, 2.1.2, 3.1.1, 4.2, 4.3, 5, 7.1, 8, 9, 10
Fraser's dolphin (unconfirmed)	<i>Lagenodelphis hosei</i>	Timor	2.1.1
Irrawaddy dolphin	<i>Orcaella brevirostris</i>	QLD, Timor	2.1.1, 9

2. Sightings data

2.1 Field work

2.1.1 SYSTEMATIC

Various cetaceans – Southern Ocean

The Southern Ocean Cetacean Ecosystem Program (SOCEP) participated in one Australian Antarctic Division marine science voyage (2002/2003 Antarctic season, on board the *Aurora Australis*, ex-Hobart, 3 January - 8 March 2003. The primary science activities were: an integrated study of krill flux (fine scale), acoustic methodology and Adelie penguin provisioning; cold water calibrations of acoustic instrumentation; and Kerguelen western boundary current studies. Cetacean research was ancillary, including individual photo identification and biopsy of cetaceans, and the deployment of an acoustic recording package (ARP). The objective was to collect distribution and relative abundance data, while a multidisciplinary team focussed on fine scale krill dynamics and oceanography. Systematic visual survey for cetaceans occurred throughout the voyage alongside passive acoustic survey (sonobuoys).

264 cetacean sightings were made during 971 hours of effort, totalling 747 animals. Humpback whales were the most numerous baleen whale encountered on effort, both in number of sightings (n=63) and total number of animals counted (n=124). Sperm whales were the most sighted odontocete species (19:20), and long-finned pilot whales the most numerous (4:212). Photo identification images were obtained for six humpback and four fin whales. Six biopsy samples were collected (4 fin whale and 2 humpback whale). 91 sonobuoys were deployed and 136 h of recordings: of fin whales, sperm whales, killer whales and pilot whales. Despite numerous minke and humpback whale sightings during which buoys were deployed, no sounds were recorded from these animals. One ARP (designed by John Hildebrand's laboratory at Scripps Institute of Oceanography) was deployed (66 44.243°S 69 48.748°E at 1320.7m).

Humpback whale – NW Cape and Perth Canyon, WA

Curt and Micheline Jenner and V. Sturrock (Centre for Whale Research) carried out small boat surveys in NW Australia and the Perth Canyon. The NW surveys were carried out over June-November in 2002 and 2003, to collect biopsy samples from N and S-bound humpback whales for genetic analysis of the Group IV stock. Sighting cue data as well as behavioural and spatial data are being analysed for biases and trends.

Other small boat surveys were conducted at roughly 7-day intervals in an effort to identify the temporal and geographic dispersal patterns of humpback whales and other “mega fauna” in relation to Woodside Energy’s petroleum lease NW of North West Cape. A total of 362 humpback whales were sighted in 7 passing mode surveys during peak migration past the lease (1 August - 15 September). The project observed the following other cetacean species off-shore in the NW Cape area in 2003: inshore bottlenose dolphin (487), offshore bottlenose dolphin (34), Indo-Pacific humpback dolphin (44), spinner dolphin (262), false killer whale (100), minke whale (12), and Bryde’s whale (2). The following were observed at the Tantabiddi and Bundegi Anchorages: inshore bottlenose dolphin (42), Indo-Pacific humpback dolphin (44).

The Centre for Whale Research also carried out 34 small boat surveys at the Perth Canyon, January - April 2003, to observe pygmy blue whale activity. Work included: photo-identification, behavioural observations, genetic sampling, echo-sounder logging and deployment of satellite tags. 71 blue whales were observed in 2003, with photo-identifications of 38 animals. These studies constituted part of the WA Exercise Area Blue Whale Project (with the Royal Australian Navy). Other cetacean species observed in the Perth Canyon area in 2003 were: striped dolphin (n=525, pods=4), offshore dolphin (n=317, pods=9), spinner dolphin (n=311, pods=4), sperm whale (n=15, pods=1), Risso’s dolphin (n=6, pods=1), beaked whales (n=4, pods=1).

Humpback whale – Cape Byron, NSW

The Cape Byron Whale Research Project (David Paton, SCUWRC), studying the migration patterns, distribution, abundance and behaviour of humpback whales continued, 21 June – 6 July 2003, both from land and from a small vessel, for visual and acoustic tracking, ID photographs and skin samples. There were two aspects to the project:

1. Land based survey using a theodolite interfaced with a lap top computer to position and track whales as they migrate past the coast;
2. Photo-identification from a small vessel to identify individuals from fluke and lateral body colouration patterns and markings. Sloughed skin samples were also collected opportunistically for DNA analysis.

All identification photos have been catalogued in the new Southern Cross University Whale Research Centre humpback whale database for comparison and full life history analysis. The database will also include results obtained from sloughed skin samples, which will be individually identified and sexed, for comparison and analysis.

Results:

Year	Survey hours	# Pods	# Whales	Av Pod Size	# Sloughed skin samples
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2003	96 hrs 40 mins	79	168 (104 photo'ed)	2.13	79
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A number of other cetacean species were also observed during this period. These included confirmed sightings of bottlenose dolphins and common dolphins. Land based surveys were also conducted. A total of 138 hours and 43 minutes (av. 9 hrs 22 min/ day) of observations were conducted during this 16 day period - one full day was lost due to bad weather. A total of 505 humpback whales was observed in 302 pods (average pods size 1.7). This averaged 22 pods observed per day (33 individual humpback whales)

Humpback whale – Ballina, NSW

Southern Cross University undertook 201 hrs 10 mins of small vessel operation to determine population characteristics of humpback whales migrating along the E coast: timing and speed of migration, association patterns, and pod characteristics. Results:

Year	Survey hours	# Pods	# Whales	Av Pod Size	# Sloughed skin samples
2003	201 hrs 10 mins	179	408	2.33	29

A number of other cetacean species were also observed during this period. These included confirmed sightings of bottlenose dolphins, common dolphins, one minke whale and one southern right whale. Identification photos are currently being catalogued in the new humpback whale database for comparison and full life history analysis. All sloughed skin samples will also be individually identified and sexed, and results entered into the database.

Fieldwork was conducted for 3-4 days per week, 1 September - 6 November 2003. The project involved vessel-based photographic identification of individual whales passing Ballina / Lennox Head during their S migration 2003, as well as opportunistic sloughed skin sampling for genetic analysis. Land-based observers also conducted basic counts of whales passing Lennox Head, and radioed locations of pods to the research vessel.

Humpback whale – Peregrin, QLD

Land-based visual and acoustic surveys of humpback whales passing Peregrin Beach, 26°30'S, 153°05'E, were undertaken 9 September – 30 October 2003 (Dr Michael Noad).

Humpback whale – Hervey Bay, QLD

The Oceania Project conducted the 12th year of fieldwork of a long-term survey of humpback whales in Hervey Bay. Boundaries of the survey area are Rooneys Point, Fairway Buoy, Coongul Creek and the west coast of Fraser Island within the Whale Management and Monitoring Area of the Hervey Bay Marine Park. The survey is being undertaken in conjunction and collaboration with the QLD Environment Protection Agency.

The 2003 survey was undertaken from a 12-metre vessel for 56 days, 10 August - 17 October 2003: 448 h of effort. Observations were made on 928 individual humpbacks in 387 pods. A total of 5195 identification photographs were obtained, 10 h of behavioural DV video and 2 h of DAT whale song recordings. Two faecal samples and 173 sloughed skin samples were obtained.

Systematic observational data of pods included date, time, GPS positions, number of individuals, composition and behaviour. Photography of ventral flukes, lateral body colouration patterns and left and right dorsals were obtained as well as behavioural video and samples of whale song. The project submitted a comprehensive field report to the QLD EPA (Oceania Research Project long-term survey (1992-2003) Field Report Year 12).

Humpback whale – Perth, WA

Doug Coughran (WA Department of Conservation and Land Management) undertook an aerial survey to assess the relative abundance of humpback whales in and beyond the area of whale watch vessel activity off Perth WA. The survey is part of a long-term project aimed at monitoring trends to identify whether management strategies are effective or if modifications need to be made to minimise impacts on the whales.

Humpback whale and other cetaceans – Lomaviti Island Group, Fiji

Australian-based researchers led a cetacean survey in the Lomaiviti Island group, Fiji in 2003: 257 h of visual searching from a land-based site in Levuka, Ovalau. 32 sightings were made of six confirmed species including humpback whale (n=1), sperm whale (n=6, pods=2), short-finned pilot whale (n~209, pods=10), false killer whale (n~40, pods=2), pantropical spotted dolphin (n~350+, pods=4) and long-snouted spinner dolphin (n~280, pods=10).

Individual photo identification from the research vessel confirmed that a number of pods (particularly short-finned pilot whale) were observed multiple times during the period of the survey. Therefore the numbers indicated above include resights. In addition, there were several pods of unidentified whales or dolphins due to poor visibility or distance from the observers.

Southern right whale – Southern coastline WA-SA

John Bannister (WA Museum) continued an annual programme of aerial survey for southern right whales off the S coast. As in past years flights took place close inshore between Cape Leeuwin, AW, and Ceduna, SA. Two 'short' flights, 28 July-8 August and 6-9 October, between Cape Leeuwin and Twilight Cove, WA, maintained the series of flights on the southern WA coast since 1976. A 'long' flight, between Cape Leeuwin, WA and Ceduna, SA on 15-19 September, continued the series extended along the coast into SA from 1993; an additional leg, on the W coast between Perth and Cape Leeuwin, was flown on 15 September. Counts and identifying photographs were obtained, but, as usual, with emphasis on the latter on the 'short' flights and on the former on the 'long' flight.

