AUSTRALIA. PROGRESS REPORT ON CETACEAN RESEARCH, JANUARY 2001 TO DECEMBER 2001, WITH STATISTICAL DATA FOR THE CALENDAR YEAR 2001

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

This report summarises information obtained from: Australian Fisheries Management Authority, Canberra – ACT; NSW National Parks and Wildlife Service (NPWS) – NSW; NSW Fisheries – NSW; Taronga Zoo, Sydney (TZ) – NSW; The Australian Museum (AM), Sydney – NSW; The Cape Byron Whale Research Project – NSW; Pet Porpoise Pool – NSW; Department of Veterinary Anatomy, University of Sydney – NSW; Graduate School of the Environment, Macquarie University, Sydney – NSW; Oceania Project, Byron Bay – NSW; Australian Marine Mammal Research Centre, Faculty of Veterinary Science, University of Sydney – NSW; Northern Territory Parks and Wildlife Commission – NT; Queensland Parks and Wildlife Service (QPWS), Brisbane – QLD; Queensland Department of Primary Industries Shark Control Program (QDPI SCP) – QLD; Great Barrier Reef Marine Park Authority (GBRMPA), Townsville – QLD; Museum of Tropical Queensland, Townsville – QLD; Department of Tourism, James Cook University, Townsville – QLD; The Ecology Centre, University of Queensland, Brisbane – QLD; Sea World Enterprises Pty Ltd, Surfers Paradise – QLD; Queensland Museum, South Brisbane – QLD; Tropical Environmental Studies and Geography, James Cook University, Townsville – QLD; South Australian Museum , Adelaide – SA; Eubalaena Pty Ltd, Tennyson – SA; Antarctic Wildlife Research Unit, University of Tasmania – TAS; Australian Antarctic Division – TAS; Department of Primary Industries, Water and Environment (DPIWE), Hobart – TAS; School of Ecology and Environment, Deakin University, Warrnambool – VIC; Museum of Victoria, Melbourne – VIC; Australocetus Research and Deakin University, Warrnambool – VIC; Department of Natural Resources and Environment, Melbourne – VIC; Ocean Alliance – *RV Odyssey*; Western Australian Museum, Perth – WA; Centre for Whale Research, Fremantle – WA; Department of Conservation and Land Management, – WA; Centre for Marine Science and Technology, Curtin University – WA.

1. Species and stocks studied

Common name	Scientific name	Area/stock(s)	Items referred to
MYSTICETI			
Southern Right whale	*Eubalaena australis*	SA coastline, S Hemisphere	2.1, 2.1.1, 3.1.1, 3.1.3, 4.2, 5, 6.2, 8
Pygmy Right Whale	*Caperea marginata*	SA coastline	4.3, 5, 8
Humpback whale	*Megaptera novaeangliae*	Groups B, C, D, E Samoa (Group V?), Aust E coast (Group V), NW Shelf, WA (Group IV)	2.1, 2.1.1, 2.1.2, 2.2, 3.1.1, 3.1.2, 3.1.3, 4.1, 4.3, 4.4, 5, 6.2, 8, 9, 10, 11, 11.1; 11.2
Common minke whale	*Balaenoptera acutorostrata*	S Pacific, N/A, NW Shelf, WA	2.1.1
Dwarf minke whale	*Balaenoptera acutorostrata*	N Great Barrier Reef	2.1.1, 2.1.2, 3.1.1, 4.1, 4.3, 11.1, 11.2
Bryde's whale	*Balaenoptera edeni*	N/A	2.1.2, 4, 6
Blue whale	*Balaenoptera musculus*	Antarctic, Western VIC, SE Aust, S Hemisphere, N coastline, WA	2.1.1, 2.1.2, 2.2, 3.1.1, 4.1, 4.3, 6.2, 6.3, 8, 11.1
Pygmy blue whale	*Balaenoptera musculus*	S coastline, N coastline, NW Shelf, WA	2.1.1, 3.1.3, 4.1, 6.3, 9
Fin whale	*Balaenoptera physalus*	N/A	2.1.1
Southern bottlenose whale	*Hyperodon planifrons*	N/A	2.1.1
Unidentified whale		QLD coast	4.3
ODONTOCETI			
Sperm whale	*Physeter macrocephalus*	TAS, VIC, QLD coast, Samoa, NW Shelf, WA	2.1.1, 2.2, 3.1.1, 4.3, 5, 8, 9, 10, 11.1
Pygmy sperm whale	*Kogia breviceps*	SA coastline, E Aust, S Hemisphere	4.3, 5, 8
Long-finned pilot whale	*Globicephala melena*	S Hemisphere, VIC	4.3, 8

Pilot Whale	*Globicephala* sp	SA coastline	4.3, 5, 8
Southern bottlenose whale	*Hyperodon planifrons*	N/A	2.1.1
Killer whale	*Orcinus orca*	Antarctic, VIC, QLD coast	2.1.1, 4.3, 8, 11.1
False killer whale	*Pseudorca crassidens*	SE Aust, QLD coast, Samoa	2.1.1, 2.1.2, 2.2, 4.3, 6.2
Pilot whale	*Globicephala sp.*	N/A	2.1.1
Melon-headed whale	*Peponocephala electra*	S Hemisphere	6.2
Arnoux's beaked whale	*Berardius arnuxii*	N/A	2.1.1
Blainsville's beaked whale	*Mesoplodon densirostris*	S Hemisphere	4.3, 8
Hector's beaked whale	*Mesoplodon hectori*	N/A	4.3, 8
Gray's beaked whale	*Mesoplodon grayi*	N/A	8
Beaked whale	*Mesoplodon sp*	SA coastline, N/A	4.3, 5, 8
Indo-Pacific humpback dolphin	*Sousa chinensis*	QLD coast, N coastline	2.1.1, 2.1.2, 3.1.1, 4.1, 4.3, 7.1, 7.2, 11.1
Bottlenose dolphin	*Tursiops truncatus*	SA coastline, QLD coast, Aust	2.1.1, 4.2, 4.3, 5, 7.1, 8, 11.1
Indian Ocean bottlenose dolphin	*Tursiops aduncus*	QLD coast, N/A	2.1.1, 3.1.2, 4, 7.1, 8, 11.1
Bottlenose dolphin sp	*Tursiops sp.*	QLD coast	4.3, 7.1
Striped dolphin	*Stenella coeruleoalba*	N/A	8
Spinner dolphin	*Stenella coeruleoalba*	E Aust, Aust, Samoa, WA	2.1.1, 2.1.2, 2.2, 4.3, 8
Long-snouted spinner dolphin	*Stenella longirostris*	QLD coast	7.1
Common dolphin	*Delphinus delphis*	SA coastline, SE Aust, N/A, QLD coast	2.1.1, 4.2, 4.3, 5, 7.1, 8
Irrawaddy dolphin	*Orcaella brevirostris*	QLD coast, Irrawaddy River	2.1.1, 3.1.1, 4.3, 7.1, 11.1
Hourglass dolphin	*Lagenorhynchus cruciger*	N/A	2.1.1
Unidentified dolphin	Delphinidae	SA coastline, VIC, QLD coast	2.1.2, 4.2, 4.3, 8
Unidentified cetacean	Cetacea Fam Gen sp	South Australian coastline	8

2. Sightings data

2.1 Field work

2.1.1 SYSTEMATIC

Southern Ocean – various cetaceans

The Southern Ocean Cetacean Ecosystem Program (SOCEP) conducted an Antarctic voyage, combining a cetacean visual survey with the collection of biopsy samples, on board the Australian Antarctic research vessel *Aurora Australis* during January and February 2001. This was in collaboration with a fine-scale krill survey and oceanographic research. Environment Australia provided funds and holds the voyage report. D. Thiele holds all original data.

On Voyage 6, 224 cetacean sightings were made, of a total of 660 animals. Fourteen species of cetacean were seen (8 odontocete and 6 mysticete). Humpback whales were the most numerous baleen whale encountered on the voyage, both in number of sightings (n=68) and total number of animals counted (n=150). Killer whales (13 sightings / 123 individuals) and Pilot whales (5 sightings / 150 individuals) were the most numerous odontocete, while Sperm whales were sighted most often (21/22). Other species were: Arnoux's beaked whale (2/3), Blue whale (1/3), Bottlenose dolphin (1/9), Common dolphin (1/15), Fin whale (2/13), Hourglass dolphin (3/34), Minke whale (52/64), S. Bottlenose whale (8/14), Sei whale (2/2), S. Right whale (2/5). There were also 41 groups of unidentified cetaceans (53 animals in total).

