

Cetacean research in New Zealand 2003/04

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ABSTRACT

This report summarises cetacean (i.e. whale and dolphin) research undertaken in New Zealand over the period from April 2003 to March 2004, with statistical information for the 2003 calendar year. The report summarises cetacean research undertaken by a wide range of researchers including government, university, and non-governmental agencies and individuals. Information presented includes details of species studied, strandings, summaries of collections and catalogues, research projects undertaken, samples collected, and publications resulting from research. Data are included from 28 species, from 12 different institutions and agencies and over 40 researchers. Although this is a comprehensive collection of research for 2003/04, it does not include all cetacean research carried out in New Zealand over the period as some researchers did not provide a report of their work to the New Zealand Department of Conservation.

Keywords: cetacean, research, marine mammal, IWC.

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1. Introduction

This report follows on from previous reports which summarised cetacean research in New Zealand over the period 1997–2000, 2001/02, and 2002/03 (Childerhouse & Donoghue 2002; Childerhouse 2002; Childerhouse 2004). It provides updated information about recent research in New Zealand. For a full description of the format and explanation of the sections in the report please refer to Childerhouse & Donoghue (2002). This, and previous reports, are published records of the New Zealand National Progress Report on Cetacean Research which is presented annually to the Scientific Committee of the International Whaling Commission (IWC).

The IWC is the international agency responsible for the ‘conservation of whale stocks and the orderly development of the whaling industry’ and has approximately 60 member nations including New Zealand. New Zealand has been a member of the IWC since 1948 (Friedheim 2001). One of the obligations of member nations is the provision annually to the IWC of a National Progress Report on Cetacean Research. This report includes details such as the number and location of cetaceans taken commercially or incidentally in fishing operations, numbers of stranded cetaceans, and status of ongoing research projects. One of the original aims of these reports was to provide data on the commercial catch of large whales to facilitate the management of whaling. However, over time, National Progress Reports have been modified to include the reporting of additional information such as levels of bycatch and other data on dolphins. Prior to 1997, National Progress Reports were published in their entirety in IWC volumes but since then only a small summary of the full report has been published.

The National Progress Reports have been compiled annually by the New Zealand Department of Conservation based on reports from researchers. Although a considerable amount of effort has been made to contact all researchers who have undertaken cetacean research in New Zealand, and encourage them to provide details of their research, this has not always been completely successful. As such, the report presented in this document covers most of the work undertaken in New Zealand but some research, which has not been reported to the Government, does not appear. However, overall, only a small proportion of the active cetacean research in New Zealand has not been included in this document.

The aim of compiling and publishing these reports is to make the information accessible and useful as a tool in the management and protection of cetaceans in New Zealand. These reports are a useful resource for summarising New Zealand-based research projects and for identifying researchers who are working on species or projects. Obviously, research is ongoing and these reports will continue to be published in the future.

2. Acknowledgements

This project would not have been possible without the support of researchers who have provided summaries of their work over the last year. It is a tribute to researchers that the high quality and quantity of work is reflected in this document. I would like to thank all those who made the effort to contribute and hope that we can continue with the high standard in the future. I would especially like to thank M. Donoghue for his support and guidance when compiling these reports.

3. References

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Appendix 1

NEW ZEALAND PROGRESS REPORT ON
CETACEAN RESEARCH, APRIL 2003 TO
MARCH 2004, WITH STATISTICAL DATA FOR
THE CALENDAR YEAR 2003

**NEW ZEALAND PROGRESS REPORT ON CETACEAN RESEARCH, APRIL 2003 TO MARCH 2004,
WITH STATISTICAL DATA FOR THE CALENDAR YEAR 2003**

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This report summarises information obtained from: Auckland (AU), Massey (MU), and Otago (OU) Universities, Auckland University of Technology (AUT), Te Papa Tongarewa / Museum of New Zealand (TP), Department of Conservation (DOC), Ministry of Fisheries (MFish), National Institute of Water & Atmospheric Research Ltd (NIWA), Texas A&M University (TAM), Orca Research Trust (ORT), Smithsonian Institution (SI), New England Aquarium (NEA) and independent researchers.