Southern right whale – Head of Bight, SA and Point Ann, WA

Rebecca Pirzl (Deakin University, VIC) completed the second season of a 3-year project examining coastal habitat use of southern right whales on broad (whole of Australia) and fine (within aggregation areas) scales. 70 days were spent at 2 study sites (Head of Bight, SA and Point Ann, WA). The project collected individual movement and distribution data along with environmental information to examine the relationship between right whale distribution and habitat parameters.

Southern right whale – SA

Dr DJ Needham continued aerial surveys and photographic identification of southern right whales in SA.

Blue whale - Geographe Bay and Perth Canyon, WA.

Chris Burton (Western Whale Research Pty Ltd) observed blue whales using three methods of survey in Geographe Bay, WA over an 8 week period, October - December 2003. 121 sightings were made: 12 from aerial surveys, 34 during land-based surveys and 75 from vessel-based surveys. Humpback whales, several species of dolphins and a small number of southern right whales were also sighted.

Cape Naturaliste: Land-based sightings from a small rocky headland approximately 6m above sea level on Cape Naturaliste showed a wider temporal distribution than previously recorded from vessel surveys, with blue whales observed close to land (within 2 km) during early morning and evening and moving from E to W. Blow rates of several pods were recorded. Photo-identification photographs were obtained on some pods transiting very close to the Cape. Vessel-based surveys from whale watching and research vessels recorded 75 sightings of blue whales, including 11 calves, close to the Cape. Approximately 90% of sighted blue whales were observed moving W along the Cape. A small number were observed further offshore moving SE into the Bay. 40 sets of identification photos of blue whales were obtained.

Perth Canyon: In continuation of work since 1999, Chris Burton conducted aerial surveys in the Perth Canyon area, WA (ca 32°S, 115°W), January-May 2003. Two transect designs were adopted, running alternatively, continuing, as in past years, in tandem with an 'extended area' survey consisting of 3 parallel transects commencing N of Rottenest Island at 31° 20'S and terminating S near Cape Naturaliste at 33 40°S. Blue whales were observed on 8 out of the 10 aerial surveys. 84 sightings of blue whales were made from the two sets of transects: 78 sightings (70 pods) from the dedicated canyon surveys and 6 during the extended surveys to the S. 1 cow/calf pair was sighted. Several species of dolphins, sperm whales, beaked whales, Risso's dolphins and unidentified whales were also sighted. Blue whale sightings were concentrated over the deep waters of the known feeding area of the Perth Canyon. Very few sightings were observed N or S along the 200 – 1000m depth contours. Swim directions for these whales were variable. The 2003 season represents the second highest number of blue whale sightings from aerial surveys over the 5-year project.

Blue whale – VIC

The Whale Ecology Group (Deakin University) undertook both aerial surveys and boat-based surveys off VIC. 323 blue whale sightings were recorded during 34 aerial surveys. The total number of whales sighted has not yet been determined, as resights occurred during some surveys. The maximum number of blue whales sighted during any survey was 47. Surveys occurred in January (3), February (2), March (3), April (2), May (3), August (1), October (1), November (5), and December (11). No blue whales were sighted during August or October. Other species sighted during aerial surveys in the Bonney Upwelling included fin, sei, minke, and humpback. Sperm, pilot, beaked and killer whales were sighted in upper slope waters adjacent to the Bonney Upwelling. Dolphin schools, probably mostly common dolphins and bottlenose dolphins, were frequently sighted in the Bonney Upwelling.

12 boat-based survey days were completed, 18 April - 16 May 2003. Surveys covered a minimum of 460 nautical miles. The team completed 12 transects in the vicinity of whales, and 6 random transects. Over the survey period, 19 sightings with 27 individual blue whales were recorded. 7 blue whale sightings were confirmed as surface feeding, and a majority of the time these whales were associated with acoustic backscatter at the surface or at depth that was characteristic of predicted dense krill swarms. Other cetacean species encountered: common and bottlenose dolphins.

Odontocetes – Bonney Upwelling

The Antarctic Wildlife Research Unit conducted a pilot project investigating the distribution, seasonality and habitat usage by odontocetes within the Bonney upwelling region in December 2003: involving the University of Tasmania and Deakin University (Warrnambool). Aerial surveys combined with a fine-scale boat-based survey to establish the potential for interactions within this region. To the end of 2003 only one aerial survey had been conducted – the results from this will be combined with subsequent aerial surveys and the fine-scale boat based survey.

Various baleen whales – WA and VIC

Rob McCauley (Curtin University) conducted a number of passive acoustic studies, including single hydrophone recordings of pygmy blue, true blue and fin whales from the Perth Canyon (2002-2004). Samples were taken almost continuously at a sampling schedule of 120-200 s at 15 minute intervals with a 4-10 kHz sample rate. Samples will be analysed for great whale presence and for pygmy blue whales, to census population while correlating acoustic abundance estimates with visual sightings data (aerial studies by Bannister & Burton and boat based studies by Jenner & Jenner). Tracking grid of hydrophones set for pygmy blue whales in February-April 2003 in the Perth Canyon is currently being analysed.

Tracking grid of hydrophones set for humpback whales traversing a region of active seismic surveys between Dongara and Abrolhos Is (WA) were laid over in late 2003. The tracking grid was deployed 3 times. Analysis is also under way of a large data set recorded October-December 2003 from 14 sites in the Otway Basin (VIC) for industrial noise and pygmy blue whale signals, which were detected. Analysis includes a tracking grid of 5 hydrophones.

Analysis of sea noise records, late 2002 - late 2003, from the Comprehensive Test Ban Treaty listening station off Cape Leeuwin (WA) is currently underway, and is detecting many great whales and seasonal patterns in movements. McCauley also deployed and recovered a sea noise recording package off the continental shelf edge NW of Broome (WA), March-August 2003. The recording set detected great whales, including seasonal visit by minke whales.

Bottlenose dolphin – Cockburn Sound, WA

Bec Donaldson (Murdoch University) undertook ten surveys of bottlenose dolphin groups in Cockburn Sound. This was part of continuing annual monitoring following an earlier more intensive study, of 930 surveys on the approximately 150 dolphins inhabiting the Sound (all identified). Surveys include time, date, location, depth, water temperature, fish stats from depth sounder (number, size class), predominant behaviour of group, group size, and group composition including identity, sex and age-class of all group members, and any social subgroups.

The project has made 600 extended 'focal individual' follows of calves to investigate social development from birth to weaning. Each follow included between 30 minutes and 4 hours of focal individual sampling of a calf including all behavioural events at surface; all social partners; and 2.5 minute point samples of behaviour of calf and mother, mother-calf distance, nearest neighbour, group composition (identity of all group members) and group behaviour.

Bottlenose dolphin – Port Phillip Bay and Gippsland Lakes, VIC

The Dolphin Research Institute conducted surveys on the bottlenose dolphin population in S Port Phillip Bay, January - December 2003. Surveys were also extended to N Port Phillip in May and the Gippsland Lakes, October

2003. The Institute also collected dorsal fin photographs (for identification of individuals), and behavioural data. Shore-based observations, primarily concerned with dolphin movements and behaviours, were also collected in S Port Phillip Bay. Researchers conducted 31 shore-based surveys: 24 from the Institute's vessel, and 3 from other vessels (Gippsland Lakes), resulting in approximately 279 field hours. 91 sightings of dolphins were made.

Bottlenose dolphin – NSW

The NSW Department of Environment and Conservation conducted acoustic recordings and surveys for bottlenose dolphins in the Port Stephens and Jervis Bay areas, August - November 2003 to investigate the possibility of geographic variation. Theodolite tracking also occurred in February and April 2003, quantifying dolphin response to vessel approaches (see Allen *et al.* 2003a).

Three months of vessel transect and land observations were conducted along the NSW coastline from Brunswick Heads to Ballina. These surveys gathered small cetacean species data within the boundaries of the proposed Cape Byron Marine Park. In addition, the surveys established population density estimates of inshore bottlenose dolphins.

Behaviour and acoustic surveys were conducted over a period of 3 months from several observation platforms including land stations and vessels, which encompassed motor, sail and personal (e.g. kayak). These observations assessed the influence of vessel interactions on the behaviour and acoustic patterns of inshore bottlenose dolphins. Opportunistic photo-identification of the dolphins in the Jervis Bay and Port Stephens areas was also undertaken.

Cetaceans – Samoa

In 61 h 57 min of vessel-based operation in September 2003, 210 cetaceans were sighted in the area around Samoa as part of the South Pacific Islands Whale Research Project. Confirmed sightings included bottlenose dolphin, short-finned pilot whales, rough-toothed dolphin and long-snouted spinner dolphin, and one sighting of a pod of 3 unidentified beaked whales, possibly Blainville's beaked whale. The sightings of bottlenose dolphin, rough-toothed dolphin and beaked whales are new recordings for Samoa. A total of 5 humpback whales were sighted and a further 6 were identified acoustically. The average humpback pod size was 1.25.

Small cetaceans – Timor Sea

A systematic survey of the Timor Sea, supported by the Governments of Australia, Indonesia and East Timor, and funded by DEH and the Convention on Migratory Species, was conducted by WWF (Australia/ Hong Kong/ Indonesia), 9-23 June 2003. The aim of the survey was to derive population abundance estimates for small cetaceans in the Timor Sea. Photo-identification and acoustic data were also recorded.