The *RSV Aurora Australis* departed Hobart, TAS on 1 January 2001 on a course for Cape Darnley, Antarctica. From 1-9 January, when the ship reached 60°S, researchers made 20 cetacean sightings. Twelve of these occurred on 9 January, when 36 whales were counted (Minke, Fin, Humpback, and Arnoux's beaked whales). From 60°S to the beginning of the KACTAS grid, 10-14 January, 32 sightings were made. One of these was a group of 60 Long-finned pilot whales, while the others included Minke, Humpback, and Sperm whales totalling 52 individuals.

There were two areas of special interest from the voyage: the KACTAS grid near the Mawson coast (15-23 January), and the transit east to Casey (26 January - 1 February). In the grid, 38 sightings (64 individuals) were made of 7 species (Arnoux's beaked, Blue, Fin, Humpback, Minke, Southern bottlenose, and Sperm whale). There was no obvious correlation between whale sightings and bathymetry or krill aggregations (personal communication/ observations). However, these data will be used in further analyses to determine the demography, or critical habitat (biotic and abiotic features) for cetaceans around Antarctica. On the transit east to Casey (26 January – 1 February), while the vessel maintained a course at or near the ice edge, 62 sightings of 138 individuals were made: Humpback (27 sightings/53 whales), Minke, Killer (5/52), Sperm and Southern bottlenose whales. Of particular note was that from 29-30 January, 20 observers logged sightings of 39 Humpback whales. Skin and blubber biopsy samples were taken from three Humpback whales.

The next leg of the voyage was from Casey, with krill acoustic work along the way, to the Amery Ice Shelf for the AMISOR work (2-12 February). On the way to the Amery, 32 sightings of 82 whales were logged. Minke whales were the most frequently sighted (n=13). Humpback (n=6), Killer (n=5), Southern bottlenose (n=5), Sei and Sperm whales were also seen. During this route, the ship spent more time within pack ice than on the previous parts of the voyage, and thus there was a subsequent increase in both Minke and Killer whale sightings.

The AMISOR work, transiting the face of the Amery Ice Shelf, with CTD and mooring deployment stations, lasted from 13-20 February. The only confirmed sightings made during this time were of Minke (5/6), Killer (2/24) and Sei (1/1) whales. This area contained no pack ice, and was virtually open water, save the numerous icebergs from the Shelf. The route from the Amery to Davis (21-25 February) took the ship northwest towards Cape Darnley / Higg's Hill, through rough weather. The only confirmed species seen were two Minke whales.

The *Aurora Australis* departed Davis Base on 26 February. On the eve of departure, a single sighting of 7 Killer whales was made in pack ice, before the weather turned rough and hindered observations except for 2 and 3 February. In this short period of time, while the ship was between 62 and 60°S, there were 25 sightings. Humpback whales were the most common sighting (11/22). Three sightings of Pilot whales (n=85) were made, as were 3 sightings of 3 Sperm Whales, and 2 sightings of 21 Hourglass Dolphins. Most noteworthy were 2 sightings made of 5 Southern Right Whales near 60 and 62°S. Southern Right whales have not been sighted frequently in the past in this area, and photo-identification pictures were taken of the callosity pattern on the heads of 3 of the whales.

Cape Byron, NSW – Humpback whale

Under NPWS Licence and Environment Australia permit, the Cape Byron Whale Research Project continued during 2001. This study of the migration patterns, distribution, abundance and behaviour of Humpback whales was undertaken from and off Cape Byron, northern NSW. There are three aspects to the research 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 individual animals from fluke and lateral body colouration patterns and markings (and the opportunistic collection of skin samples from sloughed skin for DNA analysis);
3. Acoustic monitoring of whales passing Cape Byron.

The bulk of the research project was conducted between 23 June and 8 July 2002. This coincides with the timing of the peak recorded catch by the Byron Bay whaling station, which closed in 1962.

Summary results for the 14 days on the water in 2001:

Survey hours	# Pods	# Whales	# Adults	# SubAd	# Calfs	# Unkown	Skin samples (sloughed)	Av pod size
106.44	72	154	101	48	1	4	145	2.14

Summary results for 16 days of land-based data collection in 2001:

Date	Survey hours	# Pods	# Whales	Av Pod Size	Av Distance off shore (M)	Av pod speed (Kn)
23 June – 8 July 2001	141:10	344	573	1.67	4172.73	3.33

The research group is in the process of selecting and analysing Humpback identification photographs, to compare with previous years. A full assessment and record of life histories of the known animals is still under way. An Honours student at Southern Cross University is currently scanning all photo identification images and compiling a digital catalogue to allow easier analysis of images. A full analysis will be completed by December 2002.

SCCWR conducted acoustic recordings of Humpbacks off Cape Byron, NSW at the same time, as part of its long-term study of Humpback acoustics.

Port Stephens, NSW – Bottlenose dolphin

A research project on the impacts of vessels on Bottlenose dolphins, with the collaboration of the NSW National Parks and Wildlife Service and Macquarie University, continued in 2001. Since 1999, the project has involved:

- Collecting baseline scientific data on cetaceans in and around Port Stephens;
- Assessing the impacts of commercial and recreational vessels on cetaceans in and around Port Stephens;
- Photo-identification to identify individual animals using fluke and lateral body coloration and markings.

Jervis Bay and Port Stephens, NSW – Bottlenose dolphin

A PhD student from Macquarie University continued a research project on the social structure and dynamics of Bottlenose dolphins in Jervis Bay and Port Stephens, which has been underway since 1997. The project involves:

- Investigating group size, composition and stability in relation to behaviour, kinship and gender;
- Assessing genetic relatedness within same-sex individuals and between sexes;
- Investigating individual site fidelity and habitat use; and
- Comparing the social behaviour of Bottlenose dolphins between Jervis Bay and Port Stephens and identifying possible ecological and social factors explaining observed differences and similarities.

Another ongoing research project in the area by a PhD student at Macquarie University involves a detailed comparative study of the acoustic behaviour of two populations of Bottlenose dolphins, located in Jervis Bay and Port Stephens, NSW, to determine the presence of geographic variation and call evolution. In addition, the project assessed the effect of vessel disturbance on the vocal and non-vocal behaviour of the dolphins. The investigation aims to determine whether there are consistent patterns of change in their vocal behaviour when dolphins are exposed to known sources of human-induced underwater noise.

The acoustic recording project involves:

- Comparative investigation of geographic variation in dolphin vocalisations (Jervis Bay / Port Stephens);
- Effects of anthropogenic disturbance on dolphin vocalisations;
- Opportunistic photo identification of the dolphins in both areas.

The distribution surveys are randomly stratified surveys of Jervis Bay, made in conjunction with Jervis Bay Marine Park.

E. Cape Solander, NSW – Humpback whale

NPWS supported land-based sighting survey of Humpback whales on their northern migration.

Northern Great Barrier Reef, QLD – Dwarf minke whale

P.W. Arnold and R.A. Birtles conducted a six-week field season in the Cairns section of the Great Barrier Reef Marine Park on the dive vessel *Undersea Explorer* from 9 June to 20 July 2001. The research team had 72 encounters with 191 Dwarf minke whales. These were documented by approximately 2000 slides or digital still photographs and around 10 hours of digital video, all primarily taken underwater. Re-sightings included an individual seen in 1999. The researchers collected sloughed skin samples, which are yet to be analysed. *Undersea Explorer* staff documented an additional 4 encounters with 12 Dwarf minke whales from 24 May to 8 June 2001.

Hervey Bay, QLD – Humpback whale

In 2001, the Oceania Research Project conducted a Humpback whale survey in the Hervey Bay Whale Management & Monitoring Area within the Hervey Bay Marine Park (specifically the area within and bounded by Rooneys Point, Fairway Buoy, Coongul Creek and the west coast of Fraser Island). The fieldwork is for a long-term study of abundance, distribution and behaviour of the Humpbacks in Hervey Bay, being undertaken in conjunction and collaboration with the Queensland Environment Protection Agency (QEPA).

Effort involved 10 weeks of fieldwork, 60 working days, from 12 August to 19 October 2001. Researchers conducted the survey from a 12-metre vessel, 6 days each week: 7am to 5pm Sunday to Thursday and 7am to 1pm Friday. This

effort led to 947 Humpback sightings and the collection of 4621 photographs, 13 hours of DV video and 2 hours of DAT whalesong recordings.

The Oceania Project conducted systematic observation of pods including numbers, composition &behaviour. Photography of ventral flukes, lateral body colouration patterns and left and right dorsals were obtained as well as video of behaviour and samples of whalesong. Documentation includes GPS positions, time, date, behaviour and observation notes. W. and P. Franklin will submit a comprehensive Field Report to the QEPA:
The Oceania Research Project - A ten-year study (1992-2001) of the Abundance, Distribution and Behaviour of Humpback Whales in the Hervey Bay Marine Park, Queensland Australia - Field Report Year 10 -2001.