1. Species and stocks studied

Common name	Scientific name	Area / stock(s)	Numbered sections referred to in following text
Andrew's beaked whale	<i>Mesoplodon bowdoini</i>	NZ	8
Antarctic minke whale	<i>Balaenoptera acutorostrata</i>	Area V	8
Arnoux's beaked whale	<i>Beradius arnuxii</i>	NZ	4.3
Beaked whales	Family <i>Ziphiidae</i>	NZ	9
Bottlenose dolphin	<i>Tursiops truncatus</i>	NZ	2.1.1, 2.1.2, 3.1.1, 4.1, 4.3, 8, 9
Bryde's whale	<i>Balaenoptera edeni</i>	NZ	3.1.1, 4.3, 8
Common dolphin	<i>Delphinus delphis</i>	NZ	2.1.2, 3.1.1, 4.2, 4.3, 7.1, 8, 9
Cuvier's beaked whale	<i>Ziphius cavirostris</i>	NZ	4.3, 8
Dusky dolphin	<i>Lagenorhynchus obscurus</i>	NZ	2.1.1, 3.1.1, 4.3, 8, 9
False killer whale	<i>Pseudorca crassidens</i>	NZ, Tonga	4.1, 4.3
Ginkgo-toothed whale	<i>Mesoplodon ginkgodens</i>	NZ	8
Gray's beaked whale	<i>Mesoplodon grayi</i>	NZ	4.3, 8
Hector's dolphin	<i>Cephalorhynchus hectori hectori</i>	NZ	2.1.1, 3.1.1, 3.1.3, 7.1, 8, 9
Humpback whale	<i>Megaptera novaeangliae</i>	Area V	4.1, 4.3, 4.4, 8, 9
Killer whale	<i>Orcinus orca</i>	NZ	3.1.1, 4.1, 4.3, 4.4, 8, 9
Longman's beaked whale	<i>Indopacetus pacificus</i>	NZ	9
Maui's dolphin	<i>Cephalorhynchus hectori maui</i>	North I., NZ	2.1.1, 3.1.1, 4.4, 7.1, 9
Perrin's beaked whale	<i>Mesoplodon perrini</i>	NZ	
Pilot whale	<i>Globicephala melaena</i>	NZ, Samoa	3.1.1, 4.1, 8, 9
Pygmy right whale	<i>Caperea marginata</i>	NZ	4.3, 8
Pygmy sperm whale	<i>Kogia breviceps</i>	NZ	4.3, 8, 9
Rough-toothed dolphin	<i>Steno bredanensis</i>	Samoa	4.1
Shepherd's beaked whale	<i>Tasmacetus shepherdii</i>	NZ	8
Southern right whale	<i>Eubalaena australis</i>	NZ	3.1.1, 4.1, 4.3, 9
Southern right whale dolphin	<i>Lissodelphis peronii</i>	NZ	
Sperm whale	<i>Physeter macrocephalus</i>	NZ	2.1.1, 3.1.1, 8, 9
Spinner dolphin	<i>Stenella longirostris</i>	Samoa	4.1
Strap-toothed whale	<i>Mesoplodon layardii</i>	NZ	4.3, 8

2. Sightings data

2.1 Field work

2.1.1 Systematic

B. Wursig (P.I.) (TAM) continues research on dusky dolphins. Surveys were conducted at Kaikoura and at Admiralty Bay in the Marlborough Sounds.

D. Lusseau, O. Boisseau, D. Rundgren & S. Maersk Lusseau (OU) studied the population size, residency pattern, behavioural ecology, feeding ecology, acoustic behaviour and offshore distribution of bottlenose dolphins in Fiordland. In Milford Sound and Doubtful Sound the focus of research was the impact of tourism activities upon the dolphins and also vocalisation patterns. A further study was conducted in Doubtful Sound investigating the feeding ecology of the dolphins. Work in the other fiords studied coastal distribution and movement patterns of bottlenose dolphins, both within and between fiords.

K. Russell (AU) continued research on Maui's dolphin, investigating ecology and population genetics.

P. Ensor participated as a team leader during the 2003 NILS cruise in the North Atlantic, and also acted as cruise leader on the 2003/2004 IWC-SOWER circumpolar cruise, Area V of the Antarctic. C. Olavarría (AU) also participated in the 2003/2004 IWC-SOWER circumpolar cruise, Area V of the Antarctic.

S. DuFresne (OU) completed 3 years of a long-term photo-ID study of Hector's dolphins within the Banks Peninsula Marine Mammal Sanctuary, focussing on estimating survival rates. W. Rayment (OU) continued the second year of a three-year study examining movements and fine-scale habitat use by Hector's dolphins at Banks Peninsula. The project will involve aerial surveys to further investigate seasonal changes in offshore distribution, photo-ID to investigate alongshore movements of individuals and acoustic monitoring using click detectors (PODs) to investigate fine-scale habitat use.