The shipboard survey of the S Timor Sea was conducted on a 47-foot motor vessel. The primary methodology was dual platform, line transect mode, as developed specifically for small cetaceans (Holt and Powers 1982; Wade and Gerrodette 1993; Barlow 1994; Thomas *et al.* 2000). The total track length of 1780km included 42 encounters with 5 cetacean species: bottlenose dolphin (n=7), false killer whale (n=3), Indo-Pacific humpback dolphin (n=6), Irrawaddy dolphin (n=14), long-snouted spinner dolphin (n=1), unknown (n=5), dolphin species (n=1), and Fraser's dolphin (unconfirmed) (n=6). 2 occurred with dugongs, 24 with 4 turtle species and 5 with at least 2 species of sea snake.

2.1.2 OPPORTUNISTIC, PLATFORMS OF OPPORTUNITY

Commonwealth waters

In 2003, AFMA fisheries observers aboard commercial fishing vessels off E Aust recorded cetacean sightings (215 trips in the E Coast Tuna Fishery, 3 to the SE Trawl Fishery, 6 to the S and W Tuna and Billfish Fishery, all trips to both the Heard Is and McDonald Is Fishery and the Macquarie Is Fishery, 1 to Norfolk and the Coast Deepwater Trawl Fishery and 4 to the Indian Ocean high seas by Australian vessels). The following were recorded from longline vessels: humpback whale (6 sightings, n=15, including unconfirmed), sperm (1, n=4), pygmy sperm (1, n=1 unconfirmed), killer (2, n= 18-23), false killer (2, n=21-26), pilot (3, n= 67-74), minke (1, n=1), short finned pilot (1, n=7), Ziphiidae beaked (1, n=1). 2 species were recorded from trawl vessels: sperm (1, n=3, including unconfirmed sightings), killer (1, n>12). All reports indicated no recorded interaction between cetaceans and fishing gear.

Queensland

In N QLD, Dr R.A. Birtles and Dr P.W. Arnold continued observations from *Undersea Explorer*, a 25m commercial live-aboard dive vessel, for 6 weeks (June-July 2003). Of 70 encounters, 45 included an extended interaction (equal to

or greater than 10 mins). 205-248 dwarf minke whales were seen, of which 154-190 were seen underwater. Surface and underwater observations were routinely made during the encounters, concentrating on recognition of individual whales and documentation of whale-swimmer interactions. Sighting sheets were received from other live-aboard dive vessels running swim-with-whales programs. In 2003, for the first time, commercial operators offering such programs were under permit, a condition of which was completing a sighting sheet. The returns are being analysed, covering 173 encounters with dwarf minke whales from 12 vessels.

In S QLD, under the *Hervey Bay Marine Park Zoning Plan 1989*, the QPWS implemented a compliance-monitoring program. The program involves the collection of data by both QPWS staff and commercial operators conducting whale-watching tours in Hervey Bay Marine Park. In recent years, QPWS has collected opportunistic data whilst on patrol in Hervey Bay Marine Park. Data fields include: time; pod position; water temperature and depth; pod configuration (adults, sub adults and calves); pod activity / behaviour (breach, pectoral slap, fluke slap, spy hop, mugging, direction travelling, mother-calf feeding, other); and vessels present (commercial / recreational). Since 1990, commercial operators have collected daily spatial and temporal pod sightings data. QPWS uses these data both to monitor the use of the Bay by commercial vessels, and to calculate vessel/pod interactions and an encounter ratio.

South Australia

Mike Bossley continued opportunistic sightings of dolphins from tour boats in Gulf St Vincent. In 2003, the SA Museum reported the following opportunistic sightings: humpback whale (n=8), southern right whale (n=67), killer whale (n=10), blue whale (n=175), bottlenose dolphin (n= numerous), common dolphin (n=1), unidentified large (n=7), medium (n=2), small cetaceans (n=20).

Tasmania

Most sightings (including strandings) are reported to NCB by members of the public. A whale hotline phone (staffed 24 hrs / day) was introduced to enhance public participation in the reporting of cetacean occurrences. All sightings are entered into the Tasmanian Cetacean Database. Since its introduction, reporting of cetacean sightings has increased, to 144 (excluding common and bottlenose dolphins) in 2003 in Tasmanian waters. NCB staff followed up reports to confirm each sighting. Cetacean identification brochures describing most frequently observed species have been produced and circulated to the public to assist in the confirmation of sightings.

Cetacean sightings/observations for 2003: southern right whales (55 events, n=85), humpbacks whales (38 events, n=84), killer whales (9 reports, n=18), unidentified pilot whale (1, n=2), unidentified cetaceans (41 reports n=83). NCB staff undertook 3 aerial surveys in response to public reports of sightings in 2003. Aerial surveys totalled 4 hrs 57 mins, June - November. 2 of these identified and photographed southern right whales – Derwent estuary (2 in June), Great Oyster Bay (2 in November) and one identified humpback whales – Frederick Henry Bay (5 in June).

Victoria

The DRI continued building a community dolphin sighting network which has resulted in the recording of regular dolphin sightings within most of VIC's coastal waters including Port Phillip Bay, Westernport Bay and the Gippsland Lakes, resulting in approximately 313 reported sightings. Most reports are of bottlenose dolphins. Others included southern right, humpback, blue and killer whales.

Portland rock lobster fishers voluntarily contributed 4 blue whale sightings to the Whale Ecology Group Study.

The Department of Sustainability and Environment conducted photo-identification flights (weather permitting when whales were present) at the following locations in S-E Australia: several localities between Portland and Port Campbell (VIC); Opossum Bay, Denison Beach and Banwell Bay (TAS), Encounter Bay (SA), Twofold Bay (NSW).

Western Australia

In continuation of work that began in 1989, vessel-based surveys in the inshore coastal waters off Perth and Rottenest Island, SW Australia, (ca 31° 50' S, 115° 30' W) were conducted by Western Whale Research Pty Ltd, September-November 2003.

Observations, GPS locations and photo- identification were made aboard 2 vessels during whale watching operations from Hillarys Boat Harbour, on the northern coastal suburbs of Perth. Humpback whales were observed on 95% of trips. 300 sightings of humpback whales were made from the 2 whale watching vessels during 42 trips. 24 cow/calf

pairs were sighted. 1 pair of adult blue whales were observed on 13 November moving W within 2 km of Rottenest Is. Approximately 100 sets of photo identification photographs were obtained including those of the blue whales.

In continuation of work since 1995, vessel-based surveys were undertaken in the inshore coastal waters of Flinders Bay near Augusta, S-W Australia (ca 34° 20'S, 115° 15' W), late May - August 2003. Observations, GPS locations and photo-identification were made aboard 2 whale watching vessels operating from Augusta, near Cape Leeuwin. Approximately 350 sightings were made from the vessels during 106 trips. These included humpback (n=200), southern right (n=150) and blue whales (n=1). Many of the right whale sightings were repeats of the same cow/calf pairs that remained in the Bay for extended periods. One pair of adult blue whales was observed on 31 May, moving W within 2 km of the coast towards Cape Leeuwin and represent the first recorded sighting of blue whales in the area. Sightings of common and bottlenose dolphins were numerous. Approximately 50 sets of photo identification photographs were obtained including those of the humpback, southern right and blue whales.

New South Wales

Pacific Whale Foundation Research Associate, Amy Hellrung, joined public whale watching tours to observe humpback whales on 32 days, once daily for approximately 4 h. Information gathered: weather/sea state conditions, time, location, species, pod composition, behaviour, direction of travel; where possible photographs of left and/or right dorsal fins and ventral side of flukes.

Preliminary observations of various fishing activities were undertaken as part of a study investigating the broad-scale interactions occurring between fishing and marine wildlife (including cetaceans) in NSW. Cetacean sightings during observations in NSW coastal and estuarine waters included: humpback whales (2 sightings); 1 unidentified whale; common dolphins; approximately 30 bottlenose dolphins (2 sightings). Only the dolphins interacted with the observed fishing activity: common dolphins fed on prawn trawl dis cards, bottlenose dolphins fed on or played with salmon that escaped from hauling gear.

Near Eden, over 32 days, 89 pods of a total of 182 humpback whales were documented. In 134 h of survey, approximately 49 h were spent observing humpback whales. On 7 October 2003 there was one sighting of killer whales (1 pod of 5 animals: two adults, two juveniles, and one calf). One mother/calf pod of southern right whales was resighted 5 times, including one documented interaction with three humpback whales. There was 1 sighting of a juvenile southern right whale, which was observed travelling for approximately 30 min.

Fiji

As part of the South Pacific Island Whale and Dolphin Program, photo-identification samples were collected from humpback whales, short-finned pilot whales, false killer whales, long-snouted spinner dolphins and pantropical spotted dolphins. These will be further analysed and compiled into a catalogue to compare with individuals from other areas of the South Pacific. The Program replicated the surveys undertaken by Dawbin in the late 1950's to determine the current status of whales and dolphins in the Lomaiviti Island group of Fiji. It worked in partnership with local government authorities, organisations, commercial operators and educational institutions to introduce techniques used in whale and dolphin identification, behaviour monitoring and research. The Program aimed to assist the management of the Fijian Whale Sanctuary and to raise awareness of whales and dolphins within the region, as well as supplying the Government of Fiji with current information on whales and dolphins in its waters.