North Stradbroke Island, QLD – Humpback whale

R. and P. Paterson continued their long-term study of the east Australian Humpback whale population (Area V) from Point Lookout, North Stradbroke Island in 2001. This study began in 1978. Observations were carried out for five days per week from 31 May to 3 August. A total of 1018 humpback whales were seen and the population continues to increase at ~11%p.a. as recently reported (Paterson et al., 2001). Further information is available from the Queensland Museum.

South East QLD – Indo-Pacific humpback dolphin

P. Hale of the University of Queensland continued dedicated boat-based surveys in SE QLD, specifically in Moreton Bay and the Great Sandy Strait, with the aim of gathering data on the population ecology of the Indo-Pacific humpback dolphin. The project has collected photographs for identification purposes, and slough skin samples. At present, 100 individuals have been identified in Moreton Bay and approximately 40 in the Great Sandy Strait.

Central Great Barrier Reef Marine Park, QLD – Irrawaddy and Indo-Pacific humpback dolphin

G. Parra of James Cook University conducted a fieldwork season of research on the ecology and conservation biology of Irrawaddy and Indo-Pacific humpback dolphins in the central section of the Great Barrier Reef Marine Park in 2001. This project uses a combination of boat-based surveys, photo-identification techniques, focal behavioural observations, stomach sample analysis and GIS, to gain information on the ecology of both species throughout the central section of the Park. The project is in its last fieldwork season and results have not yet been fully analysed.

Head of the Bight, SA – Southern Right whale

Eubalaena Pty Ltd conducted shore-based surveys of Southern Right whale numbers and distribution at the Head of the Great Australian Bight aggregation area, SA. Further details are available from S. Burnell.

Western VIC – Blue whale

Australocetus Research / Deakin University, Warrnambool, VIC carried out one short period of yacht-based research and 12 aerial surveys in 2001:

Sightings source	No of sightings	No of Blue whales
All boats	3	3
Aerial surveys (12)	83	128
Total	86	131

Southern WA and SA – Southern Right whale

J. Bannister (Western Australia Museum, Perth WA) conducted his annual program of aerial survey for Southern Right whales off the southern coastline of Australia in 2001. As in past years, flights took place close inshore between C Leeuwin, WA, and Ceduna, SA where the majority of the "Australian" population seems to approach the coast in winter/spring: cows about to give birth, at an average of every three years, and others, which appear less predictably.

Two "short" flights, 31 July-02 August and 24-26 October, between C Leeuwin and Twilight Cove, WA, continued the series of flights that have taken place on the southern WA coast since 1976. A "long" flight, on 13-17 September between C Leeuwin, WA and Ceduna, SA continued the series extended along the southern Australian coast from 1993. An additional leg, on the west coast between C Leeuwin and Perth, was flown on 13 September. The flights provided counts and identifying photographs, with an emphasis on the latter on the "short" flights and on the former

on the "long" flight.

Usual concentrations, mainly but not exclusively, of cows accompanied by calves of the year, were encountered at Doubtful I Bay (WA), in and east of Israelite Bay (WA), and at Head of the Bight (SA). Overall numbers recorded (414 animals including 133 calves) were higher than in any previous year (1998: 338 including 108 calves). Significant positive increase rates continue to be obtained for a number of combinations of time series, animal classes and subareas. That for cow/calf pairs is now significant at the 5% level (9.89%, p=0.012) but it remains somewhat higher than that recorded for other Southern Hemisphere populations (South Africa, eastern South America, at ca 7%). The 95% CI is also wide (2.98-16.81) in line with a 1997 power analysis indicating the need for a time series to 2007 to provide a reliable result.

The survey obtained some 181 identifying photographs. A computerised matching system, allied with a computerised database, is now being implemented to compare photographs available from 1980-1995 with those from 1996-2001. Some 3400 scanned images are now available for use in that program. Population size for that part of the "Australian" population visiting the area surveyed is estimated to be 1200-1300 animals.

Rottnest Island, southern WA – Blue whale

The WA Museum reports that a series of monthly survey flights for Blue whales, begun in 1999, in an area *ca* 20nm west of Rottnest Island, WA where up to five Blue whales per day had been sighted on the Japan/IWC sightings cruise in December 1995 is due for completion in May 2002.

Contrary to expectations, only one Blue whale was seen on the surveys (conducted under the field leadership of C. Burton) between February 1999 and January 2000, though only 8 flights were completed through vagaries of weather, availability of aircraft and of observers. However, in February 2000, two flights recorded a total of 15 Blue whales. With the small number of sightings, no conclusions on seasonal distribution or abundance of this species were possible. Continuation of the programme in 2000-2001 gave more positive results.

Observers aboard one flight in February 2001 saw 14 Blue whales, and during 30 days of boat-based operations in the same area, in January-March 2001, there were 75 Blue whale sightings, including 5 calves (although some are likely to have been repeat sightings). The largest daily count from the boat was 12, including one calf. Only a small number of sightings has been recorded in 2001-2002. The boat-based operations (undertaken by C. and M-N. Jenner, Centre for Whale Research, WA), designed to provide identification photographs of individuals, and skin samples for genetic studies, continued in December 2001 and are due for completion in April 2002. Thus far, as with the aerial surveys, only small numbers of animals have been recorded.

The project is now being carried out in conjunction with a comprehensive programme of aerial survey and boat work (to include photoidentification, biopsy sampling and satellite telemetry, begun in December 2001, and (at least for aerial survey) covering a wide area of the west coast between C Naturaliste in the south and Lancelin in the north. That program is the responsibility of a group of agencies, comprising Curtin University, the Centre for Whale Research and the Western Australian Museum, under contract to the Australian Navy. Parallel acoustic studies have been conducted in the area (by R McCauley, Centre for Marine Science and Technology, Curtin University, WA), mainly using automatic "loggers" that record underwater sounds over a period, but also from hydrophones deployed opportunistically during the boat-based operations. Even in the absence of sightings, many records of sounds probably attributable to Blue Whales were obtained during February-April 2000. However, these possibly originated from animals outside visual range of the boat or aircraft. Boat-based opportunistic sound recording continued during 2001, with 76 records obtained from early January to mid-March.

The results so far suggest that the occurrence of Blue whales in the area is most probably linked to the presence of their food (small planktonic shrimp-like crustaceans), itself dependent on oceanographic conditions, which in this area can be very variable. At the time of year of the major occurrence so far of blue whales in the area (mid-late summer) most if not all the sightings are likely to have been Pygmy blues.

Southern WA – Sperm whale

Ocean Alliance, aboard RV *Odyssey*, completed Leg 1 of the Australian segment of its five-year program to gather baseline data on synthetic contaminates throughout the world's oceans, using Sperm whales as a bio-indicator species, from 27 December 2001 to 5 January 2002. The Odyssey departed from and returned to Fremantle, WA. Under permit from Environment Australia, the objectives of this expedition were to collect biopsy samples, identification photographs and acoustic recordings from Sperm whales.

The *Odyssey* maintained a visual watch during daylight hours and recorded all marine mammal sightings in the computerised database Logger 2000 v.2.03. The crew also recorded sea-surface temperature, weather conditions and navigation data. Two acoustic arrays towed off the stern also monitored audible Sperm whale clicks in a listening range of 3-10 nm. Acoustic contacts with cetaceans were regularly entered into the Logger system.

North West WA – Humpback whale

The Centre for Whale Research carried out a series of 28 aerial surveys and 31 small boat surveys in June – November, 2000 and 2001. Surveys were conducted at roughly 10 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 a 1934 humpback whales in 1291 pods were sighted. Peak numbers of whales were sighted during the last week of August. Some 25% of the pods sighted were inside Exmouth Gulf. Peak numbers of cow/calf pods utilise Exmouth Gulf as a resting area approximately 4 weeks later than the main migratory herd's peak off the W side of the Cape. The majority of pods (63%, 604/958) sighted W of the Cape were in water less than 300m deep (surveys extended to 1500m).

Other species sighted were Pilot whales (n=45), Pygmy blue whales (n=32), Minke whales (n=32), Sperm whales (n=12), False killer whales (n=12).

Independent Samoa – various cetaceans

In October 2001, the Southern Cross Centre for Whale Research (SCCWR), based at Southern Cross University, NSW, and funded by Environment Australia, conducted the acoustic part of a combined visual/acoustic survey of cetaceans in the waters of Independent Samoa. Researchers based their survey on transects in a small boat with hourly recordings. Species heard included Humpback Whales, Sperm Whales, unknown mysticetes (Bryde's whales?), Spinner dolphins, and False killer whales. Species seen included Humpbacks, Spinner dolphins and False killer whales. More details of sightings are available from D. Paton.

