Orca (*Orcinus orca*) in New Zealand waters

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"When I think back to all the crap I learnt in High School, it's a wonder I can think at all"
Paul Simon (1973)

"The only way to survive an encounter with a killer whale is reincarnation"
Hoyt (1984)

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ABSTRACT

Orca (*Orcinus orca*), also known as killer whales, are more widely recognised than other marine mammals. Although they have been reported from all oceans of the world, including the seas around New Zealand, information above anecdotal notes exists for only a few places. Orca are an apex marine predator that exhibits cultural differences in diet, vocalisations, and behaviour, between and within populations. This study was established to determine baseline information on New Zealand orca and to provide recommendations for future management and conservation. The conservation status of orca worldwide is poorly known, although two populations of the Pacific North West Coast of North America have recently been classified as 'Threatened' and 'Vulnerable'.

Photo identification was used to determine the population size, distribution around New Zealand waters, as well as range use and association among individuals. The total New Zealand orca population is small (range 65-167 animals, with 115 calculated alive in 1997). Resighting rates were high, with 75 % (n = 88) of the animals seen on more than two occasions. The mean number of sightings for the 117 photo-identified animals was 5.4, the mode was one sighting, and the median 9 – 10 sightings. One orca was photographed over a 20 year period. Population structure, frequency of association with others, and other social behaviours were used to determine population demographics. The New Zealand orca population appears to be made up of at least three sub-populations based on geographic distribution (North-Island-only, South-Island-only and North+South-Island sub-populations). Preliminary mtDNA analysis supports the hypothesis that some New Zealand orca do not mix. The mean Association Indices within the North-Island-only and South-Island-only sub-populations are significantly greater than within the North+South-Island sub-population. Those animals sharing food had higher Association Indices than those who did not share food. Sex ratios appear similar within each sub-population and calves were present in each, suggesting all sub-populations are breeding.

Feeding behaviour was observed to assess habitat use and differences between foraging strategies and prey preferences. Twenty four different species of prey have been recorded in the New Zealand orca diet. Of these, ten have not been recorded elsewhere. The prey consists of four types; rays (the most common food type), sharks, fin-fish and cetaceans (pinnipeds have not been identified as a prey source). Foraging strategies were different for each prey type, with benthic foraging for rays in shallow waters the most diverse strategy used in New Zealand. Food sharing was observed for all prey types. One of the three proposed New Zealand sub-populations appears to be generalist or opportunistic foragers, feeding on all four prey types, another sub-population slightly less so, feeding on three prey types, and the third sub-population appears to be a more specialist forager, only recorded taking one prey type (cetaceans).

Potential threats to orca, in addition to small population size, such as bioaccumulation of toxic chemicals, oil spills, boat strikes and shootings are considered and recommendations for conservation and future management are offered.

Whether the three sub-divisions within the New Zealand orca population are reproductively isolated and hence require separate management, and whether there is further sub-division within the proposed North+South-Island sub-population, requires further study including genetic analysis. Some level of ongoing monitoring is recommended to ensure that the population of New Zealand orca does not decline.

In addition, records of stranding locations and details of strandings are appended. Twenty-four live strandings occurred, involving 63 killer whales, of which 17 animals were successfully refloated and two of these resighted. One was seen after three years (nine resightings) and the other after four months (10 resightings). Refloating stranded orca is recommended.

Published papers

Berghan, J., and I. N. Visser. 2000. Vertebral column malformations in New Zealand delphinids with a review of cases world-wide. *Aquatic Mammals*. 26 (1): 17-25.

Constantine, R., I. Visser, D. Buurman, R. Buurman and B. McFadden. 1998. Killer whale (*Orcinus orca*) predation on dusky dolphins (*Lagenorhynchus obscurus*) in Kaikoura, New Zealand. *Marine Mammal Science*. 14: 324-330.

Duignan, P. J., J. E. B. Hunter, I. N. Visser, G. W. Jones and A. Nutman. 2000. Stingray spines: A potential cause of killer whale mortality in New Zealand. *Aquatic Mammals.*, 26 (2): 143-147

Visser, I. N. 1998. Prolific body scars and collapsing dorsal fins on killer whales in New Zealand waters. *Aquatic Mammals*. 24 (2): 71-81.

Visser, I. N. 1999. Antarctic Orca in New Zealand? *New Zealand Journal of Marine and Freshwater Research*. 33: 515-520.

Visser, I. N. 1999. Benthic foraging on stingrays by killer whales (*Orcinus orca*) in New Zealand waters. *Marine Mammal Science*. 15: 220-227.

Visser, I. N. 1999. Propeller scars and known migration of two orca (*Orcinus orca*) in New Zealand waters. *New Zealand Journal of Marine and Freshwater Research*. 33: 635-642.

Visser, I. N. 1999. A summary of interactions between orca (*Orcinus orca*) and other cetaceans in New Zealand waters. *New Zealand Journal of Natural Science*. 24: 101-112.

Visser, I. N. 2000. Killer whale (*Orcinus orca*) interactions with longline fisheries in New Zealand waters. *Aquatic Mammals.* 26 (3): 241-252.

Visser, I. N., and D. C. Fertl. 2000. Stranding, resighting and probable boat strike of a killer whale (*Orcinus orca*) from New Zealand. *Aquatic Mammals.* 26 (3): 232-240.

Visser, I. N., D. Fertl, J. Berghan and R. van Meurs. 2000. Killer whale (*Orcinus orca*) predation on a shortfin mako shark (*Isurus oxyrinchus*), in New Zealand waters. *Aquatic Mammals.* 26 (3): 229-231.

Visser, I. N., and P. Mäkeläinen. 2000. Variation in eye patch shape of killer whales (*Orcinus orca*) in New Zealand waters. *Marine Mammal Science*. 16: 459-469.