Samoa

A study of the whales and dolphins of Samoa was undertaken, 15-27 September 2003. There were 3 main aspects to the research project: photo-identification from a small vessel to identify individual animals from fluke and lateral body colouration patterns and markings; acoustic sampling from a hydrophone linked to a Digital Audio Tape recorder by 20 m of cable, and the active collection of skin samples through use of a PAXARM system for subsequent DNA analysis. Additional sightings were made during the survey reconnaissance trip, 4 - 10 August.

2.2 Analyses/development of techniques

Demographic statistics - Bottlenose dolphins

Ben Donaldson (Murdoch University) analysed bottlenose dolphins in Cockburn Sound, WA: foraging ecology statistics (relating feeding to depth and benthic/habitat data; sex differences); demographic statistics (age and sex structure; reproductive statistics including birth rates and seasonality; weaning ages; death rates of calves and non-

calves with some post mortems); social statistics (male alliances; association patterns relating to age and sex; changes with reproductive state); ranging patterns (using ArcView to analyse ranges and movement patterns of individuals and classes including investigating female range shifts when they have calves; sex differences in mean range areas and locations; and correlating ranging patterns with data on bathymetry, Chlorophyll a, temperature and salinity levels).

Aerial surveys - Southern right whales

Aerial survey results undertaken by WA Museum (see 2.1.1) showed usual concentrations of southern right whales, mainly but not exclusively, of cows accompanied by calves of the year, in and near Doubtful I Bay (WA), in and E of Israelite Bay (WA), and at Head of the Bight (SA). Animals were again present in and near Twilight Cove (WA) but none were present in the area C Adare-Fowlers Bay (SA). The number recorded on the 'long' flight in 2003 (273 animals including 95 calves) was lower than in any year since 2000, largely because of a much reduced number of sightings of the generally more ephemeral 'unaccompanied', i. e. non-calving, adults. The latter possibly resulted from the later than usual timing of the 'long' flight. Nevertheless, significant positive increase rates were obtained for 'all' animals and cow/calf pairs in the 'long' flight data series (1993-2003), excluding data for 1996 and 1997 where there seems to have been some undercounting. For cow/calf pairs the increase rate for 1993-2003 is 7.14% ($p=0.007$), but the 95% CI remains wide (2.63-11.65%) in line with a 1997 power analysis indicating the need for a time series to 2007 to provide a reliable result.

Current population size for that part of the 'Australian' southern right whale population visiting the area surveyed is estimated at *ca* 1500 animals.

Photo-identification catalogue – southern right whales

The Department of Sustainability and Environment (VIC) collected individual IDs to add to the SE Australian photo-identification catalogue. Results presented at the Australasian right whale workshop, Adelaide, January 2004.

Acoustic studies - humpback and pygmy blue whales

Robert McCauley (Curtin University) heard pygmy blue whales in the Perth Canyon area, November - June with most animals present in February-March. Pygmy blue whales produce a stereotype 3-part call. In the summer of 2003-2004, a large number of variants were identified suggesting that the call structure was changing. Curtin University is establishing census techniques based on number of animals calling per unit time within a defined range, compared with aerial survey abundance estimates for pygmy blue whales. Based on calls, true blue whales occur in the Perth Canyon from late March through July. Their call differs slightly from the recognised Antarctic type call.

Work is continuing on collating great whale presence and abundance from disparate sea noise data sets (some historical, some current or planned) from WA offshore waters in an attempt to delineate large-scale movements and any trends of great whales. A wide variety of great whale signals are present on the Cape Leeuwin site. These include true and pygmy blue whales, fin whales and many signals that cannot yet be attributed to a source. The 2003 WA humpback song is considerably different from the 2000 WA song. Further work will look for spatial differences in the 2003 song along the WA coast. Humpback vocalisations appear to be little affected by the presence of nearby seismic signals, which attenuate rapidly in shallow shelf waters along the WA coast.

There have been improvements on the capability for setting great whale tracking grids in deep water. These are complex to deploy because of the long baselines required and the inherent instability of clocks on each recording package. Curtin University has developed a specialised sea noise logger that has proven reliable and is highly flexible. Current capacity is 17 Gbyte for up to one year. The new version will have > 60 Gbyte capacity, with the limiting factor on recording space being the physical size of the disk which can fit into the housing used and the number of batteries available. The 60 Gbyte version will be deployed in mid 2004.

Photo identification – Humpback whale

The Oceania Project's photography in Hervey Bay for 2003 has been recorded in the field notes log, analysed and archived on CD. The catalogue total for the period 1992-2003 is 2110 flukes.

Underwater measurements – Dwarf minke whale

Working with Andrew Dunstan (*Undersea Explorer*), Birtles and Arnold, and Susan Sobtzick used the modified techniques of Spitz, Herman & Pack (2000) to measure minke whales using underwater videogrammetry. Results were

prepared (see 11.2), based on replicate measurements of 23 individual whales from 4 encounters.

Trialling satellite tags

Dorsal fins from two stranded cetaceans in TAS were collected in 2003 for trialling attachment methods for satellite tags to assess the survival rates of rescued cetaceans. This work was carried out by DPIWE

Acoustic recordings - bottlenose dolphins

Over 111 days (650 h), acoustic recordings of bottlenose dolphins were made near Port Stephens and Jervis Bay (NSW). 316 dolphins were encountered. This work was undertaken by Macquarie University.

Bottlenose dolphins observations – Ballina to Byron, NSW

Land station surveys undertaken by Southern Cross University provided detailed observations of dolphin behaviour and human activities along the coastal zone. One-hour focal follows were conducted from vessels during which continuous behaviour and acoustic sampling was made. Still photos were taken for photo identification of individual dolphins. Land observations and research vessel surveys were conducted simultaneously, enabling a detailed investigation into the behaviour and acoustics patterns of dolphins before, during and after vessel approaches. A specialised database has been developed to store all data as well as photo identification and acoustic catalogues.

3. Marking data

3.1 Field work

3.1.1 NATURAL MARKING DATA

3.1.1. Species	Feature	Area/stock	Calendar year no. photographed	Catalogued (Y/N)	Catalogue total	Contact person/institute
Southern right whale	Callosity	S Ocean	3	Y	5	Pacific Whale Foundation
	Callosity patterns	WA	20	N	0	C Burton / Western Whale Research
	Head callosities patterns	WA-SA	Ca 150	N	2830 images (1976-2002) incl. 353 ID-ed individuals (mainly from 1976-1993)	J.L. Bannister / WA Museum
	Topside head callosity pattern	SE Aust	13 (plus an additional 19 collected from the region between 2000	Y	33	M Watson / Department of Sustainability and Environment, VIC
	Dorsal head (callosities)	TAS	4	In progress	N/A	R. Gales / DPIWE
Blue whale	Lateral body	South Aust, VIC	8	Y	20	P. Gill and M. Morrice / Blue Whale Study, Deakin
	Lateral body	WA	40	N	0	C Burton, Western Whale Research
Pygmy Blue whale	Fluke	WA		Y	19	C&M Jenner/CWR
	Left Lateral body	WA		Y	78	C&M Jenner/CWR
	Right Lateral body	WA		Y	98	C&M Jenner/CWR
	Sex ID	WA	2003	Y	0	C&M Jenner/CWR
Fin whale	Lateral/dorsal	Antarctic/Sth n Ocean	4	Y		D Thiele/ Deakin Uni
Humpback whale	Lateral/dorsal	Antarctic/Sth n Ocean	2	Y		D Thiele/ Deakin Uni
	Lateral body	WA	150	N	0	C Burton, Western Whale Research

3.1.1. Species	Feature	Area/stock	Calendar year no. photographed	Catalogued (Y/N)	Catalogue total	Contact person/institute
	Fluke	WA		Y to 1998	1283 (1990-2001)	C&M Jenner/CWR
	Left Lateral Body	WA		Y to 1998	1661 (1990-2001)	C&M Jenner/CWR
	Right Lateral Body	WA		Y to 1998	1682 (1990-2001)	C&M Jenner/CWR
	Sex ID	WA		Y to 1998	23 (1990-	C&M Jenner/CWR
	NA	Area V	0	N/A	2	D Paton SCUWRC
	Fluke	Area V	1	Y	2	D Paton SCUWRC
	Fluke	E Aust.	107	Y	?	M. Noad, J. Smith / Uni Qld
	Lateral body	E Aust.	56	Y	?	M. Noad, J. Smith / Uni Qld
	Fluke	Group V	104	Y	667	D. Paton / D Burns SCUWRC
	Fluke	Group V	Still under analysis	partly	-	D. Paton / D Burns SCUWRC
	Ventral Flukes/ Left & right Dorsal fin/ Lateral Body	Area V (Hervey Bay)	928	Y	2110	T. Franklin / Oceania Project
	Fluke	Group V	1	Y	2	David Paton SCUWRC
	Fluke/dorsal	Stock V	~182	N in progress	2,511	Pacific Whale Foundation
Indo-pacific bottlenose dolphin	Dorsal	Jervis Bay, Port Stephens	[Opportunistic photos]	-	-	M Lemon, GSE, Macquarie University
	Dorsal	Byron Bay NSW	3	N	-	E Hawkins, SCUWRC
Killer whale	Lateral body	Southern Ocean	5	Y	5	Pacific Whale Foundation
Bottlenose dolphin sp.	Dorsal fin	Ballina-Byron Bay,	>188	Y	188	E Hawkins, SCUWRC
	-	Samoa	To be analysed	N	NA	S Walsh SCUWRC
	Dorsal fin	Port Phillip Bay & Gippsland, VIC	~50	Y	~100	A Goldsworthy, DRI
	Dorsal fin	WA		Y	~900	J Mann/Georgetown University
	Dorsal fin, body scars	Perth metro area, WA	10 new individuals, 50 known from previous years	Y	Approx. 200	B Donaldson/Murdoch University
Short-finned pilot whale	-	Samoa	To be analysed	N	NA	S Walsh /SCUWRC
Rough-toothed dolphin	-	Samoa	To be analysed	N	NA	S Walsh /SCUWRC
Long-snouted spinner dolphin	-	Samoa	To be analysed	N	NA	S Walsh /SCUWRC
Common dolphin	Dorsal fin	Ballina-Byron Bay,	40+	Y	8	E Hawkins, SCUWRC

Identification: dolphins, SA

Mike Bossley continues his work on identifying dolphins by natural markings in the Port River, Adelaide.

