

**NEW ZEALAND PROGRESS REPORT ON CETACEAN RESEARCH, APRIL 1997 TO APRIL 1998, WITH
STATISTICAL DATA FOR THE CALENDAR YEAR 1997**

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This report summarises information obtained from: Auckland, Massey, Otago and Texas A&M Universities, Museum of New Zealand, Institute for Environmental Science and Research, Department of Conservation, Ministry of Fisheries and private researchers.

1. Species and stocks studied

Common name	Scientific name	Area/stock(s)	Items referred to
Beaked whales	Family Ziphiidae	Worldwide	2.1.2; 4.3; 4.4; 8; 10; 11.1; 11.2
Bottlenose dolphin	<i>Tursiops truncatus</i>	South I.	4.3; 5; 8; 9
Common dolphin	<i>Delphinus delphis</i>	North I.	4.3; 5; 8; 9
Cuvier's beaked whale	<i>Ziphius cavirostris</i>	North and South Is.	4.3; 5; 8; 9
Dusky dolphin	<i>Lagenorhynchus obscurus</i>	South I. (Kaikoura)	2.1; 2.2; 3.1.1; 3.24.1; 4.3; 4.4; 5; 8; 9; 10; 11.1
Hector's dolphin	<i>Cephalorhynchus hectori</i>	North and South Is.	4.3; 5; 8; 9
Humpback whale	<i>Megaptera novaeangliae</i>	Mexican Pacific	4.1; 4.4; 9; 11
Humpback whale	<i>Megaptera novaeangliae</i>	Worldwide	4.4
Longfinned pilot whale	<i>Globicephala melas</i>	North I.	4.3; 5; 8; 9
Pygmy right whale	<i>Caperea marginata</i>	South I.	4.3; 5; 8; 9
Pygmy sperm whale	<i>Kogia breviceps</i>	North and South Is.	4.3; 5; 8; 9
Sperm whale	<i>Physeter macrocephalus</i>	South I. (Kaikoura)	2.2; 3.1
Straptoothed whale	<i>Mesoplodon layardii</i>	North I.	4.3; 5; 8; 9

2. Sightings data

2.1 Field work

2.1.1 Systematic

The Otago Marine Mammal Research group routinely conducts intensive surveys from small boats, to facilitate photo-ID of sperm whales (since 1990), Hector's dolphins (since 1984) and bottlenose dolphins (since 1990), for studies of their ecology, behaviour and habitat utilisation.

A line transect survey was conducted from a modified 15m catamaran to quantify Hector's dolphin abundance between Motunau and Timaru, including Banks Peninsula. Progress reports have been lodged with the Department of Conservation.

2.1.2 Opportunistic, platforms of opportunity

C. Jowett continues to record cetacean sightings from various platforms of opportunity around the NZ coastline and in the Tasman Sea and South Pacific. Several years of data are currently being entered onto a GIS database administered by the Department of Conservation.

As part of her research into the molecular genetics of beaked whales, M. Dalebout attended a number of beaked whale strandings in the Auckland and Northland regions of the North Island of NZ. Measurements, photographs and tissue samples for histopathology, toxicology, pollutant and heavy metal analysis, and genetic analysis are taken from all stranded cetaceans in NZ as part of a programme coordinated by the Museum of NZ with the help of the Department of Conservation.

2.2 Analyses/development of techniques

A team of researchers from Otago University (L. Slooten and S. Dawson), Massey University (S. Haslett) and Texas A&M University (C. Gates) are working on methods of estimating sperm whale abundance from directional hydrophone data. The data were collected using a hand-held directional hydrophone from a rigid-hulled inflatable boat at Kaikoura. Gates and Haslett are continuing work on a computer model to determine the number of whales that are detected from two or more hydrophone stations in order to estimate whale density.

A team of researchers from the National Marine Fisheries Service in the USA (B. Taylor, K. Fear) and Otago University (E. Slooten, D. Fletcher, S. Burkhart) are collaborating on population models to assess the impact of gillnetting on Hector's dolphins around NZ. Modelling work so far includes estimation of carrying capacity using population estimates and fishing effort data, predictions of future distribution and abundance, and estimates of extinction probability under different management regimes.

