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Stranding, resighting, and boat strike of a killer whale (*Orcinus orca*) off New Zealand

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Abstract

In mid-June 1997, a subadult, male killer whale was found stranded on the coast of New Zealand. It remained on the beach for approximately 21 h and, with assistance, was successfully refloated. Prior to the stranding the animal was observed on six occasions (as early as September 1996), and subsequently was resighted 11 times (as recently as October 1999). On the fifth post-stranding encounter (October 1998), this killer whale was observed with substantial damage to the dorsal fin, caused by a boat strike. This individual whale has survived for over three and a half years since stranding, and for two years since the boat strike. Information on wound healing is presented.

Key words: killer whale, *Orcinus orca*, stranding, rehabilitation, photo identification, boat strike, wound healing, New Zealand.

Introduction

A long-term study of killer whales (*Orcinus orca*) in New Zealand waters has been on-going since December 1992. To date, 117 individuals have been photographically identified using distinctive marks on their dorsal fins, saddle-patches, and eye-patches (Visser & Mäkeläinen, 2000). We report on one killer whale seen in the area since 1996. This individual was found stranded in mid-1997, was returned to the water and was subsequently resighted. During one post-stranding sighting this killer whale had substantial damage to the dorsal fin, attributed to a boat strike.

Materials and Methods

On 14 June 1997, at approximately 1500 h, a killer whale was seen in the surf on a beach about 3.5 km south of Mangawhai Harbour, Northland (36°05.0 S, 174°36.2 E) (Fig. 1, sighting no. 7, Table 1). The animal appeared to be uninjured externally, except for a few minor wounds (a cut running along the joint of the left pectoral fin and two blisters on the same joint). These wounds could have been caused when the animal rolled around on its left side in the surf. Another larger blister (approximately 20 cm long, 5 cm wide, and 5 cm high) was apparent just below the base of the dorsal fin on its left side. This blister appeared to have been caused during the stranding, by the dorsal fin drooping over to the left side (at a 15° angle), causing pressure on this area. A number of fresh and superficial tooth rake marks were seen on the body at various locations, suggesting conspecific interactions (Visser, 1998). A small sample of loose skin from one of the cuts was collected and stored in 70% alcohol and subsequently sent to R. Hoelzel at the University of Durham (UK) for genetic analysis. Dorsal fin, saddle- and eye-patch photographs were taken, and body measurements made (Table 2). Basic first aid was administered to the whale in the form of uprighting it, keeping it cool with wet sheets and bucketed water (later this was supplied by hoses from a fire truck). Holes were dug in the sand to allow the whale's pectoral fins to hang at a more natural angle. A pool was also dug for the tail flukes, to assist in keeping body temperature down. During the stranding the whale produced intermittent sounds, which were recorded.

On 15 June at 0600 h, preparation began to shift the animal back to the water. Inspection in daylight revealed the left pectoral fin joint could have been broken, since it hung at a different angle from the right fin. The joint was bleeding slightly from the cut running parallel to the body. Standard whale stranding procedures in New Zealand do not cater for rehabilitation in captivity, as there are no suitable facilities. Hence, the whale, although possibly injured, was refloated ready for release. Refloating was achieved using specially designed 'rescue pontoons', which consisted of a PVC/nylon mat with attachment rings, and two inflatable pontoons. At