Photo-identification: Humpback whales

Curt and Micheline Jenner and V. Sturrock (Centre for Whale Research) developed the WA Humpback Whale

Sighting Database as a computerised aid to matching humpback whale fluke and lateral body ID photos. 4735 images of 2251 whales have been searched from the CWR 1990-1998 catalogue. 141 resights have been found (67 intra season and 74 inter season) resulting in a catalogue of 2110 individuals. From 1999 to 2002, 377 whales were photo-identified and are being added to the database. In 2003 a further 381 whales were photo-identified and are currently being added to and checked against the database. Photo ID of humpback whales off the Perth coast during commercial whale watch season by C. Burton (WA Museum) and D. Coughran (CALM) continued, supplying data to J. Bannister (WA Museum). C. Burton also conducted passive behavioural observation, acoustic recording and underwater photography of humpback, southern right and blue whales.

Photo-identification: Pygmy blue whales

Curt and Micheline Jenner and V. Sturrock (Centre for Whale Research) developed a Blue Whale Sighting sightings database as a computerised aid to matching blue whale fluke and lateral body ID photos. 107 whales were recorded in the database by the end of 2003. 27 resights have been found (14 intra season and 9 inter season), resulting in a catalogue of 91 individual whales (3 whales were observed 3 times).

Dr R.A. Birtles and Dr P.W. Arnold – dwarf minke whales

Recognition of individuals based on scar and colour pattern variations and field length measurements were priorities.

Photo-identification: bottlenose dolphins

The team led by J. Mann (Georgetown University) at Shark Bay have digitised a Dolphin Dorsal Fin Catalogue of about 900 animals. The dorsal fins have also been traced to use the digital matching program “FinScan”. The team is working on linking the database to other files to recall information such as birth date, sex, relatives, associates.

Photo-identification: South Pacific cetaceans

Photo-identification samples were collected from humpback whales, short-finned pilot whales, false killer whales, long-nouted spinner dolphins and Pantropical spotted dolphins, from land based surveys and vessel surveys. These will be further analysed and compiled into a catalogue to compare with individuals from other areas of the South Pacific. A large male pilot whale with a distinctive mark was seen several times during the survey, suggesting that the same group of pilot whales may be resident in the Ovalau area, Fiji, at least over periods of up to a month.

3.1.2. ARTIFICIAL MARKING DATA

Nil.

3.1.3 TELEMETRY DATA

3.1.3. Species	Tag type	No. successfully deployed	Maximum time transmitting	Contact person/institute
Pygmy blue whale	Satellite	3 (WA)	12 hours	C. Jenner / CWR, N. Gales / AAD
	Satellite	1 (Timor)	7 days	C. Jenner / CWR, N. Gales / AAD
Humpback whale	Satellite	1 (WA)	17 days	C. Jenner / CWR, N. Gales / AAD
	Satellite	4	?	University of Santa Cruz, N. Gales / AAD
	Digital acoustic/movement	11	6h	N Biassoni, Woods Hole Oceanographic Institution
Blue whale	Satellite	2	?	University of Santa Cruz, N. Gales / AAD
	Satellite	5	?	CWR, N. Gales / AAD

3.2 Analyses/development of techniques

Migratory patterns – humpback whales

Analysis of Centre for Whale Research database for humpback migratory patterns continues (Jenner *et al.* 2001).

Opportunistic sightings - humpback whales

The Pacific Whale Foundation Australia catalogue currently consists of 2,511 individuals. This data was collected from E Australia, W Australia, Antarctica, Tonga, and American Samoa, 1984-2002. Individuals are identified by their natural fluke markings. Lateral body markings are currently a secondary method used for identification purposes. The data collected in Eden, NSW in 2003 is currently being matched for unique individuals seen within the 2003 season, and will then be matched to the existing catalogue.

Sightings – dwarf minke whales

Analysis of the data collected by Drs R.A. Birtles and Dr P.W. Arnold in the N Great Barrier Reef is still in progress. To date, 9 whales have been confirmed as within-season re-sightings. This is lower than in 2002. There were 4 between-year re-sightings. Gender was determined for 11 individuals: 8 females and 3 males.

Identification - humpback whales

Trish and Wally Franklin are analysing data obtained during 1994-2003 by The Oceania Project's long-term humpback whale survey in Hervey Bay: on the 'Social and ecological significance of Hervey Bay to the Area V humpback whales' and 'genetic relatedness amongst humpback whales in Hervey Bay'.

Visual and Acoustic Surveys – Humpback Whale

Dr Michael Noad undertook visual and acoustic surveys on humpback whales. Tags held on by suction cups, deployed from a 14m carbon-fibre pole were used to record depth, acoustics and acceleration in 3 dimensions. Combined with land-based visual tracking, this allows reconstruction of whale's movements, vocalisations, swimming activity and responses to noises heard. Work was conducted by the Woods Hole Oceanographic Institution.

4. Tissue/biological samples collected

4.1 Biopsy samples

4.1. Species	Area/stock	2003 no. collected	Archived (Y/N)	No. analysed	Total holdings	Contact person/institute
Blue whale	Off WA	1	N	-	5 sloughed skin samples (2002) +1 sample	C. Jenner/CWR, J. Bannister/WA Museum
Humpback whale	Antarctic/Southern Ocean	2	Y	0	5	D Thiele/ Deakin Uni
	Group IV	156	In progress	Y	259 samples (103 in 2002 +156 in 2003)	C. Jenner/CWR, M. Brasseur/Edith Cowan University
	QLD	2 (faecal samples)	Y	?	?	T&W Franklin/ The Oceania Project, N. Gales/AAD
	E Aust	14	Y	0	15	J Smith/ Uni of QLD
	Area V (E Aust.)	79 (sloughed skin)	Y	0	508	M. Anderson / Southern Cross Uni
	Area V (Hervey)	173 (sloughed skin samples)	Y	674	6847	W Franklin/ The Oceania Project
Fin whale	Antarctic/Southern	4	Y	0	4	D Thiele/ Deakin Uni
Long-snouted spinner dolphin	Samoa	3	Y	Y	3	C Olavarria, Uni of Auckland*
Rough-toothed dolphin	Samoa	4	Y	Y	4	C Olavarria, Uni of Auckland*
Short-finned pilot whale	Samoa	3	Y	Y	3	C Olavarria, Uni of Auckland*
False killer whale	NT	9	Y	0	9	M. Krutzen / University of
	Timor	10	?	Pending	?	M Krutzen, BEES, Uni of NSW and Sydney Uni
Pygmy sperm whale	TAS	? (Faecal samples)	N	N	?	DPIWE TAS, N. Gales/AAD
Indo-Pacific bottlenose	Timor	7	?	Pending	?	M Krutzen, BEES, Uni of NSW and Sydney Uni

4.1. Species	Area/stock	2003 no. collected	Archived (Y/N)	No. analysed	Total holdings	Contact person/institute
Bottlenose dolphin	Shark Bay WA	19	Y	0	460	M. Krutzen / University of NSW
	NT	7	Y	0	7	M. Krutzen / University of NSW
Pantropical spotted dolphin	Unknown (Fiji)	1	Y	Y	1	Carlos Olavarria, Uni of Auckland
Common bottlenose dolphin	Samoa	1	Y	Y	1	C Olavarria, Uni of Auckland*
	VIC	3	Y	3	3	K. Charlton & S. McKechnie / Monash Uni

* All skin samples have been individually identified and sexed. Individual identification results have been compared with a South Pacific Cetacean Database held in Auckland, New Zealand for comparison and full life history analysis.

4.2 Samples from directed catches or bycatches*

4.2. Species	Area/stock	Calendar year total	Archived (Y/N)	Tissue type(s)	Contact person/institute
Common dolphin	Tasmania	2**	Y	Blubber (2), muscle (2), skin (2), stomach contents (2), whole animal (1)	R. Gales / DPIWE
	SA	2	2Y	Genetic tissues (blood liver kidney muscle skin), reproductives, stomach and intestines, toxic contaminants (liver,	C. Kemper / S.A. Museum
	NSW	2	N	Stomach and digestive track	C. Ganassin / NSWf
Indo-Pacific Bottlenose Dolphin	SA	3	2Y	Genetic tissues (blood liver kidney muscle skin), reproductives, stomach and intestines, toxic contaminants (liver, kidney, muscle, blubber)	C. Kemper/ S.A. Museum
Pygmy sperm whale	SA	2	2Y	Genetic tissues (blood liver kidney muscle skin), reproductives, stomach and intestines, toxic contaminants (liver, kidney, muscle, blubber)	C. Kemper/S.A.Museum
Bottlenose dolphin	Tasmania	1	Y	Blubber, muscle, skin, stomach contents, liver kidney, teeth	R. Gales / DPIWE

* All samples taken from accidental by-catch.