Fear, Taylor and Slooten have constructed a spatially-structured, deterministic model (submitted for publication). Burkhart and Slooten are working on stochastic models with a similar structure. These models are helping to determine which populations are likely to decline if current levels of gillnetting continue, and which populations are able to sustain the level of gillnetting in the local area. While gillnetting effort is substantially reduced in the Banks Peninsula Marine Mammal Sanctuary, gillnetting continues in most parts of NZ waters.

Otago University researchers S. Brager and A. Chong have developed a close range stereo photogrammetry system to measure dolphins as they ride the bow wave of a small research vessel. A housed video camera simultaneously records the underside of the animals for information on gender. This system has been used with Hector's dolphins to gain information on size structure and sex ratio of groups.

Otago researchers L. Bejder, S. Bräger and D. Fletcher have developed a new quantitative method for analysing the strength of associations between individuals. The method is based on Monte Carlo randomisations of possible associations.

K. Schneider (Otago University) used an echo-sounder in Doubtful Sound, Fiordland to trace the dive depth of bottlenose dolphins after the attachment of time-depth recorders with suction cups failed to produce dive-depth results (Schneider et al. 1998). On 170 occasions the echo-sounder displayed diving dolphins at various depths. The deepest dive recorded was to 199 m, with the bottom at 228m.

Between 17 July 1997 and 31 March 1998, A. Harlin and T. Markowitz spent 457.5 hours engaged in boat-based research in Kaikoura. During that time, they collected data on the location of dusky dolphin groups using a Global Positioning System. A total of 177.78 hours of GPS tracking were completed with 162 dolphin pods, more time was spent tracking large pods (> 50 individuals) than small pods (<50 individuals). In addition, dolphin groups and vessels near pods were tracked from shore with a theodolite (Wursig et al. 1991). From October, 1997 to March 1998, a total of 142.3 hours of theodolite tracking were completed on 48 days. The number of dolphin pods tracked from shore per day averaged $3.0 + 0.24$. These data have yet to be analysed.

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
Bottlenose dolphin	Fin/ body scars	Doubtful Sound	1990–1998	Yes	97	Otago Univ.
Dusky dolphin	Dorsal fin	Kaikoura	1997	Yes	510	T Markowitz/ Texas A&M Univ.
Hector's dolphin	Fin/ body scars	East South I.	1984–1997	Yes	467	Otago Univ.
		West South I.	1994–1997	Yes	238	Otago Univ.
Sperm whale	Fluke	Kaikoura	1990–1998	Yes	136	Otago Univ.

3.2 Analyses/development of techniques

Currently, just over 500 marked dusky dolphins have been catalogued from photos taken in Kaikoura over the past year. Roughly 10 percent of these individuals ($n = 54$) have been re-photographed. Roughly one in three individuals (33.47 percent) has natural markings which are distinctive. Based on the number of photographs still to be catalogued, it is estimated that between 2000 and 2500 marked individuals have been photographed this year. Preliminary analysis of this catalogue reveals that there may be some degree of year-round residency in Kaikoura, or at least that certain dolphins visit the area in both Winter and Summer.

A new, non-injurious technique was used to collect tissue from the backs of bow-riding dusky dolphins using a nylon kitchen scrub pad affixed to the end of a wooden dowel. Collection procedure and behavioural responses of dolphins to sampling are reviewed by Harlin *et. al, in press*.

4. Tissue/biological samples collected

4.1 Biopsy samples

Species	Area	1998 collection	Archived	No. analysed	Total holdings	Contact institution
Dusky dolphin	Kaikoura	181	Yes	65	181	Auckland Univ.
Hector's dolphin	NZ	54	Yes	nil	54	Auckland Univ.
Humpback whale	Mexican Pacific	>100	Yes (up to 1997)	~200 (none of 1998)	>500	Facultad de Ciencias UNAM

4.2 Samples from directed catches or by-catches:

Species	Area/stock	Calendar year total	Archived	Tissue types	Contact person / institution
Hector's dolphin	NZ coastal	25 ¹	Yes	Skin, blubber, organs	F. Pichler / Auckland Univ.