2.1.2 OPPORTUNISTIC, PLATFORMS OF OPPORTUNITY

Commonwealth waters

AFMA fisheries observers aboard commercial fishing vessels recorded the following sightings in 2001.*

Species	Date	Location	Number	Vessel type	Interaction with fishing gear	Comments
Sperm whale	12/06/01	41S 144E	2	Longline	No	Maybe 1 calf too
Dolphin	12/06/01	41S 144E	4	Longline	No	Small common dolphins swimming steadily
Bottle-nose dolphin	20/12/01	33S 152E	22	Longline	No	2.5-3metres breaching, swimming
Humpback	17/11/01	32S 152E	1	Longline	No	4 metres, swimming
Humpback	17/11/01	31S 152E	1	Longline	No	8 metres, swimming
Pilot whale	25/01/01	33S 155E	4	Longline	No	Approx. 2 metres, swimming steadily
Humpback	28/11/01	36S 150E	2	Longline	No	Adult and calf, swimming steadily
Humpback (?)	18/01/01	36S 150E	2	Longline	No	12 and 8 metres, stationary
Humpback	30/10/01	30S 153E	2	Longline	No	Splashing
Humpback	02/11/01	33S 45E	2	Longline	No	Adult and calf, breaching / swimming
Orca	11/09/01	HIMI Fishery	1	Trawl	No	Swimming, looking
Pygmy blue	21/11/01	Lakes Entrance, VIC	1	N/A	No	23-27 metres, Dead
Sperm whales	27/06/01 - 03/07/01	Deepwater Trawl, TAS	2	Trawl	No	
Humpback	18/02/01	36S 150E	1	longline	No	Swimming steadily

* In 2001, AFMA fisheries observers were on board all commercial fishing trips to the Heard Island and McDonald Islands Fishery (sub Antarctic); all commercial fishing trips to the Macquarie Island Fishery (sub Antarctic); one fishing trip to the Antarctic sub-continent (CCAMLR Statistical Division 58.4.2), which included transiting CCAMLR Statistical Division 58.4.1; some fishing voyages to the Indian Ocean high seas by Australian vessels; one trawl fishing operation on the South Tasman Rise, external to the Australian EEZ; vessels trawl fishing for blue grenadier off the west coast of Tasmania; 1 fishing trip to Cocos-Keeling Islands; 3 fishing trips to Norfolk Island; 3 fishing trips to Lord Howe Island; and approximately 8 fishing trips to the East Coast Tuna fishing grounds.

New South Whales

Numerous sightings of cetacean species occur each year on an opportunistic basis along the S coast of NSW. These come to the attention of the NSW NPWS. Species sighted in 2001 included over 500 sightings of Humpback Whales and numerous sightings of Blue, Minke, Bryde's, Killer, False killer, Pilot and Southern Right whales.

Further, one animal, identified as either a juvenile Minke or a Dwarf minke, was sighted in Sydney Harbour on 9 August 2001.

Queensland

A. Dunstan (from the platform of opportunity provided by *Undersea Explorer*) continues his studies on field measurements of Dwarf minke whales in the Northern Great Barrier Reef using underwater digital video and a portable high frequency underwater rangefinder. This is reported in

Birtles, R.A., P. Arnold, M. Curnock, P. Valentine and A. Dunstan, 2001. Developing ecologically sustainable dwarf minke whale tourism (1999-2001). Final Report to the Commonwealth Department of Environment and Heritage (Environment Australia), November 2001. 44 pp. + 16 Appendices.

The Oceania Research Project has completed the analysis of Humpback whale photographs from 1996 to 2000 in Hervey Bay, and analysis for 1994/95 and 2001 is in progress. Analysis includes identifying resights within and between season and review of pod composition. The Oceania Project is also developing a web-based fluke catalogue. A dataset for the period 1996/2001, which is being prepared, will be a basis for mark/recapture estimates of abundance.

Summary of Oceania Research Project photography, 1994-2001:

Year	whales sighted	photographs obtained
1994	307	1293
1995	345	1015
1996	371	6456
1997	672	5148
1998	919	5220
1999	925	4896
2000	805	3528
2001	947	4621

Under the terms of the Hervey Bay Marine Park Zoning Plan 1989, Queensland Parks and Wildlife Service implemented a Humpback whale compliance-monitoring program. The program involves the collection of data by both QPWS staff and commercial whale-watching operators in the Hervey Bay Marine Park.

For the past five years, QPWS has collected opportunistic data while on patrol in Hervey Bay Marine Park. The data is stored in both hard copy and as an electronic spreadsheet. The fields of data include:

- Time;
- Pod position (latitude and longitude);
- Water temperature and depth;
- Pod configuration – number of adults, sub-adults and calves;
- Pod activity/behaviour – i.e. breach, pectoral slap, fluke slap, spy hop, mugging, direction travelling, mother-calf feeding, other;
- Vessels present – commercial and recreational.

Since 1990, commercial operators have collected daily spatial and temporal pod sightings data. QPWS use these data to calculate vessel/pod interactions and an encounter ratio, and to monitor the temporal and spatial use of Hervey Bay by commercial whale watching vessels.

Tasmania

Opportunistic sightings made off the coast of TAS and reported to the Department of Primary Industries, Water and Environment or the Parks and Wildlife Service are recorded in a database available from: Nature Conservation Branch (Marine), Department of Primary Industries, Water and Environment, PO Box 44a, Hobart TAS 7000. In 2001, the Department added 12 sightings of more than twenty five whales in total: Southern Right whale (n=12), Humpback whale (n=7), Killer whale (n=5 + pod), Pilot whale (n=1). There were also over thirty dolphin sightings (ca 800 individuals): 9 bottlenose sightings; 23 common dolphin sightings.

Southern Ocean – Killer whale

Opportunistic sightings of killer whales are still being collated for the Southern Oceans Orca Database, particularly from expeditioners on sub-Antarctic Macquarie Island. Records are also being sought from institutions around Australia. For further information, contact M. Morrice, Southern Oceans Orca Database, School of Ecology and Environment, Deakin University, PO Box 423, VIC 3280.

Western Australia

Ocean Alliance recorded sightings of 1 Spinner dolphin and 1 unidentified dolphin off the S coast of WA during Leg 1 of the Australian segment of the Journey of the Odyssey.

2.2 Analyses/development of techniques

Acoustics – Humpback whale

Southern Cross Centre for Whale Research (SCCWR) continued to analyse 1997 data from song and behavioural observations of Humpback Whales off East Australia (part of a PhD thesis). Analyses suggest that:

(a) singing does not promote spacing between singers,
(b) many aspects of the behavioural ecology of humpbacks during migration (including singing) are similar to those of the breeding grounds,
(c) females may attract singing males using surface-generated sounds.

Further, brief analyses of Humpback whale songs off Samoa by SCCWR revealed some similarities to east Australian song in the same year.

The combined use of acoustics and visual observations by SCCWR proved to be a very successful technique, as cetaceans were heard on approximately 80% of hourly listening stops while sightings of cetaceans were scarce.

Genetics – Bottlenose dolphin

L. Moller completed a Macquarie University PhD thesis in May 2001, which further developed techniques for biopsy darting and analysis of genetic relatedness of Bottlenose Dolphin.

Movements and GIS – Humpback whale, Dolphin

During 2001, Newcastle University in conjunction with the Cape Byron Whale Research Project developed a GIS package to analyse the movements of marine mammals. This package has been trialled on Humpback whale movements (off Cape Byron, NSW) and on dolphin and vessel movements (in and around Port Stephens, NSW). The following is an abstract of a paper, which E. Kniest and D. Paton are developing in relation to the GIS package:

> *Classic GIS systems are insufficient in dealing with temporal data, such as that collected when positioning whale or dolphin pods, which are constantly on the move. As part of the Cape Byron Whale Research Project, a temporal GIS system called ŒCyclops GIS, is being developed to make better use of such data collected by theodolite tracking systems. This temporal GIS system can make the study of marine mammal behaviour, such as the interaction with other mammals or vessels, easier and much more efficient. For example, the behaviour of a whale pod can be closely examined as a vessel approaches over a period of time. Changes in the pod's behaviour, speed and course can be monitored at timed intervals, along with the critical distance between subjects. This GIS system adds a valuable additional function to the theodolite tracking system ŒCyclops. ŒCyclops GIS also contains most of the main features of traditional GIS systems without the complex user interface and set-up procedures, since most data is directly imported from ŒCyclops. Both ŒCyclops and ŒCyclops GIS have been developed as part of a continuing marine mammal research program and are freely available to researchers.*

Sightings data – Southern Right whale

Eubalaena Pty Ltd continued its annual compilation of Southern Right whale sightings data in SA and development of a GIS system.