** Samples not collected from all animals, number of individuals sampled is shown in brackets.

4.3 Samples from stranded animals

4.3. Species	Area/stock	Calendar year total	Archived (Y/N)	Tissue type(s)	Contact person/institute
Southern right whale	TAS	1	N/A	nil	R. Gales / DPIWE
	Southern	2003, n/a	-	DNA samples taken	WA Museum
	WA	2003, 1	Y	Skin and surface muscle	N. Cooper/WAM
Pygmy right whale	S Aust	1	Y	Blubber, skin, muscle, baleen	Museum of Victoria
Humpback whale	Group B and C	2003, n/a	-	DNA samples taken	WA Museum
	WA	2003, 1	Y	Skin	M Brasseur/Edith Cowan University

4.3. Species	Area/stock	Calendar year total	Archived (Y/N)	Tissue type(s)	Contact person/institute
	Group V (E Aust), NSW	2	Y	Blubber, baleen	Wendy McFarlane (ORRCA), Sandy Ingleby (The Australian Museum)
	QLD coast (Warana Beach,	1	?	Skull	QLD Museum
Bryde's whale	East coast	1	?	Skin, blubber, muscle, kidney, ovary, liver	Andy Marshall (DEC officer, Hastings Area) taken for the Australian Museum
False killer whale	QLD coast (Bingil Bay Beach, Chimp Pt)	1	?	Blubber	D Haynes/ GBRMPA
Minke whale	S Hemisphere	2003, n/a	-	DNA samples taken	WA Museum
Sperm whale	QLD coast (btw Jardine River and Vrilya Pt,	1	?	Skin	Col Limpus, QPWS, Brisbane
	Summercloud Bay, Jervis Bay NSW	1	-	Tissue samples and jaw bone	ORRCA, DEC (Booderee National Park), Sandy Ingleby, the Australian Museum
	TAS	12*	Y	lower jaw (9), blubber (10), skin (10), muscle (10), liver	R. Gales / DPIWE
	S Aust	2	Y	Blubber, muscle, skin,	Museum of Victoria
Pygmy sperm whale	TAS	3*	Y	Blubber (2), muscle (2), kidney (2), liver (2), skin (2), stomach contents (2), testes (1), ovaries (1), faeces (2), skeleton (2)	R. Gales / DPIWE
	E Aust	?	Y	Liver, heart, kidney, muscle	S Ingleby, Aust Museum
Unidentified baleen whale	Tasmania	1	N/A	nil	R. Gales / DPIWE
Long finned pilot whale	TAS	1120*	Y	Blubber (39), muscle (39), skin (39), liver (1), kidney(1), teeth(3)	R. Gales / DPIWE
Pilot whale	SA coastline	2	2Y	Genetic tissues (blood liver kidney muscle skin), reproductives, stomach and intestines, toxic contaminants (liver, kidney, muscle, blubber)	C. Kemper / SA Museum
Short-finned pilot whale	QLD coast	1	?	Skeleton, kidney, lung, stomach: nematodes, stomach: squid beaks	Skeleton-QLD Museum, kidney-DNR Indooroopilly, Lung-QPWS Toonah, nematodes-R Allard, Squid beaks-H Genetskie
Cuvier's beaked whale	TAS	1	Y	blubber, muscle, kidney, liver, stomach contents, skull	R. Gales / DPIWE
Dense Beaked whale	Lord Howe Island	1	N	Muscle, skin, blubber	Geoff Kelly, (DEC Lord Howe Island)
Gray's beaked whale	SA	2	2Y	Genetic tissues (blood liver kidney muscle skin), reproductives, stomach and intestines, toxic contaminants (liver, kidney, muscle, blubber)	C. Kemper/S.A.Museum
	S Hemisphere (WA)	2003, n/a	-	DNA samples taken	WA Museum
Shepherd's beaked whale	Tasmania	1	Y	blubber, muscle, kidney, liver, skin, stomach contents, skeleton	R. Gales / DPIWE

4.3. Species	Area/stock	Calendar year total	Archived (Y/N)	Tissue type(s)	Contact person/institute
Strap-toothed beaked whale	SA	2	2Y	Genetic tissues,(blood liver kidney muscle skin) reproductives, stomach and intestines, toxic contaminants (liver, kidney, muscle, blubber)	C. Kemper/S.A.Museum
Indo-Pacific humpback	NT	1	Y	Measurements only	Ray Chatto / NT PWC
Bottlenose dolphin	Tasmania	28*	Y	Blubber (11) , muscle (11), skin (11)	R. Gales / DPIWE
	SA	4	1Y	Genetic tissues (blood liver kidney muscle skin), reproductives, stomach and intestines, toxic contaminants (liver, kidney, muscle, blubber)	C. Kemper/S.A.Museum
	SE Aust	2	Y	Blubber, skin, all major organs and teeth (1)	Verne Dove (Uni of Melbourne) has samples from one of the animals. Steve Mc Kechnie (Monash Uni) has blubber and skin of the other
	NSW	1	N	Stomach content	C. Ganassin / NSWF
Indo-Pacific bottlenose dolphin	SA	4	4Y	Genetic tissues,(blood liver kidney muscle skin) reproductives, stomach and intestines, toxic contaminants (liver, kidney, muscle, blubber)	C. Kemper/S.A.Museum
Unidentified dolphin	Tasmania	3	N/A	nil	R. Gales / DPIWE
Bottlenose dolphin	Inscription Point/Botany	-	Y	Full histological set	Karrie Rose/Taronga Zoo
Risso's dolphin	Iluka	1	N	Blubber	DEC office, Clarence North
Spinner dolphin	QLD coast (Burleigh Heads, Gold Coast)	1	?	Skin, blubber, liver, muscle	Duncan Limpus. QPWS, Brisbane
Striped dolphin	NSW	1	N	stomach	C. Ganassin / NSWF
Dusky dolphin	TAS	2	Y	Blubber (2), muscle (2), kidney (1), liver (1), skin (2), stomach contents (2), skeleton (2)	R. Gales / DPIWE
Common dolphin	Tasmania	9*	Y	Blubber (6) , muscle (6), skin (6), kidney (6), liver (6), stomach contents (6), skeleton (1).	R. Gales / DPIWE*
	SE Aust	1	Y		Museum of Victoria recovered the body, refer to them for details of samples kept.
	SA coastline	13	9Y	Genetic tissues (blood liver kidney muscle skin), reproductives, stomach and intestines, toxic contaminants (liver, kidney, muscle, blubber)	C. Kemper / SA Museum
	Burleigh/Gold Coast	-	Y	Full histological set	Karrie Rose/Taronga Zoo
	Bondi Beach, NSW	-	Y	Full histological set	Karrie Rose/Taronga Zoo

* Tasmanian samples lodged with Tasmanian Museum and Art Gallery for curation (Contact Person: David Pemberton).

4.4 Analyses/development of techniques

Opportunistic sightings - humpback whales and other species

Since 1984 the Pacific Whale Foundation has maintained an extensive photo-identification catalogue from a number of areas within the apparent migratory range of the Group V humpback whale. Photographs of the ventral surface of the tail flukes and left and right views of the lateral body have been obtained, as well as: date, time, location, sea state, observation condition, pod number, pod composition, frame number and content of each digital image. Location and observation conditions were documented every 30 min while searching for whales, and every 15 minutes while observing whales.

Field observations classified whales on the basis of estimated size: calf (6m or less), yearling or sub-adult (8 – 12m), or adult (>12m). Gender was determined either on the basis of documentation of the genital slit, or on behavioural indicators considered to be sex-specific. An adult in continuous closest proximity to a calf was considered the mother, and therefore a mature female. Adults accompanying mother-calf pairs (termed an “escort”) were judged to be males, based on previous findings. Identified singers were also judged to be males. All digital images have been examined and judged for quality, based on variables such as size, clarity, contrast and fluke orientation. The best quality images were cross-compared to generate a within-season resight history for every identified whale (see Forestell *et al* 2003).

Opportunistic observations - impact of fishing activities on marine mammals

The contents of the stomach samples of dead common and bottlenose dolphins (to be analysed in 2004) will provide information on the diet of cetaceans off NSW. This information will be published in a NSW Fisheries report on the broad-scale interactions occurring between marine wildlife and fishing activities in NSW, to be completed in 2004.

Genetic stock identification

VIC: Kate Charlton, Monash University, carried out genetic analysis of samples collected from bottlenose dolphins in Port Phillip Bay and the Gippsland Lakes (biopsy and stranded animals). This involved a combination of genetic markers including DNA sequences from the mitochondrial control region, 8 micro satellite loci and genetic sexing markers (Charlton, 2003). All sequences have been posted on Genbank.

QLD: DNA analysis of sloughed skin samples are being undertaken by Megan Anderson and Wally Franklin at the Centre for Animal Conservation Genetics, Southern Cross University, under the supervision of Professor Peter Baverstock. Analysis of total holdings will be completed and up to date by the end of November 2004. 2 humpback whale faecal samples were obtained in Hervey Bay in 2003. The samples are being analysed by Nick Gales and Simon Jarman, Applied Marine Mammal Ecology Group, AAD, using DNA technology developed at AAD to study the diet of marine mammals using faecal samples.