No directed catches taken

4.3 Samples from stranded animals: (¹ Most of samples extracted from historic collections)

Species	Period total	Archived (Y/N)	Tissues	Contact person/ institute
Bottlenose dolphin	1	Yes	skin, blubber, blood, gonads, all organs, skeleton	C. S. Baker/ Auckland Univ.; P. Jones/ ESR; P. Duignan/ Massey Univ.; A.van Helden, Museum of NZ
Bryde's whale	2	Yes	blubber, skin	C. S. Baker/ Auckland Univ.; P. Jones/ ESR; P. Duignan/ Massey Univ.; A.van Helden, Museum of NZ
Common dolphin	3	Yes	skin, blubber, blood, gonads, all organs, skeleton	C. S. Baker/ Auckland Univ.; P. Jones/ ESR; P. Duignan/ Massey Univ.; A.van Helden, Museum of NZ
Cuvier's beaked whale	4	Yes	blubber, skin, some organs	C. S. Baker/ Auckland Univ.; P. Jones/ ESR; P. Duignan/ Massey Univ.; A.van Helden, Museum of NZ
Dusky dolphin	6	Yes	skin, blubber, blood, gonads, all organs, skeleton	C. S. Baker/ Auckland Univ.; P. Jones/ ESR; P. Duignan/ Massey Univ.; A.van Helden, Museum of NZ
Gray's beaked whale	15	Yes	skin, blubber	C. S. Baker, Auckland Univ.
Hector's dolphin	38 ¹	Yes	skin, blubber, blood, gonads, all organs, skeleton	C. S. Baker/ Auckland Univ.; P. Jones/ ESR; P. Duignan/ Massey Univ.; A.van Helden, Museum of NZ
Minke whale	2	Yes	blubber, skin, some organs (2), skeleton (1)	C. S. Baker/ Auckland Univ.; P. Jones/ ESR; P. Duignan/ Massey Univ.; A.van Helden, Museum of NZ
Pilot whale	23	Yes	blubber, skin, some organs (22), skeleton (1)	C. S. Baker/ Auckland Univ.; P. Jones/ ESR; P. Duignan/ Massey Univ.; A.van Helden, Museum of NZ
Pygmy right whale	1	Yes	blubber, skin	C. S. Baker/ Auckland Univ.; P. Jones/ ESR; P. Duignan/ Massey Univ.; A.van Helden, Museum of NZ
Pygmy sperm whale	6	Yes	blubber, skin (4)	C. S. Baker/ Auckland Univ.; P. Jones/ ESR; P. Duignan/ Massey Univ.; A.van Helden, Museum of NZ
Southern bottlenosed whale	1	Yes	skin, blubber	C. S. Baker/ Auckland Univ.
Straptoothed-whale	2	Yes	skin, blubber	C. S. Baker/ Auckland Univ.

4.4 Analyses/development of techniques:

Analyses of mitochondrial, nuclear genetic markers and sex identity have continued on tissue samples of humpback whales from the Mexican Pacific and other regions worldwide. Significant progress has been made in analyzing the extant published data of mtDNA variation in humpback whales worldwide.

The beachcast and bycatch specimens of Hector's dolphin are being analysed at Auckland University for variation in mitochondrial DNA control region sequences and microsatellite loci. (See the paper by Pichler et al in Publications, which describes mtDNA variation between three regional populations of Hector's dolphin). An extraction technique has been developed that allows extraction of genomic DNA from single Hector's dolphin museum teeth dating back to 1870. To date, 43 museum specimens have been sequenced for a 206bp fragment of the mtDNA control region.

As part of her doctoral dissertation, M.Dalebout is investigating the evolutionary relationships of the beaked whales (Ziphiidae) using molecular systematics. To assist in species identification she has compiled a DNA database of 'reference' sequences from the rapidly evolving mitochondrial DNA control region for 17 of the 20 species of beaked whale currently recognised. Reference samples for 8 species were obtained from strandings in NZ and South Australia. Sequences for an additional 7 species were obtained from a previously published report (Henshaw *et al.* 1997). Other reference samples were obtained from Peru and Canada. This DNA database was used to confirm the identify of 20 'test' samples from incompletely documented beaked whale strandings around NZ. 20% of these stranded animals had been initially misidentified on the beach. This included a densebeaked whale, the first record of this species in NZ waters, and a juvenile Andrews' beaked whale, a species known from less than 20 strandings worldwide. Additional analyses of the reference sequences including trends in within- and between-species genetic variation showed that one of the reference specimens from the Northern Hemisphere had also been misidentified. This could represent the discovery of a new species of beaked whale.

Several other molecular datasets from more slowly evolving regions of the mitochondrial genome, are currently being finalised, including the mtDNA 16S rRNA gene and the 3' end of the control region, which may help to resolve some of the higher-level phylogenetic relationships in this group. The phylogenetic potential of several nuclear loci, including the first intron of the muscle actin gene, are also under investigation, as well as assessment of the levels of major histocompatibility complex (MHC) diversity in this group.