Pollutants and dietary data – Sperm whale

The Antarctic Wildlife Research Unit at the University of Tasmania completed analysis of demographic data, pollutant concentrations and distributions, and dietary data for sperm whales.

Ecosystem dynamics – Blue whale

Research by Australocetus Research / Deakin University, Warrnambool, during 2001 focused on ecosystem dynamics, particularly on the dynamics and mechanics of the Bonney Coast upwelling system, as well as on systematic sightings surveys for blue whales and krill. Analysis is ongoing and will form part of a PhD thesis to be completed during 2002.

Photoidentification – Humpback whale

C. Burton and staff from the WA Department of Conservation and Land Management developed techniques for photo identification of Humpback whales off the Perth coast during the commercial whale watch season. Analysis of humpback whale data from an aerial survey undertaken in 1999 is now complete, within the context of earlier surveys (Bannister and Hedley 2001). From 1976 to 1994, aerial surveys of Southern Hemisphere "Group IV" Humpback whales (wintering off the coast of WA and summering in the Antarctic between *ca* 80ºE and 120ºE) provided relative abundance indices off the WA coast. They demonstrated a high rate of population increase, at least between 1982 and 1991, of *ca* 10% per year.

The surveys were flown over 10 "good" days in mid-July on northward migrating animals in an area off Shark Bay, WA, where Humpback whales were taken in the last years of Australian Humpback whaling, to 1963. The 1994 survey, taking into account animals apparently "staging" in the northern part of Shark Bay, confirmed the increase rate. 1994 population size, based on a comparison of sighting rates from the commercial whale spotting aircraft in 1963 and the aerial surveys, was estimated as *ca* 4000. A further survey in 1999, which planned to obtain an estimate of absolute abundance, was considerably affected by poor weather (only 15 "good" days' flying were possible out of 30 planned over a two-month period). Researchers reviewed reported increase rate and population estimates for this population in the Antarctic, as well as preliminary Southern Hemisphere population estimates that take account of much larger than officially reported catches in the 1950s-60s.

Further, the Western Australian Humpback Whale Sightings database was developed as a computerised aid to matching Humpback whale fluke and lateral body ID photos. A total of 4735 images of 2251 whales have been searched from the CWR 1990-1998 catalogue. 141 resights have been found (67 intra season and 74 intra season), resulting in a catalogue of 2110 individual whales.

3. Marking data

3.1 Field work

3.1.1 NATURAL MARKING DATA

Species	Feature	Area/stock	Calendar year/season/ no. photographed	Catalogued (Y/N)	Catalogue total	Contact person/institute
Blue whale	Flank	S Aust, WA	2001	Y	16	P. Gill / Australocetus
	Lateral body	Off Rottnest I, WA	Fieldwork under way	N	-	J. Bannister / WA Museum, C. Jenner / Centre for Whale Research, WA
Humpback whale	Fluke	E Aust, QLD	2001		1	P. Hale / University of Queensland, D. Paton / Southern Cross University
	Fluke	Hervey Bay Group V	2001 /Aug-Oct/ 947	In progress	4572 (1992-2001)	W&P Franklin / the Oceania Project

	Left & right dorsal	Hervey Bay Group V	2001 /Aug-Oct/ 947	In progress	4572 (1992-2001)	W&P Franklin / the Oceania Project
	Left & right lateral	Hervey Bay Group V	2001 /Aug-Oct/ 947	In progress	4572 (1992-2001)	W&P Franklin / the Oceania Project
	Laterals	Area IV	2001/00-01 season/12	Y	?	IWC, D Thiele / SOCEP
	Fluke**	Group V	2001	Y		D. Paton / Southern Cross University, C. Jenner / Centre for
	Fluke	WA	1990/2001	Y to 1998	1283	C&M Jenner / Centre for Whale Research
	Left Lateral Body	WA	1990/2001	Y to 1998	1661	C&M Jenner / Centre for Whale Research
	Right Lateral Body	WA	1990/2001	Y to 1998	1682	C&M Jenner / Centre for Whale Research
	Sex ID	WA	1990/2001	Y to 1998	23	C&M Jenner / Centre for Whale Research
Southern Right whale	Callosities	Head of Bight, SA	2001/ Approx. 80	Ongoing	>400	S. Burnell / Eubalaena Pty Ltd*
	Head	Area IV	2001/00-01 season/1	Y	?	S Burnell, D Thiele*
		Area IV	2001/00-01 season	Y	?	WA Museum
Dwarf minke whale		N Great Barrier Reef, QLD	2001 / June-July / 50	In progress	50	A. Birtles / Dept of Tourism, James Cook University
Sperm whale	Dorsal area, Fluke	Off WA	2001 / ?	In progress	?	Ocean Alliance / H. Whitehead, Dalhousie University
Bottlenose dolphin	Dorsal fin***	Port Stephens, NSW	2001			L. Moller, S. Allen / GSE, Macquarie University
	Dorsal Fin***	Jervis Bay, NSW	2001			M. Lemon, GSE / Macquarie University
Indo-Pacific humpback dolphin	Left & right lateral body markings	Moreton Bay & Great Sandy Strait, QLD	To date / ? / 150	Y	150	P. Hale / Ecology Centre, University of Queensland
	Dorsal surface	Cleveland Bay, QLD	1999/summer/winter 2000/summer/winter 2001/summer/winter	Y Y Y	37 48 50	G. Parra / TESG, James Cook University
Irrawaddy dolphin	Dorsal surface	Cleveland Bay, QLD	1999/summer/winter 2000/summer/winter 2001/summer/winter	Y Y Y	38 58 64	G. Parra / TESG, James Cook University

* Natural markings for Humpbacks are in the form of photographs and digital video records and include right and left lateral/dorsal views. Only one photograph of callosities on one Southern Right whale was collected.

** Data currently being analysed.
*** Opportunistic photo identification.

3.1.2. ARTIFICIAL MARKING DATA

Bottlenose dolphin

QPWS branded and released alive one stranded Bottlenose dolphin on the Gold Coast, QLD. The event was fully archived. Further information is available from C. Limpus, QPWS.

Humpback whale

See section 6.2 - Humpback whale with rope wrapped around tail.

3.1.3 TELEMETRY DATA

Species	Tag type	No. successfully deployed	Maximum time transmitting	Contact person/institute
Humpback whale	Satellite	2	16 hours	C Jenner / Centre for Whale Reseach, N.Gales / Australian Antarctic Division
Pygmy blue whale	Satellite	1	7 days	C Jenner / CWR, N.Gales / AAD

3.2 Analyses/development of techniques

S. Burnell of Eubalaena continued analysis of sightings and movement data, while cataloguing and matching continues. See Burnell (2001) and Burnell and Shanahan (2001).

4. Tissue/biological samples collected

4.1 Biopsy samples

Species	Area/stock	Calendar year/ season no. collected	Archived (Y/N)	No. analysed	Total holdings	Contact person/institute
Humpback whale	Group D/E	2001/cy00_01/ 3	Y		3	C.S. Baker, D. Thiele
	Area V	145	Y	145	To be confirmed	D. Paton / Southern Cross University*
	Group V / Hervey Bay	2000 / 140 2001 / 287	Y	0	427	W&P Franklin / the Oceania Project
Blue whale	Off WA	field work under way	N	-	34 skin samples and sloughed skin	J. Bannister / WA Museum, C. Jenner / Centre for Whale Research, WA
Dwarf minke whale	N Great Barrier Reef	To date	Y	0	16	A. Birtles / Dept of Tourism, James Cook University
Sperm whale	Off WA	2001 / 9	Y	?	Skin and blubber	R. Clark, Ocean Alliance**
Bottlenose dolphin	Port Stephens, NSW	2001 / ?	?	?	Biopsy samples	NSW NPWS
Short-beaked common dolphin	SA coastline	2001/1	Y	1	Genetic tissue, reproductives, toxins	C. Kemper / SA Museum*
Bottlenose dolphin	SA coastline	2001/2	Y	2	Genetic tissue, reproductives, toxins	C. Kemper / SA Museum
Southern Right whale	SA coastline	2001/2	Y	2	Genetic tissue, reproductives, toxins	C. Kemper / SA Museum
Short-beaked common dolphin	SA coastline	2001/1	Y	1	Genetic tissue, reproductives, toxins	C. Kemper / SA Museum

Indo-Pacific humpback dolphin	Aust	To date	Y	?	40	P. Hale / University of Queensland

* The Southern Cross University collected 145 Humpback sloughed skin samples from Byron Bay during 2001. Using a genetic procedure known as microsatellite genotyping these samples were individually identified. 21 samples, however, were unable to produce enough accurate identifying information, due to poor amplification of the microsatellite genotypes. Such poor amplification can be attributed to the use of poorly designed standard microsatellite primers. Re-design of these primers is currently underway in order to produce more accurate microsatellite genotypes in future studies. 124 sloughed skin samples from research in Byron Bay in 2001 were positively identified using microsatellite genotyping. 56 of these samples were identified as individuals, while the remaining 68 samples were duplicates collected from the 56 identified individuals.