D. Clement (OU) concluded fine-scale (spatial and temporal) distribution surveys of Hector's dolphins and the investigation of localised population movements within the Banks Peninsula Sanctuary and around Westport in 2002. An on-going evaluation comparing the changing oceanography of the study areas with seasonal and inter-annual fluctuations in relative distribution and densities of dolphins has been completed.

S. Dawson and E. Slooten (OU) continued their research on sperm whales off Kaikoura, investigating abundance, residency and the effects of tourism.

E. Green (OU) completed an investigation of the effects of tourism on Hector's dolphins in Porpoise Bay. The two-year study also investigated population size, range and habitat utilisation of the summer resident group. Potential impacts from the sole tourist boat operator and from beach swimmers were measured with the use of a theodolite, and behavioural assessments made in the presence and absence of boats and swimmers. Photo-ID and surveys for alongshore range of the dolphins were carried out by boat.

S. Dawson, E. Slooten, W. Rayment (OU), and S. Childerhouse (DOC) completed aerial surveys to investigate the offshore distribution of Hector's dolphins at Banks Peninsula. Transect lines were flown from the coast to 20 nautical miles offshore. In the summer survey, nearly 80% of dolphin groups were sighted within the four nautical mile Marine Mammal Sanctuary boundary. In the winter, only 35% were sighted within the same area, suggesting that the majority of Hector's dolphins move offshore in winter and outside the protection of the Marine Mammal Sanctuary. The same team also completed an aerial survey of Maui's dolphin on the West Coast of the North Island to investigate offshore distribution and abundance. Transect lines were flown from the coast up to 20 nautical miles offshore. The surveys confirmed that Maui's dolphins have a near-shore distribution, with all groups seen within 5 nautical miles of the coast. The survey provided a robust population estimate for this subspecies (approximately 114 individuals).

2.1.2 Opportunistic, platforms of opportunity

J. Berghan has been collecting photo-IDs of bottlenose dolphins in the Hauraki Gulf. In addition, ongoing photo-ID research on bottlenose dolphins by A. Fleming (DOC), R. Constantine (AU) and J. Berghan continues in the Bay of Islands using the dolphin-tour boats and independent vessels.

K. Stockin and M. Orams (MU) are investigating the relationship between ecotourism and common dolphins in the Hauraki Gulf. The primary aims of the research are to investigate the behavioural ecology of dolphins targeted by tourist operators by assessing behavioural states of dolphins before, during and after tourist encounters. The study aims to assess the discreteness of the Hauraki Gulf population compared with that of adjacent populations by monitoring parameters relating to behavioural ecology, habitat use and population biology. The outcomes from the study will be useful in designing appropriate management strategies to minimise disturbance of common dolphins by other recreational boat traffic in the Hauraki Gulf.

H. Stengs and T. Johnson (DOC) have been undertaking opportunistic surveys for cetaceans around the Grey River mouth on the west coast of the South Island.

2.2 Analyses / development of techniques

None.

3. Marking data

3.1 Field work

3.1.1 Natural marking data

Species	Feature	Area / stock	Calendar year / season	Catalogued	Catalogue total	Contact person (Institution)
Bottlenose dolphin	Fin / body	Doubtful Sound	1990–2003	Yes	> 83	O. Boisseau OU
Bottlenose dolphin	Fin / body	Milford Sound	2000–2003	Yes	50	O. Boisseau OU
Bottlenose dolphin	Fin / body	Fiordland	2000–2003	Yes	~ 200	O. Boisseau OU
Bottlenose dolphin	Fin / body	North I.	1993–2004	Yes	415	G. de Tezanos Pinto, R. Constantine AU
Bottlenose dolphin	Fin / body	Hauraki Gulf	2000–2003	Yes	102	J. Berghan
Brydes whale	Fin / body	Hauraki Gulf	2002	Yes	> 20	C.S. Baker AU
Common dolphin	Fin / body	Whitianga / Whakatane	1998–2002	Yes	408	D. Neumann MU
Dusky dolphin	Fin / body	Kaikoura & Admiralty Bay	1997–2003	Yes	> 4000	Tim Markowitz TAM
Hector's dolphin	Fin / body	East South I. West South I.	1984–2003 1994–97, 2001–2003	Yes	515	S. DuFresne, E. Slooten OU
Humpback whale	Fluke	Area V	1991–2004	Yes	484	C. S. Baker AU
Humpback whale	Fluke	NZ	1995–2003	Yes	11	R. Constantine AU
Killer whale	Fins / saddle / eye patches	NZ	1993–2004	Yes	130	I. Visser ORT
Killer whale	Fins / saddle / eye patches	Antarctica	2000–2004	Yes	27	I. Visser ORT
Killer whale	Fins / saddle / eye patches	Papua New Guinea	2000–2004	Yes	14	I. Visser ORT
Killer whale	Fins / saddle / eye patches	Peninsula Valdez, Argentina	2000–2004	Yes	24	I. Visser ORT
Killer whale	Fins / saddle / eye patches	Area V	2001	Yes	11	C. Olavarría AU
Maui's dolphin	Fin / body	North I.	1998–2003	Yes	> 34	K. Russell AU
Pilot whale	Fins / saddles	NZ	?–2003	Yes	> 84	T. O'Callaghan
Southern right whale	Callosities / lip lines	Area V	2001	Yes	2	C. Olavarría AU
Southern right whale	Callosities / lip lines	NZ mainland	?–2004	Yes	> 30	N. Patenaude AU
Southern right whale	Callosities / lip lines	NZ subantarctic	1995–99	Yes	402	N. Patenaude AU; B. Todd Project Tohora
Sperm whale	Fluke	Kaikoura	1990–2003	Yes	190	E. Slooten OU