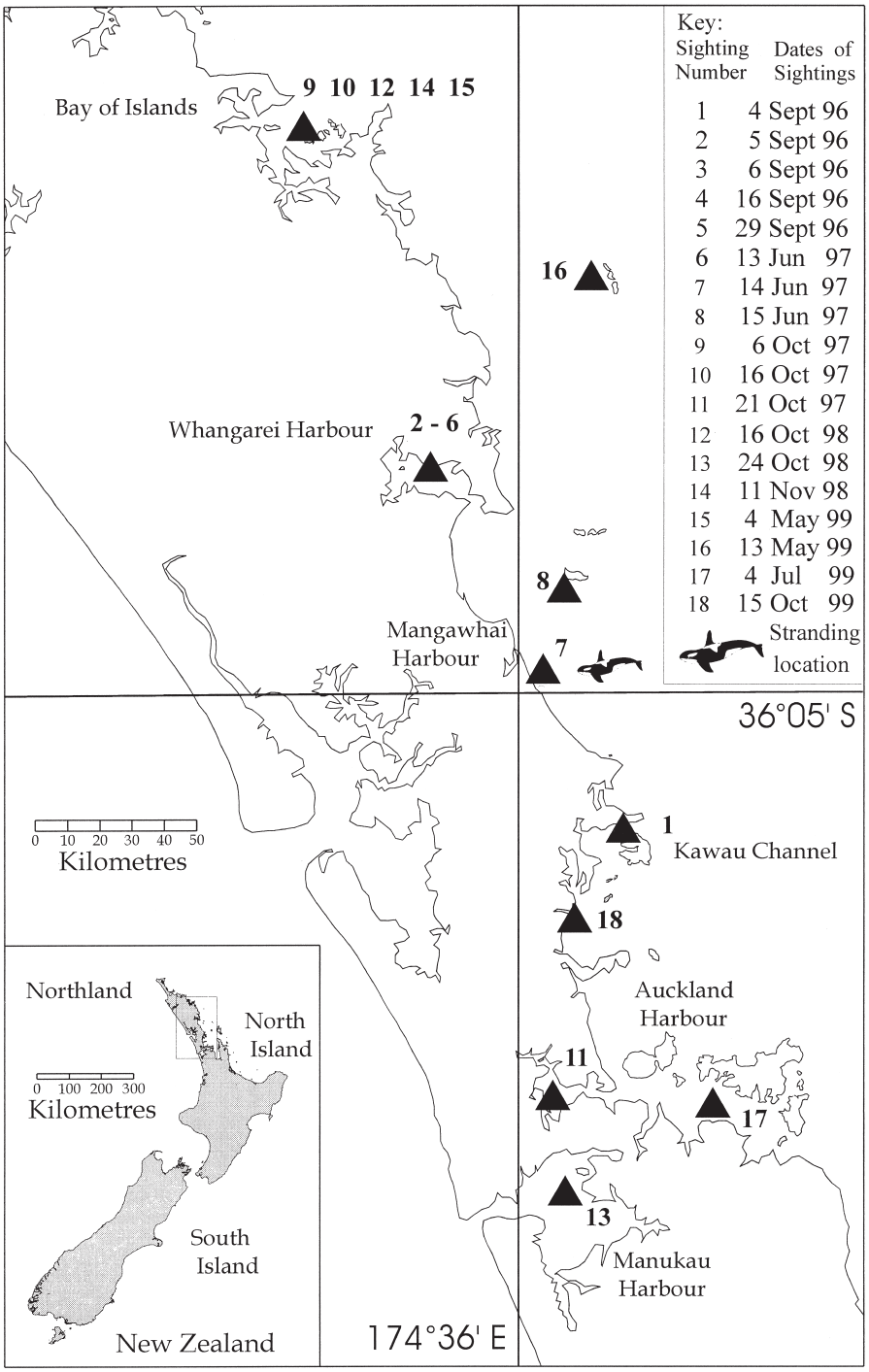

Figure 1. Sightings of killer whale NZ101 near New Zealand pre- and post-stranding.

Table 1. Sightings of subadult male killer whale (NZ101) in Northland from 1996–1999 (pre- and post-stranding).

Date	Location	Days post stranding	Days post boat strike	Behaviour of NZ101 and notes	Killer whales identified with NZ101 (*n*=approximate no. of unidentified)	Sighting source
4 September 1996	Kawau Channel, Northland	N/A	N/A	Benthic foraging for stingrays	NZ4, NZ5, NZ6, NZ7, NZ9, NZ13, NZ50, NZ51, NZ63, NZ87, NZ96, NZ97 (*n*=8)	INV
5 September 1996	Whangarei Harbour	N/A	N/A	Benthic foraging for stingrays	NZ4, NZ5, NZ6, NZ7, NZ8, NZ9, NZ13, NZ50, NZ51, NZ63, NZ87, NZ96, NZ97 (*n*=7)	INV
6 September 1996	Whangarei Harbour	N/A	N/A	Benthic foraging for stingrays	NZ4, NZ6, NZ8, NZ9, NZ51, NZ63, NZ87, NZ94, NZ96, NZ97 (*n*=5)	INV
16 September 1996	Whangarei Harbour	N/A	N/A	Benthic foraging for stingrays	NZ1, NZ2, NZ3, NZ4, NZ5, NZ6, NZ7, NZ8, NZ9, NZ13, NZ50, NZ51, NZ52, NZ63, NZ87, NZ94, NZ96, NZ99 (*n*=5)	INV
29 September 1996	Whangarei Harbour	N/A	N/A	Benthic foraging for stingrays	NZ4, NZ5, NZ6, NZ7, NZ13, NZ62, NZ63, NZ96 (*n*=6)	INV
13 June 1997	Whangarei Harbour	N/A	N/A	Benthic foraging for stingrays	NZ4, NZ5, NZ6, N63 (*n*=3)	INV
14 June 1997	Mangawhai Heads	0	N/A	Stranded. See text for full details	NZ101 on beach	G. Gough, F. Crawford, INV
15 June 1997	Hen & Chicken Islands	1	N/A	Refloated. Morning—joined one unidentified animal offshore Afternoon—resighted above water and filmed under water, group foraging for rays	Morning—(*n*=1) Afternoon—NZ6 (*n*=6)	L. Partington, J. Ackley, A. Penniket