NSW: Some testing of a technique for genetic sexing (standard methodology) was undertaken near Cape Byron by Michael Noad for the Humpback Whale Visual and Acoustic Surveys.

5. Pollution studies

South Australia

Nicole Butterfield completed an Honours thesis at the University of Adelaide on the heavy metal status of Indo-Pacific bottlenose dolphin, common bottlenose dolphin and common dolphin. She found high levels of mercury in many animals but concluded that this was probably offset by the amount of selenium present. Moderately high levels of cadmium were also found. There was a significant difference in some metals between species, and a distinct age trend in all metals. No regional differences were found – possibly due to inadequate samples from adults.

Tasmania

Blubber samples were collected and archived for future analyses of pollutants (see above Table 4.3).

Western Australia

Murdoch University continued its analysis of bottlenose dolphin ranging and foraging patterns for Chlorophyll A and salinity levels, particularly around the Kwinana heavy industrial site on the E shore of Cockburn Sound.

Queensland

The Oceania Project and QLD EPA undertook the 11th year of Chlorophyll A sampling for a long-term habitat and water quality-monitoring program, in the Whale Management and Monitoring Area of the Hervey Bay Marine Park. Weekly triplicate Chlorophyll A samples were obtained from 6 structured geographical areas within the Hervey Bay Marine Park, 10 August - 17 October 2003.

6. Statistics for large cetaceans

6.1 Direct catches (commercial, aboriginal and scientific permits) for the calendar year 2003

Nil to report. Under the *Environment Protection and Biodiversity Conservation Act 1999*, it is an offence to kill, injure, take, trade, keep, move or interfere with whales and other cetaceans.

6.2 Other non-natural mortality for the calendar year 2003

6.2. Species	Area/stock	Males	Females	Total	Cause	Methodology
Pilot whale	32°S 153°E			Nil (1 released alive)		15/10/2003: Longline vessel. Released alive
Dwarf minke whale	East coast			1	Ship strike	Superficial examination of
Whale	28°S 155°E			Nil (1 released alive)	Whale was foul hooked	11/11/2003: Longline vessel. Released alive.
	Sunshine Coast (Mooloolaba)			Nil (1 released alive)	Commercial crab fishery set line – freed itself	freed
Baleen whale	Refuge Bay, NT			1	Possible net entanglement	Dead
Humpback whale	Group V, (Surfers Paradise, Gold Coast QLD)			Nil (1 released alive)	Shark control program	Rescued
	Gold Coast QLD		Calf?	1	Entanglement (Shark control net)	Found dead
	Area V	2	-	2	Found dead, possible cause of death boat or propeller strike	Necropsy

7. Statistics for small cetaceans

7.1 For the calendar year 2003

7.1. Species	Area/stock	Directed catch		Incidental mortality			Live-capture
		Reported	Est. total	Reported	Est.	Source	Reported
Spinner dolphin	Gold Coast, QLD (Burleigh Heads)	-	-	June	1	Shark control program	-
	Gold Coast, QLD (Surfers Paradise and Burleigh Heads)	-	-	October	2	Shark control program	-
	Gold Coast, QLD (Currumbin)	-	-	December	1	Shark control program	-
Pygmy sperm whale	SA	-	-	2	unknown	OU (probably boat strike)	-
Common dolphin	Tasmania	-	-	10/04/2003	1	Salmonid farm net	-
	Tasmania	-	-	08/01/2003	1	Salmonid farm net	-
	32°S 153°E	-	-	19/06/2003	1	Longline. AFMA logbook, released alive	-
	24°S 154°E	-	-	18/01/2003	1	Longline. AFMA logbook, released alive	-

7.1.		Directed catch		Incidental mortality			Live-capture
Species	Area/stock	Reported	Est. total	Reported	Est.	Source	Reported
	29°S 161°E	-	-	05/08/2003	1	Longline. AFMA logbook, released alive	-
	Surfers Paradise, QLD	-	-	October	1	Shark control program-Released alive	-
	Gold Coast, QLD (Currumbin, Main Beach and Burleigh Heads)	-	-	November	3	Shark control program	-
	Sunshine Coast, QLD (Wurtulla)	-	-	March	2	Shark control program	-
	Sunshine Coast, QLD (Marcoola)	-	-	September	1	Shark control program	-
	Sunshine Coast	-	-	15/05/02	1	Shark control net	-
	Sydney	-	-	08/10/03	1	Shark control net	-
	Sydney	-	-	19/11/03	1	Shark control net	-
Unidentified dolphin	Sunshine Coast, QLD (Rainbow Beach)	-	-	September	1	Shark control program	-
	Rockhampton, QLD (Lammermoor)	-	-	November	Nil (1 released alive)	Shark control program-Released alive	-
Bottlenose dolphin	Tasmania	-	-	26/10/200	1	Salmonid farm	-
	Sunshine coast, QLD	-	-	January	1	Shark control program	-
	Gold Coast, QLD	-	-	April	1	Shark control program	-
	Sunshine Coast, QLD	-	-	January	1	Shark control program	-
	Tweed River, NSW	-	-	17/09/03	Nil (1 released alive)	Entangled in fishing line – cut free	-
Indo-Pacific bottlenose dolphin	SA coastline	-	-	3	unknown	Propeller strike	-
	Gold Coast, QLD	-	-	September	Nil (1 released alive)	Entangled in fishing line-Released alive	-
	SA coastline	-	-	2	unknown		-

8. Strandings

NSW: The Australian Museum: contact Sandy Ingleby (6 College St., Sydney, NSW 2010) for information on stranded cetaceans the Museum collected during the 2003 calendar year.

NSW: National Parks and Wildlife Service: contact Kelly Waples (Wildlife Management, NPWS, PO Box 1967, Hurstville NSW 2220) for information from the NPWS strandings database. This contains the date, location, outcome, autopsy details (when available) and contact personnel for 3 stranding events in NSW during 2003, involving 3 animals: Common bottlenose dolphin (n=1) and Bottlenose species (n=2).

NT: Parks and Wildlife Commission: contact Ray Chatto (PO Box 496, Palmerston NT 0831) for information on

strandings in the NT, including a dead dolphin calf in Sadgroves Creek October, dead false killer whale in Fog Bay December, large dead baleen whale in Refuge Bay June, and a small dead baleen whale in Port Essington in August.

QLD: Parks and Wildlife Service: contact Col Limpus (PO Box 155, Brisbane Albert Street, QLD 4001) for information on the collection of stranded cetaceans in QLD. The EPA oversees the collection of stranded cetaceans in the state and maintains the QLD Marine Wildlife Stranding and Mortality Database. The database summarises all records of sick, injured or dead marine wildlife reported to the Agency. An annual report is compiled for cetaceans and pinnipeds. Most reports of individual strandings are supplied by Agency and Great Barrier Reef Marine Park Authority staff, including those via a state-wide stranding hotline number. In addition to the general reporting, the database contains mortality records from the QLD Department of Primary Industries Shark Control Program.

QLD: Museums: contact Queensland Museum (PO Box 3300, South Brisbane, QLD 4101) for information on skeletal material collected from cetaceans found in QLD and sent to the Museum for preparation. Contact Peter Arnold (Museum of Tropical Queensland, 70-102 Flinders Street, Townsville, QLD 4810) for information on the heads from stranded cetaceans in the central and N Great Barrier Reef region, which are deposited in the Museum for extraction and preparation of skulls.

SA: South Australian Museum: contact Catherine Kemper (North Terrace, Adelaide, SA 5000) for information from the SA Museum cetacean stranding database. In 2003, the Museum added records of 58 stranding/entanglement events in SA to the database. These involved: unidentified bottlenose dolphin (n=8), common dolphin (n=17), unidentified dolphin (n=15), Indo-Pacific bottlenose dolphin (n=7), gray's beaked whale (n=2), strap-toothed beaked whale (n=3), pygmy sperm whale (n=2), pygmy/dwarf sperm whale (n=1), pilot whale (n=2), unidentified cetacean (n=2), sperm whale (n=1), unidentified baleen whale (n=1).

TAS: Department of Primary Industries, Water and Environment: Contact Rosemary Gales or Aleks Terauds (Nature Conservation Branch, DPIWE, PO Box 44, Hobart, TAS, 7000) for strandings data from 22 events involving 181 animals in 2003. The dataset contains information on the date, location, responsible person and the action taken, for each event. The following species stranded in TAS during 2003: sperm whale (2, n=12), southern right whale (n=1), common dolphin (4, n=9), long-finned pilot whale (2, n=120), pygmy sperm whale (n=3), dusky dolphin (2, n=2), Shepherd's beaked whale (n=1), bottlenose dolphin (5, n=28), Cuvier's beaked whale (n=1), unidentified dolphin (3, n=3), unidentified baleen whale (n=1).

VIC: Dolphin Research Institute: Contact Wendy Dunn and A Goldworthy (P.O. Box 77, Hastings, VIC 3193) for records the DRI maintains on strandings of small cetaceans reported in Port Phillip Bay and nearby ocean beaches, and the Gippsland Lakes. All measurements are collected according to standardised methods. Members of Australocetus and the Whale Ecology Group assist in collecting scientific samples from dead stranded cetaceans. All contact about incidents is referred to Museum of Victoria and VIC Department of Sustainability & Environment.