** Ocean Alliance, aboard RV *Odyssey*, collected Sperm whale biopsy samples off the WA coast from an 8m platform that aims to minimise the potential disturbance to the whales. The platform allows biopsy samples to be taken while the vessel is parallel to the animal rather than behind, which Ocean Alliance believes increases the probability of obtaining a successful sample. The specific experiments to be conducted on the samples were: genetics, chemistry/toxicology, stable isotopes (skin and blubber), dosing / protein studies, mRNA.

*** The SA samples include: entanglement possible / probable – for example, animals with net marks/injuries and/or that have had flippers or flukes removed, and full stomachs and sometimes food in the oesophagus, suggesting a sudden death; entangled in tuna farm anti-predator net, entanglement in other types of net or line, accidental or intentional injury by humans for example, boat strike, shooting, stabbing.

4.2 Samples from directed catches or bycatches

Nil to report.

4.3 Samples from stranded animals

Species	Area/stock	Calendar year/ season total	Archived (Y/N)	Tissue type(s)*	Contact person/institute
NSW					
Pygmy Sperm whale	E Aust	2	Y	liver, heart, kidney, muscle	S. Ingleby / AM
Striped dolphin	E Aust	1	Y	liver, heart, kidney, muscle	S. Ingleby / AM
Minke whale	E Aust	1	Y	Skin	Denis O'Meally / AM
Bryde's whale	E Aust	1	Y	Skin	Denis O'Meally / AM
Bottlenose dolphin	Ballina, NSW	1	Y	Skin, blubber, liver, kidney, muscle	Wendy Blanshard, Sea World
NT					
Sperm whale	N Aust	1		Rib bone	Museum and Art Galleries of the NT, Darwin
SA					
Short-beaked common dolphin	SA coastline	2001/17	Y	Genetic tissues, reproductives, stomach and intestines, toxic contaminants	C. Kemper / SA Museum
Bottlenose dolphin	SA coastline	2001/21	Y	Genetic tissues, reproductives, stomach and intestines, toxic contaminants	C. Kemper / SA Museum

dolphin	SA coastline	2001/1	Y	none	C. Kemper / SA Museum
Beaked whale (*Mesoplodon* sp.)	SA coastline	2001/1	Y	Genetic tissues, toxic contaminants, reproductives, stomach & intestines	C. Kemper / SA Museum
Pilot whale (*Globicephala* sp)	SA coastline	2001/1	Y	Genetic tissues, reproductives, stomach and intestines, toxic contaminants	C. Kemper / SA Museum
Pygmy Sperm Whale (*Kogia breviceps*)	SA coastline	2001/2	Y	Genetic tissues, reproductives, stomach and intestines, toxic contaminants	C. Kemper / SA Museum
Kogia sp	SA coastline	2001/1	Y	Genetic tissue, toxic contaminants	C. Kemper / SA Museum
Pygmy Right Whale	SA coastline	2001/1	Y	Genetic tissue, toxic contaminants	C. Kemper / SA Museum
QLD					
Humpback whale	Aust east coast	1	Y	Muscle, blood	P. Hale / UQ, D. Paton / Southern Cross Uni; Blood used for path then disposed of
Humpback whale	Aust east coast	1	Y	Muscle, blood	P. Hale / UQ, D. Paton / Southern Cross Uni. Blood used for path then disposed of
TAS					
Sperm whale	S Aust (Hunter Is)	1	Y	Muscle block, teeth	R. Gales / Nature Conservation Branch, DPIWE
	S Aust (Sellars Spit vs Babal Island Spit	1	Y	Muscle block, bottom jaw	R. Gales / Nature Conservation Branch, DPIWE
S Pygmy Right	S Aust (Sandford)	1	Y	Muscle blocks, reproductive organs, stomach content and skeleton	R. Gales / Nature Conservation Branch, DPIWE
Hector's beaked whale	S. Aust (Four Mile Creek)	2	Y	Skin, blubber, liver, skeleton, reproductive organs, stomach	R. Gales / Nature Conservation Branch, DPIWE
Unidentified baleen whale	Sloping Main Beach	1	Y		R. Gales / Nature Conservation Branch, DPIWE
VIC					
Sperm whale	Port Fairy	2001	Y	Skin, blubber & muscle*	L.Frigo / Museum Victoria**
Killer whale	Johanna	2001	Y	Skin, blubber & stomach contents*	L.Frigo / Museum Victoria
Long-finned pilot whale	Sandy Point	2001	Y	Kidneys & heart*	L.Frigo / Museum Victoria
Unidentified dolphin	Apollo Bay	2001	Y	Skin & blubber*	L.Frigo / Museum Victoria

Blue whale	Bass Strait	1	Y	Tissue	P. Gill / Australocetus, C. Austin, Deakin University
WA					
Bottlenose dolphin	Australian	1 (June 2001)		Blubber	WA Department of Conservation and Land Management
	Australian	1 (September 2001)		Various	WA Department of Conservation and Land Management
Blue whale	Southern Hemisphere	1 (December 2001)		Various	WA Museum

* Skeletal material (skull and/or postcranial) was collected from all specimens lodged with SA Museum.
** Skeletal material (skull &/or post-cranial) was collected from all specimens lodged with Museum Victoria.

Earlier years' statistics:

Species	Area/stock	Calendar year/ season no. collected	Archived (Y/N)	Tissue type(s)	Contact person/institute
WA					
Blainsville's beaked whale	Southern hemisphere	1 (September 2000)		tissue for DNA, and whole head	Western Australian Museum
Blue whale (?Pygmy blue whale)	Southern hemisphere	1 (November 2000)		plug for DNA, and sample of baleen	Western Australian Museum
Gray's beaked whale	Southern hemisphere	2 (December 2000)		skin sample	Nick Gales, Australian Antarctic Division.
Humpback whale	Groups B and C	1 (August 2000)		skin and blubber samples	M Jenner, Western Australian Humpback Whale Project.

4.4 Analyses/development of techniques

Environmental data

SOCEP's long-term data series is currently being analysed with environmental data, and compared with data from the IWC-SO GLOBEC collaboration. Analysis consists of GIS and development of ecosystem models.

DNA research

The Evolutionary Biology Unit at the Southern Cross University, NSW, has received tissue samples of two animals from the NSW NPWS, Eden District, on 11 Jan 2001. One animal was identified by NPWS as a baleen whale, possibly a Minke. The other was skin tissue obtained from the bottom of a recreational boat and was believed to be that of a whale or a shark. The Unit sequenced a 310 base pair (bp) region of the mitochondrial Cytochrome *b* gene and compared the sequence to similar sequences lodged in publicly available international nucleotide databases. This analysis confirmed that the samples were that of a Minke whale, and Bryde's whale, respectively.

In association with the SCCWR, Southern Cross University established a specialist cetacean genetics laboratory, which operates in close cooperation with the Auckland University Genetic Laboratory, coordinated by C. Baker. This specialist laboratory is currently analysing Humpback whale DNA samples for a population estimate of the Area V population. This is the only laboratory of its type in Australia, currently using an agreed standard protocol for analysis, to allow results to be compared with other research on whale populations throughout the world.

Migratory patterns

Analysis of the Centre for Whale Research Humpback whale database for migratory patterns continues (see Jenner et al., 2001).

5. Pollution studies

In SA, samples are routinely collected from almost all stranded or entangled animals. During 2001 the tissues from 16 Short-beaked common dolphins, 21 Bottlenose dolphins, 1 Southern Right whale, 1 Pygmy Right whale, 1 Pilot whale,

2 Pygmy sperm whales, 1 *Kogia* sp. and 1 beaked whale were collected. The SA Museum has not yet analysed these samples.

K. Evans presented the results of pollutant analyses conducted by the Antarctic Wildlife Research Unit of the University of Tasmania on Sperm whales at the Southern Hemisphere Marine Mammal Conference, held at Phillip Island, Vic, 29 May – 1 June 2001. The Unit also completed a review of the distribution and occurrence of pollutants in marine mammals throughout the Southern Hemisphere. The relevant references are:

Evans, K., In press. Pollution and marine mammals in the Southern Hemisphere: potential or present threat? In N. Gales, M. Hindell and R. Kirkwood (eds). Marine Mammals and Humans: towards a sustainable balance. Melbourne University Press.

Evans, K., M. Hindell, G. Hince, M. Morrice, A. Griffiths and D. Thiele. Organochlorine pollution in sperm whales, *Physeter macrocephalus*, in southern Australian waters. Southern Hemisphere Marine Mammal Conference, Phillip Island, Australia. May 29-June 1, 2001.