Table 1. *Continued.*

Date	Location	Days post stranding	Days post boat strike	Behaviour of NZ101 and notes	Killer whales identified with NZ101 (*n*=approximate no. of unidentified)	Sighting source
6 October 1997	Bay of Islands	113	N/A	Benthic foraging for stingrays, white scar below dorsal fin first noted and photographed	NZ4, NZ5, NZ6, NZ7, NZ8, NZ13, NZ63 (*n*=6)	INV
16 October 1997	Bay of Islands	123	N/A	Benthic foraging for stingrays	NZ4, NZ5, NZ6, NZ63 (*n*=3)	INV
21 October 1997	Waitemata (Auckland) Harbour	128	N/A	Benthic foraging, sediment plumes seen from helicopter, white scar visible	Probably NZ6 (*n*=6)	INV
16 October 1998	Bay of Islands	488	1—assumed boat strike occurred this day	Fresh wound to dorsal fin, cut from top to base, not foraging	NZ4, NZ6, NZ7, NZ13, NZ63 (*n*=9)	INV
24 October 1998	Manukau Harbour	497	9	Seen moving out of harbour	NZ6, NZ63 (*n*=6)	R. Rose
11 November 1998	Bay of Islands	515	27	Wound showing granulated tissue, slow swimming, 'logging' at surface, not foraging	NZ4, NZ5, NZ6, NZ9, NZ63 (*n*=3)	INV
4 May 1999	Bay of Islands	689	201	With group	(*n*=approximately 12)	R. Constantine, A. Flemming
13 May 1999	Poor Knight Islands	698	210	Approached boat, keeping up with other killer whales in group	(*n*=5, including 1 unidentified adult male)	S. Gray
4 July 1999	Auckland Harbour	750	262	Benthic foraging for stingrays	NZ1, NZ2, NZ3, NZ4, NZ6, NZ8, NZ9, NZ47, NZ63, NZ102	INV
15 October 1999	Hibiscus Coast	853	365	Benthic foraging for stingrays and fast travelling (approximately 10 knots)	NZ4, NZ6, NZ8, NZ21, NZ63, NZ92, NZ93, NZ95 (*n*=3)	INV

INV=Ingrid N. Visser; N/A=not applicable category.

Table 2. Body measurements of killer whale NZ101, taken during stranding on 14 June 1997.

Measurement (straight line and parallel to the body axis)	Metres
Total length—tip of upper jaw to deepest part of notch between flukes	4.95
Tip of upper jaw to eye	0.63
Gape—tip of upper jaw to corner of mouth	0.62
Tip of upper jaw to blowhole	0.55
Tip of upper jaw to insertion of pectoral fin	1.05
Tip of upper jaw to insertion of dorsal fin	2.67
Tip of upper jaw to centre of anus	3.05
Maximum girth (anterior to dorsal fin)	1.17
Maximum length of pectoral fin	0.79
Maximum width of pectoral fin	0.52
Width of tail flukes	1.43
Depth of fluke notch	0.48
Height of dorsal fin	0.55

1010 h, the animal was moved out through the surf after having remained on the beach for an estimated 21 h. Air temperature during the night ranged from 6°C to −1°C.

Upon return to the water, the whale began producing sounds, which increased during release. Once out in deeper water, the pontoons were deflated and removed. Underwater observations were made of the whale diving and flexing both pectoral fins in slow circles, suggesting perhaps that injury to the left pectoral fin joint was not substantial. The whale headed in a northerly direction at about three knots, towards the Hen and Chicken Islands (Fig. 1, sighting no. 8, Table 1). At dawn, on the morning of the release, a single unidentified killer whale was sighted from a cliff top near the stranding location, and seen about 7.5 km offshore, swimming parallel with the beach.[1] At 1010 h, when the stranded animal was placed in the water, the killer whale offshore turned and headed towards the coast. An hour after release, the previously stranded killer whale joined up with the unidentified killer whale, and both headed towards the Hen and Chicken Islands.[1]

Photographs of the stranded animal were matched to the New Zealand photographic identification catalogue and the individual identified as NZ101 (Visser, unpublished data). Based on the body measurements made at the stranding, and compared to other killer whale studies e.g., Bigg (1982), NZ101 was determined to be a subadult. Genetic analysis of the skin sample revealed that NZ101 was a male.[2]

Prior to the stranding, NZ101 was observed on six occasions in Northland (first identified in September 1996); post-stranding, he was resighted twelve times (Table 1 and Fig. 1). The first resighting occurred the day following the stranding. The second resighting occurred 113 days post stranding, during which NZ101 was noted to have a white scar in the same location as the large blister which had formed during the stranding. During each resighting, NZ101 was observed with at least six other killer whales (Table 1). NZ6 (adult male) and NZ63 (undetermined age class and sex) were sighted with him on 13 occasions, and NZ4 (adult female) on 12 occasions.