3.1.2. Artificial Marking Data

None.

3.1.3 Telemetry Data

G. Stone (P.I.) (NEA) satellite-tagged three Hector's dolphins at Banks Peninsula.

3.2 Analyses / development of techniques

None.

4. Tissue / biological samples collected

4.1 Biopsy samples (including sloughed skin samples)

Species	Area / stock	Year: no. collected	Archived	No. analysed	Total holding	Contact person (Institution)
Bottlenose dolphin	Northland	2003 / 04: 32	Yes	32	70	G. de Tezanos Pinto AU
Bottlenose dolphin	Samoa	2003: 1	Yes	1	1	C. Olavarría AU
False killer whale	Tonga	2003: 1	Yes	1	1	C. Olavarría AU
Humpback whale	Tonga	2003: 91	Yes	410	543	C. Olavarría, K. Russell AU
Killer whale	NZ	1994–2003: 10	Yes	9	10	C. Olavarría AU
Rough-toothed dolphin	Samoa	2003: 4	Yes	4	4	C. Olavarría AU
Short-finned pilot whale	Samoa	2003: 3	Yes	3	3	C. Olavarría AU
Southern right whale	NZ mainland	2003: 11	Yes	11	11	N. Patenaude AU
Spinner dolphin	Samoa	2003: 3	Yes	3	3	C. Olavarría AU

4.2 Samples from bycatch

Species	Area / stock	Calendar year / season total	Archived	Tissue type(s)	Contact person (Institution)
Common dolphin	NZ	5	Yes	Skin, blubber, fixed tissues, skeletons	P. Duignan MU

4.3 Samples from stranded animals

Species	Area/stock	Calendar year (total)	Archived	Tissue type(s)	Contact person (Institution)
Arnoux's beaked whale	NZ	1	Yes	Skin and blubber	D. Steel AU
Bottlenose dolphin	NZ	2	Yes	Skin and blubber	D. Steel AU
Bryde's whale	NZ	4	Yes	Skin and blubber	D. Steel AU
Common dolphin	NZ	4	Yes	Skin and blubber	D. Steel AU
Cuvier's beaked whale	NZ	2	Yes	Skin and blubber	D. Steel AU
Dusky dolphin	NZ	1	Yes	Skin and blubber	D. Steel AU
False killer whale	NZ	1	Yes	Skin and blubber	D. Steel AU
Gray's beaked whale	NZ	2	Yes	Skin and blubber	D. Steel AU
Humpback whale	NZ	1	Yes	Skin and blubber	D. Steel AU
Killer whale	NZ	3	Yes	Skin and blubber	D. Steel AU
Long-finned pilot whale	NZ	123	Yes	Skin and blubber	D. Steel AU
Pygmy right whale	NZ	1	Yes	Skin and blubber	D. Steel AU
Pygmy sperm whale	NZ	2	Yes	Skin and blubber	D. Steel AU
Sperm whale	NZ	12	Yes	Skin and blubber	D. Steel AU
Strap-toothed whale	NZ	1	Yes	Skin and blubber	D. Steel AU

4.4 Analyses / development of techniques

D. Steel (AU) continued to store and analyse samples collected as part of an ongoing project to archive tissue and DNA from all New Zealand strandings.