5. Pollution studies

During 1997, five cetacean samples were analysed for polychlorinated dibenzo-p-dioxins (PCDDs), dibenzofurans (PCDFs) and polychlorinated biphenyls (PCBs). Samples analysed were three Hector's dolphin (*Cephalorhynchus hectori*) one pilot whale (*Globicephala malaena*) and one sperm whale (*Physeter macrocephalus*). Retained extracts from the same samples are also to be analysed for a range of persistent organic pollutants (POPs) before June 30th 1998.

A collaborative study has begun between Massey University Cetacean Investigation Centre (MUCIC) and Dr. Paul Jones, ESR, Wellington. The aim of the research is to determine the concentration of known toxic pollutants in blubber, liver, and kidney from stranded whales and dolphins and to determine whether there is an association with pathological findings in these animals.

6. Statistics for large cetaceans

6.1 Direct catches for the 1997 calendar year

None

6.2 Other non-natural mortality for the 1997 calendar year

Species	Area	Males	Females	Total	Cause	Methodology
Bryde's whale	Hauraki Gulf	1	0	1	Entangled in mussel farm ropes	Examination of beach-cast animal

7. Statistics for small cetaceans

7.1 For the calendar year 1997

		Directed catch		Incidental mortality			Live - capture
Species	Area/stock	Reported	Est. total	Reported	Est. total	Source	Reported
Common dolphin	NZ coastal	0	0	4	?	Inshore trawl	0
Dolphin sp	NZ coastal	0	0	1	?	Midwater trawl	0
Dusky dolphin	NZ coastal	0	0	1	?	Midwater trawl	0
Hector's dolphin	East coast South Island	0	0	2	?	Gillnet / inshore trawl	0
Pilot whale	NZ coastal	0	0	1	?	Midwater trawl	0

8. Strandings

A van Helden (Museum of NZ, PO Box 467, Cable Street, Wellington) collates the information on species and numbers of whales stranded in NZ waters, and the distribution of tissue and biological samples to interested institutions. Species that stranded and from which samples were collected during the period 1/4/97 to 1/4/98 were as follows: *Caperea marginata*, *Balaenoptera acutorostrata*, *Balaenoptera edeni*, *Mesoplodon grayi*, *Mesoplodon layardii*, *Ziphius cavirostris*, *Cephalorhynchus hectori*, *Delphinus delphis*, *Globicephala macrorhynchus*, *Globicephala malaena*, *Lagenorhynchus obscurus*, *Tursiops truncatus*, *Kogia breviceps*, *Physeter macrocephalus*. During the period 1/4/97 to 1/4/98, there were 57 stranding incidents in NZ waters, involving 200 animals. Disposition of the samples collected is summarised in section 4.3.

9. Other studies and analyses

M. Cawthorn continues analysis and compilation of historical catches of large whales in the South Pacific and Indian Ocean from Townsend and other sources. These are replotted with reference to updated bathymetric and oceanographic information to assess the influence of these parameters on whale distribution and seasonality in the Southern Hemisphere. In association with Whale Watch Kaikoura, Cawthorn has designed and instigated a log-book system for use by whale watch tour boat crews, to collect information daily on the abundance and distribution of large whales in Kaikoura waters, together with environmental information. A regular aerial survey is planned to commence later this year. In association with Sealord Group Ltd, Cawthorn is involved in the design, testing and application of an excluder device intended to minimise the fatal by-catch of cetaceans and pinnipeds in trawl fisheries around NZ. Further work on a similar excluder device is being carried out by B. Isaksen and D. Gibson.

Otago University researchers are continuing their sperm whale research at Kaikoura. Directional and omni-directional hydrophones are used to find and track whales. S. Dawson and E. Slooten are continuing acoustic and photographic surveys to quantify distribution and abundance, and stereo-photogrammetry to assess population structure. S. Childerhouse (Marine Mammal Scientist at DOC, and PhD student at Otago University) is continuing to analyse the photo-ID catalogue for sperm whales at Kaikoura (Childerhouse et al. 1996). N. Jaquet (postdoc, Otago Uni) is working on fine scale distribution, movements and associations of sperm whales at Kaikoura. L. Douglas (MSc student) is continuing her work on acoustic censusing using click counting methods. The vocalisations of individually identified sperm whales are also being recorded during entire dive cycles to investigate the role of "buzzes" and "surface clicks", and to assess variability between individuals.