6. Statistics for large cetaceans

6.1 Direct catches (commercial, aboriginal and scientific permits) for the calendar year 2001

Nil to report.

6.2 Other non-natural mortality for the calendar year 2001

Species	Area/stock	Males	Females	Total*	Cause	Methodology
Humpback whale	Aust east coast (NSW)		1	1	Entanglement (float line next to beach shark protection net) – see below	Post mortem
	Gold Coast		calf?	1	Entanglement (shark protection net)	Found dead
	Area V (NSW)			1	Boat strike – probably survived	
	Area V (NSW)			1	Entanglement	
	Area V (NSW)			1	Unknown	
Southern Right whale	Southern Aust (Head of the Bight, SA)		1	1	Entanglement (tuna long line and buoys) and shark attack	Observation
	Southern Aust (Head of the Bight, SA)			1	Sub-adult (cause unknown)	Carcass inaccessible
	Victor Harbour, SA		1	1	Probable boat strike	Found dead
Blue whale	WA			1	Possible yacht strike	
	VIC			1	?	
False killer whale	SE Aust (NSW)	1			Net entanglement	

* A number of other entanglements (in shark protection nets and fishing buoys) are known to have occurred in NSW and QLD during 2001, but details of these are not available at this stage (handled by state authorities). Current information suggests that most of these disentanglements involving Humpback whales were successful.

NSW stranding – Humpback whale

The Australian Marine Mammals Centre attended one Humpback whale, which stranded and was found dead at Kingscliff (NSW) on 10 August. The animal had a rope wrapped around its tailstock. This was possibly the same animal reported to have been migrating north with rope wrapped around its tailstock approximately 2-3 months earlier. Two days before stranding, a debilitated whale with rope wrapped around its tail was cut free from shark nets off the Gold Coast (approx 50 km north) by Sea World and this almost certainly the same animal.

Post mortem revealed severe progressive damage to the tailstock due to the rope cutting into the tissues. The ropes had caused severe damage to the ligamentous structures of the tailstock and had penetrated as far as the caudal vertebrae on the dorsal aspect. Although samples could not be collected, gross pathology suggested osteomyelitis. The tail had an abnormal degree of lateral movement due to the destruction of supportive tissues and was probably no longer functional and extremely painful and debilitating. The whale was covered in "lice" (cyamids) suggesting chronic debilitation, probably over some months, consistent with the chronic nature of the wounds. The probable cause of death was a combination of chronic debilitation, infection, and renal failure.

Bass Strait mortality – Blue whale

A dead Blue whale was found floating in Bass Strait (see 4.3). An investigation on a possible link to offshore seismic operations in the area at that time found no evidence to support the link (contact P. Gill).

Fisheries logbook interactions

During the calendar year 2001, ten AFMA logbooks provided for the reporting of cetaceans (an increase from the 6 provided in 2000). The logbooks reported 8 interactions thus: 2 Bottlenose whale, 2 Dolphin, 1 juvenile Pygmy Killer Whale, 1 Melon-headed whale, 1 Pilot whale released alive; 1 Pilot whale caught during haul; 1 catch affected flag for Killer whale.

6.3 Earlier years' statistics

R. Chatto, Wildlife Management Officer with the NT Parks and Wildlife Commission, attended a Blue whale or Pygmy blue whale stranding on the reef off the NW corner of Troughton Island (WA) in November 2000. While collecting measurements, samples and observations on this rare event, he deduced that it the likely cause of death of the animal was a ship strike.

7. Statistics for small cetaceans

7.1 For the calendar year 2001

		Directed catch		Incidental mortality			Live-capture
Species	Area/stock	Reported	Est. total	Reported	Est. total	Source	Reported
QLD*							
Common dolphin	Sunshine Coast	-	-	15/05/01	1	QDPI-SCP**	-
	Sunshine Coast	-	-	29/06/01	1	QDPI-SCP	-
	Gold Coast	-	-	30/05/01	1	QDPI-SCP	-
	Gold Coast	-	-	19/04/01	1	QDPI-SCP	-
	Sunshine Coast	-	-	25/06/01	Nil – 1 Released alive	QDPI-SCP	-
	Gold Coast	-	-	13/01/01	Nil – 1 Released alive	QDPI-SCP	-
	Sunshine Coast	-	-	13/01/01	1	QDPI-SCP	-
Indo-Pacific humpback dolphin	Sunshine Coast	-	-	2/05/01	1	QDPI-SCP	-

	Cairns	-	-	05/09/01	1	QDPI-SCP	-
Long-snouted spinner dolphin	Magnetic Island	-	-	01/10/01	Nil – 1 Released alive	QDPI-SCP	-
Tursiops sp	Gulf of Carpentaria	-	-	24/03/01	3	N9 gill net fishery	-
Indian Ocean bottlenose dolphin	Gold Coast	-	-	16/09/01	Nil – 1 Released alive	QDPI-SCP	-
Bottlenose dolphin	Sunshine Coast	-	-	01/07/01	1	QDPI-SCP	-
	Gold Coast	-	-	16/06/01	1	QDPI-SCP	-
	Gold Coast	-	-	02/07/01	1	QDPI-SCP	-
	Gulf of Carpentaria	-	-	08/02/01	1	N9 gill net fishery	-
	Mackay	-	-	17/09/01	1	QDPI-SCP	-
Common dolphin	SE Aust	-	-	2		Gillnet	-
SA							
Short-beaked common dolphin	SA coastline	-	-	1	Unknown	Intentional Killing	-
Bottlenose dolphin	SA coastline	-	-	2	Unknown	Probable entanglement	-
Bottlenose dolphin	SA coastline	-	-	1	Unknown	Euthanased	-
TAS							
Bottlenose dolphin	S Aust	-	-	25.11.01	1	Salmon farm net	-

* Further information from the Queensland Marine Wildlife Stranding and Mortality Database is available from C. Limpus, QPWS.
** QDPI SCP = Queensland Department of Primary Industries Shark Control Program. Further information is available from B. Lane.

7.2 Earlier years' statistics

Chatto and Warneke (2000) describe a number of strandings in the NT. These include a female Indo-Pacific humpback dolphin stranded on Lee Point beach, Darwin, NT in October 2000, with injuries consistent with entanglement in a mesh net. This was not recorded in earlier Australian Progress Reports.

8. Strandings

The Australian Museum: contact Sandy Ingleby (Australian Museum, 6 College St., Sydney, NSW 2010) for information on 4 stranded cetaceans the Museum collected during the 2001 calendar year: 3 Pygmy sperm whales, 1 Spinner dolphin. The Museum holds the skulls and skeletons of these animals. Frequently, the NSW National Parks and Wildlife Service notifies the Australian Museum of the locality of stranding events, and when available, Museum officers attend the stranding and collect genetic samples or skeletal material. Where distance prevents Museum officers from attending a stranding, often NPWS officers are able to collect samples, which are subsequently stored at the Museum. The volunteer organisation ORRCA have also recently donated their tissue collection, derived principally from stranded animals, to the Museum.

NSW National Parks and Wildlife Service: contact Kelly Waples (Wildlife Management, NSW National Parks and Wildlife Service, PO Box 1967, Hurstville NSW 2220) for information from the NSW strandings database she maintains. This contains the date, location, outcome and autopsy details of 14 stranding events in NSW during 2001, involving 18 animals: Minke whale (2), Pygmy sperm whale (4), Gray's beaked whale (1), unidentified beaked whale (1), Bottlenose dolphin (8), Striped dolphin (1), Common dolphin (1).

Australian Marine Mammals Centre: contact Michael Noad (Australian Marine Mammal Research Centre, Faculty of Veterinary Science, University of Sydney, NSW 2006) for information on the post mortem he performed at the request of NSW National Parks and Wildlife Service on a stranded Humpback whale (see 6.2). Also present were QLD Fisheries officers and Trevor Long from Sea World.

NT Parks and Wildlife Commission: contact Ray Chatto (Parks and Wildlife Commission of the Northern Territory, PO Box 496, Palmerston NT 0831) for information on strandings in the NT.

QLD Parks and Wildlife Service: contact Col Limpus (Queensland Marine Wildlife Stranding and Mortality Database, P.O. Box 155, Brisbane Albert Street, QLD 4001) for information on the collection of stranded cetaceans in QLD. The Queensland Marine Wildlife Stranding and Mortality Database summarises all records of sick, injured or dead marine wildlife reported to the QPWS. An annual report is complied for cetaceans and pinnipeds. Most reports of individual strandings are supplied by QPWS and GBRMPA staff, including those via the state-wide stranding hotline telephone number 1300 360 898. Other reports come directly from members of the public, including organisations such as Sea World and Underwater World. In addition to the general reporting, the database contains all mortality records from the QDPI Shark Control Program.