K. Russell (AU) continued to collect skin samples from Maui's dolphins. All skin samples (biopsy and beachcast) to date have been extracted, sexed, and sequenced (D-loop region of the mtDNA) and genotyping is currently being undertaken.

C. Olavarría (AU) analysed samples collected from four odontocete species in a cetacean survey of Western Samoa. Sex was identified and a part of the mitochondrial DNA control region was sequenced and compared with individuals from other South Pacific islands. Research also includes a genetic analysis of the population structure of New Zealand

killer whales and their phylogeographic relationship with other world-wide populations. C. Olavarría continues with his doctoral research on South Pacific humpback whales population structure using molecular markers. A recent analysis of over a thousand mtDNA control region sequences showed significant differentiation between six breeding grounds (Western Australia (D stock), New Caledonia (Eii1 sub-stock), Tonga (Eii2 sub-stock), Cook Islands (F stock), French Polynesia (F stock) and the Pacific coast of Colombia (G stock)), suggesting that the Cook Islands and French Polynesia should be considered as two stocks, not the single F stock proposed previously.

5. Pollution studies

None.

6. Statistics for large cetaceans

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

None.

6.2 Other non-natural mortality for the calendar year 2003

None.

6.3 Earlier years' statistics

No amendments.

7. Statistics for small cetaceans

7.1 For the calendar year 2003

Species	Area / stock	Directed catch		Incidental mortality			Live-capture
		Reported	Est. total	Reported	Est. total	Source	Reported
Common dolphin	NZ	Nil	Nil	33 ^a	?	Trawl	Nil
Hectors dolphin	South I.	Nil	Nil	0 ^b	?	Gillnet	Nil

^a details provided by D. Fairfax (DOC) and S. Baird (NIWA) from data collected by Scientific Observer Programme of MFish

7.2 Earlier years' statistics

No amendments.

8. Strandings

A. van Helden (TP) maintains the NZ stranding database and the national marine mammal collection. The total number of reported strandings for this period is 78 incidents involving 101 animals. This excludes those animals that have been reported but for which stranding data forms had not been received before the end of March. At least 18 different species were recorded in the database for this period. The representation in the number of incidents of strandings for the different families that stranded in this period is: *Neobalaenidae* 3%, *Balaenopteridae* 5%, *Ziphiidae* 23%, *Delphinidae* 51%, *Physeteridae* 14%. The representation in number of animals for the different families that stranded in this period is: *Neobalaenidae* 2%, *Balaenopteridae* 4%, *Ziphiidae* 24%, *Delphinidae* 46% and *Physeteridae* 22%. The species with the highest number of incidents of strandings was Hector's dolphins (including subspecies Maui's dolphin) with 12 incidents. The largest number of animals of a species to strand was 16 for Gray's beaked whales. The total number of animals refloated for this period was just 9, 3 of which restranded and died, therefore 6 are presumed to have survived. Interestingly, there were no major mass stranding event of long-finned pilot whales this year, although there was one mass stranding of 12 sperm whales.

P. Duignan and G. Jones (MU) continue to autopsy stranded cetaceans and / or those killed in fishing operations to determine cause of death and investigate their biology including any evidence of disease.

S. O'Shea continues to collect diet samples from stranded cetaceans to investigate diet.

V. Binedell (MU) and T. O'Callaghan are working on a statistical analysis of the New Zealand whale stranding database. The research involves preparing the database for analysis and undertaking multivariate analysis with the aim of producing appropriate mathematical models that may explain whale and dolphin strandings around New Zealand.

T. O'Callaghan continues analysis of refloatation rates from the New Zealand Whale Stranding Database.

Species	No. of strandings	No. of animals
Andrews' beaked whale	2	2
Antarctic minke whale	1	1
Bottlenose dolphin	2	2
Bryde's whale	2	2
Common dolphin	11	14
Cuvier's beaked whale	3	3
Dusky dolphin	10	11
Gray's beaked whale	10	16
Hector's dolphin	12	12
Humpback whale	1	1
Killer whale	3	3
Ginkgo-toothed whale	1	1
Pilot whale	2	4
Pygmy right whale	2	2
Pygmy sperm whale	7	7
Shepherd's beaked whale	1	1
Sperm whale	4	15
Strap-toothed whale	1	1
Unknown	3	3
Total:	78	101

9. Other studies and analyses

B. Wursig (P.I.) (TAM) continues research providing information on the effects of dolphin watching and swim-with-dolphin activities off Kaikoura. In Admiralty Bay, ongoing studies of habitat use are directly applicable to the presence and proposed further development of the mussel farming industry in and near the Marlborough Sounds. These studies are also helping to unravel the genetic relatedness of dusky dolphins throughout New Zealand.