WA: Department of Conservation and Land Management: contact Peter Mawson and Christine Freegard (Locked Bag 104, Bentley Delivery Centre, WA 6983) for information from the WA strandings data set. In 29 stranding incidents, the following species stranded during 2003: Gray's beaked whale (n=8), bottlenose dolphin (n=7), long-finned (n=1) and short-finned pilot whale (n=1), strap-toothed whale (n=1), spinner dolphin (n=2), pygmy sperm whale (n=1), humpback whale (n=8), southern right whale (n=1), minke whale (n=1), sperm whale (n=9), false killer whale (n=1), melon-headed whale (n=1). C. Burton (Western Whale Research Pty Ltd) has developed a database to record both opportunistic sightings and verified strandings of blue whales in WA, which can also be used for other species.

9. Other studies and analyses

Surveys – Blue whale

Since 2000, the Blue Whale Study undertaken by the Whale Ecology Group-Southern Ocean, Deakin University has been increasingly involved with assessing the impacts of hydrocarbon seismic exploration on blue whales in the Otway Basin (VIC). Aerial surveys have been used as a mitigation measure during prescribed periods when blue whales were thought to be present, so that seismic vessels could avoid areas where blue whales occur. Aerial surveys were also used during periods when blue whales were not thought to be present, but seismic surveys were operating.

Aerial surveys in November 2003 showed that blue whales arrived in the Bonney Upwelling feeding area earlier than was predicted by previous seasons' observations. These surveys were undertaken during a seismic survey

conducted in waters south of Portland by Santos Ltd. Blue whales showed avoidance of seismic at a range of approx 20km. Aerial surveys in December 2003 covered waters to the W and S of Kangaroo Island, previously unsurveyed for blue whales. These surveys were conducted as a mitigation measure for Santos Ltd, carrying out 2D seismic exploration. Blue whales were encountered in these waters in numbers comparable to those previously observed in the Bonney Upwelling feeding area. At times, blue whales were observed to continue feeding when the seismic vessel had approached within 5km of the whales, which raised issues about the acoustic disturbance blue whales will tolerate when it occurs within preferred feeding areas and their nutritional requirements are high. See Gill *et al* (in press).

Sightings and entanglements - southern right whale

A review of southern right whale sightings and entanglements in Australia was completed (Allen and Bejder 2003).

Migratory characteristics - humpback whale

A study of migratory characteristics of humpback whales was undertaken by Forestell *et al* in 2003.

Identification - *Caperea* skeleton

Little progress has been made in describing the skeleton of this unique species (Kemper and Rommel).

Genetics – humpback whales

A paper is being developed recommending future research on the genetics of the available humpback whale samples to determine whether SA animals belong to Group IV or V populations.

Assessing interactions between dolphins, fishing and aquaculture

Since mid-2003, 2 Macquarie University PhD students, Kerstin Bilgmann and Sue Gibbs, have conducted field and laboratory studies on population genetics, diet (including isotope changes through time), behaviour and distribution of bottlenose and common dolphins in Spencer Gulf, SA. These data will be used to describe the biology of dolphins in the region as well as past and future impacts from human development: primarily aquaculture and fishing.

Mortalities and entanglements - southern right whale

3 events involving southern right whales and human activities in SA, 2001-2002, resulted in the deaths of 2 whales. A paper is in preparation summarising these and other mortalities and non-fatal incidents for SA (or Australia).

Genetics – Irrawaddy dolphin

Isabel Beasley (Tropical Environmental Studies, James Cook University), Peter Arnold and Kelly Robertson (Southwest Fisheries Centre, La Jolla) are comparing Irrawaddy dolphins from Australia and Asian countries, using morphological and molecular data.

Killer whales and human interactions

A paper has been submitted on the deaths of 2 killer whales in SA during 1999. There is evidence that human activities contributed to the deaths of at least one animal.

Biology – Indo-Pacific bottlenose dolphin

A long-term study continued on the behaviour, reproduction and movements of resident dolphins in Port River, SA.

Dolphin Trauma Group

Since 2002, the Dolphin Trauma Group (specialists in forensic science, museum, veterinarian, fisheries, wildlife and dolphin biologists) has studied the dead and injured dolphins along the W shores of Gulf St Vincent, SA. The specific aims of the group are to determine cause of death, provide adequate documentation in cases of human interaction and carry out scientific research that assists in conserving local dolphin populations.

Morphology identification - *Tursiops* taxonomy

Genetic analysis by Peter Hale (University of Queensland) confirmed that many of the animals assigned to *aduncus*

and *truncatus* on morphological grounds by Kemper are correctly identified. However, some animals have genetic information from both species and there is evidence of hybridisation. *Tursiops aduncus* and *truncatus* overlap in body length although *truncatus* is generally the larger species. Kemper will next differentiate the species on external morphology and colouration. She and Ross will also begin a review of the osteology of all Australian *Tursiops sp.*

Acoustic recording - bottlenose dolphin

This research involves a detailed comparative study of the acoustic behaviour of 2 populations of bottlenose dolphins, in Jervis Bay and Port Stephens, NSW, to determine geographic variation. The effect of vessel disturbance on the vocal and non-vocal behaviour of the dolphins is also being assessed. The investigation aims to determine if there are consistent patterns of change in vocal behaviour when dolphins are exposed to human-induced underwater noise.

Whale watching impacts – dwarf minke whale, other whale and dolphin species

In the Great Barrier Reef Marine Park, 9 permits were issued for tourist programs that included the swim-with-dwarf minke whale activity (Ribbon Reef Sector and Offshore Port Douglas Sector). Seven permits were issued for tourist programs that included whale watching activity. A Dwarf Minke Whale Tourism Monitoring Program Research Contract was established for the 2003 season (June-August). The project is analysing and evaluating whale-sighting sheets supplied by permitted operators conducting swim-with-dwarf minke whale activities within the N Marine Park, and will provide results to the tourism industry and the park Management Authority to allow any changes that may be necessary in the monitoring program and/or management of the whale-swimmer interactions.

Non-lethal research on whale diet – minke whale

A model has been developed by the AAD to compare the effectiveness of traditional versus genetic techniques of diet analysis in cetaceans, using minke whales as an example. The simulation results showed that a simple non-lethal measure of presence or absence of prey DNA in faeces provided the most accurate and precise estimator of proportional contribution of different prey types.

Behaviour and genetics – Bottlenose dolphin

A number of researchers in WA developed techniques for studying bottlenose dolphin. Behaviour and communications in Shark Bay, WA: principal researcher Dr J. Mann (Georgetown University, Washington DC, USA). Behavioural ecology of juveniles in Shark Bay, WA: Dr A. Samuels (Rice Conservation Biology Centre, Brookfield Zoo, IL, USA). Behaviour: H. Finn (Murdoch University). Genetics on WA coastline: Dr M. Krützen, Dr B. Sherwin (University of NSW). Ontology of echolocation in calves: J. Pettis (Georgetown University, Washington DC, USA). Impact of boating and human activities: L. Bejder (University of Dalhousie, Canada). Calf social development: Q. Gibson. Calf foraging strategies: B. Sargeant. Cycling females, females choice during consortship and their costs to females: J. Watson. Ecology in Cockburn Sound, WA: R. Donaldson (Murdoch University).

WA Whale Watching Industry

Data was collected from 109 licensed vessels conducting commercial whale watching in WA (for southern right and humpback whales), regarding the number of passengers and whales seen. In 2002 a total of 595 reported whale watching trips were made with a total of 16,187 passengers participating in whale watching activities from licensed vessels. 88 commercial dolphin watching licences were also issued during 2003.

Diet – Blue whale

A collaborative project between the Centre for Whale Research, Curtin University and the WA Museum, has identified *Euphausia recurva* as a prey species for pygmy blue whales in the Perth Canyon. Live specimens *E. recurva* were dip-netted from the footprint of a whale while collecting slough skin samples. The distinctive mandibles of this species were later identified in 5 separate faeces samples collected that season (Jenner *et al.*, 2002). Follows in 2003 with a high gain echo-sounder have revealed prey aggregations at depths between 300-350 m that blue whales target and swim through, apparently actively feeding.

Photo-identification and data analysis – right whale

A 4-day workshop on right whale photo-identification and data analysis in January 2004 involved 13 participants including Australian and New Zealand researchers, and participants from South Africa, the UK and the USA. The

workshop reviewed and compared, and where possible adopted, photographic matching techniques including available software/hardware solutions and data standards for Southern Hemisphere right whales, in the context of comparisons between existing Australasian catalogues. Two computer-assisted matching systems were discussed: Hiby/Lovell and Burnell/Shanahan. Recommendations were formulated, *inter alia*, on the possibility of combining the two systems, particularly to maximise the potential for comparing different catalogues of head callosity patterns.

Disentanglement – large cetaceans

During 2003, workshops continued to further the progress towards a national protocol to dealing with the disentanglement of large cetaceans. The workshops covered legislation, occupational welfare issues for staff and animal welfare issues for cetaceans, as well as cutting-edge technology that has been developed to allow for the safe and efficient disentanglement of cetaceans. A national workshop was conducted in VIC where all States participated. Additional workshops were held in SA (Port Lincoln) and TAS (Hobart).

Surveys – small cetaceans

Survey work was undertaken by Vanessa Taverney of University of Queensland together with QPWS in S Moreton Bay, QLD.

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