On 16 October 1998, NZ101 was observed with a split from the top to the base of the dorsal fin (Fig. 2). As the wound was red and bleeding it was assumed that the wound had occurred that day, or very recently. Parallel shallow cuts could be seen anterior and posterior of the dorsal fin. These wounds were similar to wounds seen on two other killer whales in New Zealand waters (Visser, 1999*a*) as well as those appearing on the backs of manatees (*Trichechus manatus*) (Beck *et al*., 1982; Moore, 1956), northern right whales (*Eubalaena glacialis*) (Colborn *et al*., 1998; Krause, 1990), Indo-Pacific hump-backed dolphin (*Sousa chinersis*), finless porpoise (*Neopholaena phocaenoides*), and bottlenose dolphins (*Tursiops truncatus*) (Bloom & Jager, 1994; Fertl, 1994). Twenty-seven days later, when NZ101 was resighted by the senior author, the dorsal fin had deteriorated, with the leading edge of the cut expanded and showing exuberant granulation tissue (Fig. 3), which could be expected from the healing of such a severe, major wound.[3] NZ101 appeared

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[3]Personal communication from S. Ridgway, Navy Marine Mammal Program, D3503 (PLBS), 49620 Beluga Road, San Diego CA 92152-6266, USA.

Figure 2. Split dorsal fin of killer whale NZ101 presumed to be caused by a boat strike on 16 October 1998 (first sighting after boat strike), (photographs a. by R. van Meurs and b. Ingrid N. Visser).

'sluggish' and was trailing behind the other killer whales present.

NZ101 was resighted again on 4 May, 13 May, 4 July and 15 October 1999. By 4 July (261 days after the initial sighting of the wound), the posterior portion of the dorsal fin had collapsed to the animal's left side, and although collapsed appeared fairly rigid. The open edges of the wound on the fin had healed over and were dark like the rest of the skin on the dorsal fin. On 15 October (365 days after the initial sighting of the wound), the fin remained collapsed and rigid (Fig. 4). NZ101's

Figure 3. Cut in the deteriorating dorsal fin of killer whale NZ101 (day 27), with exuberant granulated tissue visible. The white scar below the dorsal fin remained from a large blister the whale received while stranded, shallow scars anterior to the dorsal fin are visible (photograph by I. N. Visser).

Figure 4. Dorsal fin of killer whale NZ101 where the posterior portion has collapsed on 15 October 1999 (day 365). Open edges of wound are healed over and are dark like rest of the skin on the dorsal fin. The white scar is still visible (photograph by I. N. Visser).

behaviour was more consistent with his behaviour prior to the boat strike, in that he was observed to benthic forage for rays. This involves the killer whale foraging for rays on the sea floor in shallow water, and may involve digging in the substrate for rays (Visser, 1999*b*).

Discussion

It is unknown why NZ101 stranded in 1997. It is, however, possible that the stranding occurred while the whale was foraging for rays in shallow water. The stranding location is adjacent to an area already reported as used extensively for this feeding technique (Visser, 1999*b*). It also is impossible to know whether the boat strike was related to the stranding. This seems highly unlikely given the long time period (16 months) between the incidents. The wound from the boat strike was a major wound—as described by Lockyer & Morris (1990), but has healed well. Descriptions of wound healing appear in Bruce-Allen & Geraci (1985) and Corkeron *et al.* (1987).

The level of interest in stranded cetaceans is high, irrespective of whether their populations are abundant, threatened, or endangered (St. Aubin *et al.*, 1996). Little published data are available on the results, effectiveness of various rescue methods, or the overall achievements or success (Mell, 1988; Phillips, 1988). There is considerable debate over the value and success of refloating stranded individuals (Geraci & Lounsbury, 1993; Odell *et al.*, 1989). Very few cases exist where systematic efforts were made to conduct follow-up monitoring of released cetaceans (Wells *et al.*, 1998). The information reported here is one of the rare cases where a stranded animal, which was subsequently refloated, was resighted over a period of more than two years. Successful return to the wild can be assessed on survival and re-incorporation into social groups (Wells *et al.*, 1998). Based on these criteria, NZ101 is considered to be successfully returned to the wild, since he survived for at least 28 months after stranding and was resighted with individuals he was known to associate with prior to stranding.

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