M. Merriman, M. Orams and B. Springett (MU) have started a two-year project investigating the behavioural ecology of bottlenose dolphins in the Marlborough Sounds. The primary focus of the research is to establish baseline information on behavioural ecology of bottlenose dolphins and assess the spatial distribution, abundance, home range, and social interactions using boat-based surveys, photo identification and focal follows. Preliminary data, collected between October 2003 and February 2004, suggest at least some degree of residency, a tendency to form groups exceeding one hundred individuals, and stable associations of bottlenose dolphins.

M. Oremus (AU) is investigating the genetic diversity and relatedness of pilot whales within and between mass strandings. In addition, the low mtDNA diversity will be investigated and tested.

S. O'Shea (AUT) continues to investigate the diet of cetaceans in New Zealand, with special reference to cephalopod prey. Based on diet analysis, cephalopods comprise a significant component of sperm whale diet. Prey species include *Opisthoteuthis mero*, *Idioteuthis cordiformis*, *Taningia danae*, *Taningia* sp. nov., *Octopoteuthis* sp. nov. (giant), *Lepidoteuthis grimaldii*, *Pholidoteuthis boschmai*, *Architeuthis dux*, any of 7 locally occurring species of *Histioteuthis*, and any of three species of *Moroteuthis*. The diet of locally occurring pygmy sperm whales is less-well understood, but cephalopods dominate gut content samples. Based on an analysis of diet, it is speculated that the diet of all teuthophagous whales will be affected by any change in either the diversity or size-class composition of regionally occurring cephalopod taxa in New Zealand waters. Currently, research being conducted at AUT is focussing on collection and archiving of stomach contents of stranded teuthophagous whales from New Zealand waters. These collections will be the research material upon which two postgraduate theses will be based. Identification of any temporal trend in cephalopod diversity or size-class composition in the diet of teuthophagous whale species will be determined during this research.

E. Secchi (OU) completed his PhD thesis entitled 'Modelling the population dynamics and viability analysis of Franciscana and Hector's dolphins under the effects of bycatch in fisheries, parameter uncertainty and stochasticity'. The research included using stage-structured population dynamic models to estimate the population growth rate of Franciscana and Hector's dolphins and to make population projections into the future. For Hector's dolphins, a method of allowing for the spatial overlap between the dolphins and the gill net fishery was developed in order to estimate the current bycatch mortality rate on the west coast of the South Island based on information available from Banks

Peninsula region, off the east coast. The results indicate that the bycatch mortality rate off the west coast is low due to a combination of minimal overlap between dolphins and commercial gillnet fisheries and relatively low gillnet fishing effort. The estimated current annual bycatch mortality in commercial gillnetting off the west coast is approximately 18 Hector's dolphins a year. The accuracy of this estimate relies on a good estimate of potential overlap between dolphins and fisheries. Bycatch in recreational gillnetting can be higher than in commercial gillnetting in some areas off the west coast. Stage-structured population dynamic models were also used to estimate the population growth rate of Hector's dolphins and for making projections for the population into the future. The models suggest that the species has a low intrinsic potential for population growth of approximately 0.65% a year. Its low population growth rate is insufficient to compensate for current levels of fishing-related mortality in some local populations, especially when environmental and / or demographic stochasticity is considered. Stochasticity alone would considerably decrease the probability of the Banks Peninsula population increasing and recovering from past and current high bycatch levels. On the other hand, fishing effort and bycatch mortality rates seem not to be impeding population growth off the west coast of the South Island. Parameter uncertainty does not change the conclusion that immediate and extreme limitations on fishing practice and effort are necessary to increase the chances of recovery for some local populations.