Queensland Museum: contact Robert Patterson (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.

Museum of Tropical Queensland: contact P.W. Arnold (Museum of Tropical Queensland, Townsville, QLD 4810) for information on the heads from stranded cetaceans in the central and northern Great Barrier Reef region, which are deposited in the Museum of Tropical Queensland for extraction and preparation of skulls. The Queensland Environmental Protection Agency oversees the collection of stranded cetaceans in QLD.

SA Museum: contact Catherine Kemper (SA Museum, North Terrace, Adelaide, SA 5000) for more information from the SA Museum cetacean stranding database. In 2001, the Museum added record of 52 stranding events in SA to the database. These involved the following species: Bottlenose dolphin (n=22), Common dolphin (18 events involving 19 individuals), Unidentified dolphin (5), Southern Right whale (2, 3), Beaked whale (1), Pygmy Right whale (1).

TAS Department of Primary Industries, Water and Environment: contact Rosemary Gales (Nature Conservation Branch, Department of Primary Industries, Water & Environment, GPO Box 44, Hobart, TAS 7001) for strandings data from 10 strandings events in 2001. The dataset contains information on the date, location, responsible person and the action taken, for each event. The following species stranded off TAS in 2001:Sperm whale (2, 1, 1), Minke whale (1 individual stranded twice), Pigmy Right (1 individual stranded twice), unidentified baleen (1), Hector's beaked whale (mother and calf), Killer whale (1).

Museum of Victoria: contact Lina Frigo (Museum Victoria, P.O. Box 666E, Melbourne, VIC 3001) for information on 4 strandings (Sperm whale, Killer whale, unidentified dolphin, Long-finned pilot whale) from which samples were taken to the Museum.

WA Department of Conservation and Land Management: contact Peter Mawson and Christine Freegard (WA Department of Conservation and Land Management, Locked Bag 104, Bentley Delivery Centre, WA 6983) for information from the WA strandings data set. This contains information on the sex, maturity and status of 18 stranding events in 2001. The information covers strandings of the following species: 12 Bottlenose dolphins, 2 Humpback whales, 1 Blue whale, 1 Pygmy sperm whale, 1 Spinner dolphin, 1 Long-finned pilot whale. The Department also holds the data set for 21 animals that stranded in 16 events during the calendar year 2000 – this information was not available for earlier Australian reports. Species from 2000: Bottlenose dolphin (7), Humpback whale (3), False killer whale (4), Short-finned pilot whale (1), Blainsville's beaked whale (1), Indo-Pacific humpback dolphin (1), Blue or Pygmy blue whale (1), Gray's beaked whale (1).

9. Other studies and analyses

Breeding – Humpback whale

Continued analysis by the Australian Marine Mammals Centre of Humpback Whale data collected off QLD during migration in 1997 strongly suggest that courtship and breeding occur during migration and are not confined to "breeding grounds", and that this is likely to be the case world wide. This may have important management implications as the whales may be more vulnerable to disturbance during migration than previously thought.

Acoustic patterns – Bottlenose dolphin

An Honours student at Southern Cross University undertook a pilot study to determine the acoustic patterns with the assistance of behavioural analysis of provisioned Bottlenose dolphins at Tangalooma Moreton Island, QLD. This

study is being continued with the assistance of Tangalooma Resort during 2002.

Habitat preference – Southern Right whale

Eubalaena Pty Ltd secured 3 years of funding from Environment Australia to conduct detailed study of habitat preference of Southern Right whales on the SA coastline. GIS databases will be used extensively in this project due to begin in July 2002.

Diet – Blue whale

During 2001 the Australian Antarctic Division commenced a program to investigate whether the diet of whales (and other marine predators) could be determined from remains of prey DNA in faeces (Gales and Jarman, 2001). Researchers used a small existing collection of Blue whale scat material from WA (n=5, samples from K.C. Jenner) and VIC (n=1, sample from P. Gill) to test the efficacy of the system.

The program successfully extracted Krill DNA from Blue whale faeces from both study sites, proving that the technique has great potential. Further developments of the technique continue in 2002 and beyond, with major efforts directed at the collection of additional material at the existing and other sites. Scats from other cetaceans are being collected through collaborations with other scientists.

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, off WA. Researchers dip-netted live specimens *E. recurva* 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).

Demographic and dietary data – Sperm Whale

The Antarctic Wildlife Research Unit completed analyses of demographic and dietary data from samples collected from sperm whales (from three mass strandings in 1998, TAS). These are in preparation for publication. Preliminary analyses will be published in:

Evans, K., In press. Pollution and marine mammals in the Southern Hemisphere: potential or present threat? In N. Gales, M. Hindell and R. Kirkwood (eds). *Marine Mammals and Humans: towards a sustainable balance*. Melbourne University Press.

Evans, K., Morrice, M., Hindell, M. and Thiele, D. 2002. Three mass strandings of sperm whales (*Physeter macrocephalus*) in southern Australian waters. *Marine Mammal Science* 18(3): TBA.

Analysis of the factors affecting age determination in sperm whales has been completed and the manuscript containing these results has been submitted to the Journal of Cetacean Research and Management:

Evans, K., Hindell, M., Robertson, K., Lockyer, C. and Rice, D., Submitted. Factors affecting the precision of age determination in sperm whales, *Physeter macrocephalus*. *Journal of Cetacean Research and Management*.

Biology – Pygmy Right whale

Studies have begun on describing the skeleton and musculature of *Caperea marginata*. C. Kemper is working on this with overseas scientists (Sentiel Rommel, James Mead, John Heyning).

Cause of death - various cetaceans

The paper resulting from this research on cetacean mortalities in SA is still being prepared (C. Kemper, A. Flaherty, S. Gibbs, M. Long and M Hill).

A short paper will also be written on the circumstances of death and life history details of the *Eubalaena australis* females from the Head of Bight and Cape Jervis (C. Kemper, Sue Gibbs and Steve Burnell). This will include evidence that the entanglement of the Head of Bight animal probably occurred months before the animal died in early July 2001. The researchers will attempt to identify the individual by callosity matches with other known animals.

Taxonomy - Bottlenose dolphin

C. Kemper is preparing a paper on the osteological results of South Australian *Tursiops* spp. Multivariate statistical analysis produced two main groups of skulls with each having two subgroups. One group is definitely aligned with *T. aduncus* and the other probably with *T. truncatus* but there is uncertainty about the taxonomic affinity of some of the animals studied. Studies outside Australia have shown some morphological variation within each species. The

genetic status of more animals is needed before taxonomic affinities can be finalized.

The next step is to prepare a paper on the external measurements and features associated with both species in South Australia. At the same time, work will commence on redoing osteological studies for all Australian specimens (in conjunction with Graham Ross).

Taxonomy – Common dolphin

(C. Bell, C. Kemper and J. Conran) An Honours thesis was completed on the osteology of the common dolphin in southern Australia. This, combined with earlier genetic information, concluded that there is one species, *Delphinus delphis*, in the region (see SA Museum's website for a project summary and information on common dolphins in Australia.) A paper has been submitted to Australian Mammalogy on the osteological work.

Ecology, behaviour and human interactions – Bottlenose dolphin

A number of researchers in WA developed techniques for studying Bottlenose dolphin. Several of these studies formed part of PhD theses: R. Donaldson researched the ecology of Bottlenose dolphins in Cockburn Sound; M. Kruetzen conducted a genetic study of Bottlenose dolphins along the WA coastline; H. Finn studied the behaviour of Bottlenose dolphins; L. Bejder looked at the impact of boating and human activities on Bottlenose dolphin. Further, a series of studies was conducted into Bottlenose dolphin of Shark Bay: A. Samuels studied the behavioural ecology of juvenile Bottlenose Dolphins; J. Mann analysed behaviour and communication among Bottlenose Dolphins; L.M. Dill studied the prey choice in bottlenose dolphins at Shark Bay.

Whale-watching impacts – Southern Right whale, Humpback whale, dolphins

In WA, researchers investigated the impacts of commercial whalewatching. The WA Department of Conservation and Land Management issued 108 whalewatching licences (for Southern Right and Humpback whales) for the 2001 season. Commercial operators provided data on the number of passengers and whales seen during the season, and this data is still being analysed. 62 commercial dolphin watching licences were also issued during 2001. 112 licences foe whale watching were issued in the previous 2000 season, and 64 commercial dolphin watching licences, to carry a total of 12,206 passengers in metropolitan Perth waters, and 11,595 under country-based licences. In 2001, R. Duncan studied the effects on Humpback Whales of underwater noise produced by vessels in whale watch tours off the Perth coastline.

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