The Otago University research team continues its long-term research on Hector's dolphin. S. Bräger has just completed his PhD on movement patterns, ecology and population structure of Hector's dolphins. Among other things, this study provides the first detailed data on Hector's dolphins off the South Island west coast. Analyses of resightings collected at Banks Peninsula since 1984 show that individual Hector's dolphins have extraordinarily small ranges of movement (60km max). Intensive photo-ID Surveys (by Bräger) at three sites each on the east and west coasts of the South Island have shown no movement between sites. E. Slooten and S. Dawson are continuing analyses of survival rates from before and after the creation of the Banks Peninsula Marine Mammal Sanctuary. However, their main current research activity is line transect surveys of Hector's dolphins, conducted from a 15m displacement catamaran. Ongoing field activities also include collection of reproductive data from dissections of beachcast and gillnet-caught dolphins.

L. Bejder has completed his MSc study of Hector's dolphins at Porpoise Bay, Southland. Bejder's study focussed on population size, associations, and habitat utilisation of Hector's dolphins, with theodolite observations of individuals to document reactions to local dolphin tourism (see Bejder and Dawson, report to this meeting).

Studies of bottlenose dolphins in Doubtful Sound, Fiordland continue. K. Schneider is analysing his data for his PhD thesis at Otago University. Using photo-ID, video, and focal-animal sampling, he collected data on distribution, abundance, movement, behaviour and social association on a fine scale. A sequence analysis of surface behaviour observations has been used to calibrate group behaviour contexts in the field. Audio- and wide-band recordings have been made to study use of sound in different behavioural contexts. An MSc student will continue his research.

K. Barr (MSc student, Otago University) and E. Slooten have just completed a report to the Department of Conservation on the effects of boats and swimmers on the behaviour of dusky dolphins at Kaikoura. Barr's study included theodolite tracking of dolphins and boats from a clifftop, as well as observations of dolphin movements and behaviour. Statistically significant changes in dolphin behaviour were observed, as well as substantial but non-significant changes in behaviour. Dolphins were accompanied by dolphin watching boats for more than 70% of observation time, and this proportion increased significantly from the first to the second season of the study (Barr and Slooten, report to this meeting). This lowered the statistical power of comparisons between dolphin behaviour with and without boats, and makes it very difficult to assess the effects of dolphin watching and swimming. The report will be discussed with current holders of dolphin watching and swimming permits, and with applicants for new permits, after which DOC will make a decision on whether to allow any increases in dolphin watching activity.

Necropsies are conducted at Massey University Cetacean Investigation Centre (MUCIC) on carcasses of cetaceans that have been stranded or taken as by-catch if they are sufficiently fresh. Health assessment is carried out by gross examination of the carcass, histopathological examination of all organs, bacteriological and virological culture of selected samples, parasitology, and serology for selected pathogens on blood or serum samples. Health of individuals and stocks is of importance in stock management as it impacts directly on longevity, mortality, productivity and recruitment. Natural pathogens can act stochastically to cause epidemics or be more predictable with endemic infection. The role of natural disease in population regulation in NZ waters is poorly understood at present. The effects of anthropogenic factors on health such as pollution, trauma and stress can be significant and are currently under investigation in NZ.

Humane euthanasia of cetaceans has also been an important focus of studies at MUCIC. Studies on the passage of electricity through the bodies of cetaceans conducted by G. Barnes and P. Madie were presented at the 1997 meeting of the Commission.

Work underway at Auckland University using genetic analyses of mtDNA variation worldwide showed that the two recent most glaciations, Illinois and Wisconsin, have strongly affected the demographic and genetic structure of humpback whale populations as observed today. Data from Mexican researchers on photo ID and social groupings distribution in the Mexican Pacific suggest that wintering destinations and habitats change in response to climate variations and human activities. Future changes in distribution and population structure of this species due to anthropogenic activities should be considered in developing long term conservation programmes.

A. Harlin, T. Markowitz and B. Wursig have recorded detailed observations of dusky dolphin behaviour at Kaikoura. Additional analyses of the effect of pod composition, boat traffic, environmental conditions, and other factors on dolphin behaviour have yet to be completed. Data relating to the effects of boat traffic and swimmers on dolphin behaviour are also yet to be analysed.

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11. Publications

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11.2 Unpublished literature

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