N. Davis and D. Gilbert (NIWA) developed a quantitative risk analysis for Maui's dolphins using a temporal-spatial age-structured model. A technical working group was convened by the Ministry of Fisheries to oversee a risk analysis of the two strategies using Bayesian modelling techniques. This group included research providers, commercial fishing representatives, and conservation managers. Given the lack of information available to model the west coast North Island (WCNI) Maui's dolphin, a model was developed for the east coast South Island (ECSI) Hector's dolphin population, which is believed to have similar biological and productivity characteristics to Maui's dolphin. Bayesian parameter estimates were derived for a spatially and temporally stratified age-structured population model fitted to observations of the ECSI Hector's dolphin population. Parameter estimates defining population productivity, including survival rates, were highly uncertain and determined largely by the assumed prior parameter distributions. The estimates of annual population growth rate at maximum production were about 1.5%. These equate to 3.2% at near-zero population size and were consistent with previous studies. Broad assumptions were made in using the ECSI model parameters for input to a model for Maui's dolphin, and for specifying population distribution and abundance off the WCNI. The probability of population decline is high under status quo fishing effort (50–90%) and this is consistent with previous studies. As an estimate of absolute risk, this probability is highly uncertain given the uncertainty in the assumptions that determine projected absolute abundance. However, relative comparisons were made between alternative management strategies subject to the assumptions regarding the spatial dispersion of recruitment.

D. Lusseau (OU) continued research on bottlenose dolphins in Doubtful Sound. The research focused around the concept of dolphin populations as social networks. This study applied techniques developed to quantify the structure of human social networks to the bottlenose dolphin population living in Doubtful Sound, Fiordland. This study aimed to understand the role different individuals played in the society and to quantify the role of life history characteristics in the formation and evolution of the social network. This study reinforced previous findings in that it showed that individuals tend to form preferred companionship with others of similar age and sex. It also showed that the dolphin social network does not evolve in similar fashion to human social networks. The two attachment principles previously described to explain the temporal evolution of social network do not apply to the structure of the dolphin social network.

M. Dalebout (AU) continues research on beaked whales, with emphasis on species identification using molecular methods. Work includes the discovery of new specimens of Longman's beaked whales which were identified using the validated DNA database compiled to assist in beaked whale species identification. These new specimens revealed the external appearance of Longman's beaked whales for the first time and confirmed that the unidentified 'bottlenose-like' whales observed at sea from time to time in the tropical Indo-Pacific were also of this species. This database of sequences is implemented as part of the web-based programme, DNA Surveillance, which in its current version enables the molecular genetic identification of whales, dolphins and porpoises threatened by exploitation and / or protected by international agreements. Further developments include the development of a reference database to assist in beaked whale species identification using mitochondrial DNA control region (437 base pairs [bp]) and cytochrome *b* (384 bp) sequences was compiled for all 21 described species in this group. This mtDNA database is complemented by a nuclear database of actin intron sequences (925 bp) for 17 of the 21 species. All reference sequences were derived from specimens validated by diagnostic skeletal material or other documentation, and included four holotypes.

M. Cawthorn continues to monitor incidental sightings of cetaceans in the South Pacific region. Other areas of research include editing and entering the original Townsend data to computer and development of equipment to mitigate marine mammal interactions with commercial fishing gear. He was also involved in trials to reduce dolphin bycatch in the English Channel from October 2002 to March 2003.

R. Suisted, H. McConnell (DOC) and N. Patenaude (AU) are investigating the mainland population of southern right whales. The aims of the work are to investigate the status and identity of the mainland population. Methods used

include sighting programmes, surveys, photo-ID and biopsies. Preliminary analysis suggests that whales visiting the New Zealand mainland may be different from the population known to be visiting the New Zealand subantarctic islands and that the mainland breeding population could be as low as 4–11 breeding females. To date, 11 biopsy samples and 66 sighting records have been collected. Auckland University is currently comparing the mitochondrial and microsatellite DNA between individuals and populations from Australia and the New Zealand subantarctic.

P. Battersby and G. Barnes (MU) have investigated the use of brainstem auditory evoked potentials as a possible prognostic tool for assessing neurological state in stranded cetaceans. Two adult common dolphins were used as test subjects. They were loosely restrained on a stretcher out of water and their auditory pathway was stimulated using a broadband click stimulus. The brainstem responses were recorded using non-invasive skin electrodes located in the standard mammalian fashion, then modified to arrangements used by Syzmanski et al. (1999). The first arrangement failed to obtain a recognisable recording. The second arrangement recorded a response with latency 3.5 ms and amplitude 1.24 V. This waveform did not have well-defined peaks I–VII because the electrodes were of the far-field recording type. The critical factor was electrode placement and ensuring the ground electrode was behind the brainstem. This study demonstrated that BAEPs can be recorded in cetaceans out of water and further trials can be carried out to apply this technique to stranded cetaceans.

E. Fordyce (OU) continued work with collaboration with J. Mead (SI) on the osteology of the skull of bottlenose dolphin and the study of baleen whale skull structure with the aim of elucidating high-level taxonomic relationship. All research involved skeletal specimens held in museums.

A. Schaffar-Delaney and M. Orams (MU) are investigating the reproductive patterns of common dolphins in the Hauraki Gulf, New Zealand. This project aims to assess common dolphin breeding patterns, specifically female reproductive strategies. Data will be recorded from a commercial tourist boat 'Dolphin Explorer' and from a small research boat. This project will provide information which should be useful in setting appropriate permit conditions for tourism operations and management strategies, as well as guidelines for dolphin-watching operators.

Researchers at Auckland University and the South Pacific Humpback Whale Consortium continue humpback whale research in Tonga. The work focuses on the collection of ID photographs and biopsy samples. Spatial coverage has mostly focused on the island of Vava'u, but has expanded considerably in recent years. In 2003, 210 hours of effort resulted in 81 encounters with a total of 195 whales. Seventy-five whales were photo-identified and 91 skin samples were collected.

I. Visser (ORT) continues research and field work around New Zealand, with most effort conducted in the north of the North Island. Research focuses on photo identification, foraging behaviour and associations whilst foraging. Additional field work was undertaken in Antarctica, based at the Peninsula, and at Peninsula Valdez, Argentina. The programme continues to collect data from Antarctic waters from aboard eco-tourism vessels. Fifty-two days were spent at sea and killer whales sighted on seven occasions. Two 'Types' of orca were seen—'Type A' and 'Type B'. Observations included hunting of a minke whale. The first photo-identification matches within Antarctic waters were obtained for three animals, 72 days apart. A further 22 sighting reports (including photographs and video) were collected from the public / other scientists. Land-based surveys at Punta Norte, Peninsula Valdez, Argentina were conducted for 13 days. Killer whales were sighted on seven occasions, including hunting on the beach. Photo identifications were made and contributed to the on-going catalogue held by Juan Copello, La Ernestina, Punta Norte.

G. de Tezanos Pinto (AU) is continuing her PhD research investigating the genetic structure and demographics of bottlenose dolphins in New Zealand. This research aims to model demographic trends for the North Island population and to investigate the genetic structure of this species in coastal New Zealand waters, and their relationship to other bottlenose dolphin populations around the South Pacific Ocean. A total of 10 surveys have been undertaken in the Bay of Islands since March 2003 and 4 in the Hauraki Gulf. The primary aim of this research is to collect photo-identification data and biopsy samples from bottlenose dolphins that use the Bay of Islands and Hauraki Gulf as part of their home range. Fifteen new individuals were added to the Bay of Islands bottlenose dolphins fin identification catalogue. Thirty-two biopsy samples were collected from the Bay of Islands and 6 from the Hauraki Gulf. Results so far include sequencing of 129 samples from 3 different regions (Marlborough Sounds and North Island, New Zealand; Kiribati Islands—Courtesy of A. Hutt and G. Stone). Comparisons of 600 bp from the mt-DNA control region for the two New Zealand populations showed 40 unique maternal lineages defined by 43 polymorphic sites. One haplotype was shared between the North Island and Marlborough Sounds, suggesting an historic or recent exchange between these populations. Haplotype diversity values ranged from $h = 0.7105$ (Marlborough Sounds) and $h = 0.9610$ (North Island) and nucleotide diversity between $\pi = 0.08\%$ (Marlborough Sounds) and $\pi = 2.8\%$ (North Island). This may reflect a high genetic diversity in the populations studied to date. There were no shared haplotypes between New Zealand and Kiribati Islands samples.

A. Gormley (OU) continues to assess the appropriateness of applying mark-recapture techniques and photo-ID of natural markings to the problem of estimating the abundance of sperm whales in Kaikoura, bottlenose dolphins in Doubtful Sound and Hector's dolphins around Banks Peninsula. The current catalogue held by Otago University was used for analysis. In the case of Hector's dolphins, this was also the opportunity to compare the mark-recapture estimate against a previously obtained line-transect estimate.

S. Childerhouse and N. Gibbs (DOC) undertook a pilot study investigating the migratory population of humpback whales that pass through Cook Strait. Sixteen days of field effort were conducted in June 2004 using land- and vessel-based surveys. A total of 33 humpback whales were seen, and several blue and sei whales. Photo-identification was collected from 11 individuals and skin samples were collected from 12 individuals.

10. References

None.

11. Publications

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