Chapter 9
Managing the Welfare of Marine Mammals at Mass Strandings in Golden Bay, New Zealand

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Abstract In this chapter, issues of marine mammal welfare are illustrated through recounting three mass stranding events of long-finned pilot whales which occurred in Golden Bay, New Zealand. For two of the mass strandings discussed, both were reported soon after the whales stranded and had good access and high numbers of volunteers assisting Department of Conservation (DOC) staff. One of these strandings had a high refloating success rate (89% of 345 whales), the other a moderate success rate (39% of 198 whales). This contrasted with the third stranding (comprising of 105 whales) which occurred in a remote location with difficult access and was first observed from an aircraft, 1 or possibly 2 days after the initial stranding. When DOC staff arrived at this remote site, less than one quarter of the pod was still alive, and these were suffering considerably. Given the whales' poor condition, high degree of suffering and low chance of survival, they were euthanised following DOC guidelines. These three mass strandings were relatively large and if combined accounted for approximately one third of the nearly 2000 cetaceans that stranded in Golden Bay between 1990 and 2016. New Zealand has a relatively high occurrence of strandings, with an average of 300 cetaceans stranded annually in the last 26 years. Stranding events are recorded on the New Zealand Whale and Dolphin Stranding Database, which is maintained by the DOC. This government organisation has statutory responsibility for management of marine mammals under the Marine Mammal Protection Act. Its role, obligations under the Treaty of Waitangi and use of volunteers at mass strandings are briefly described.

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9.1 Introduction

Marine mammal strandings are a regular occurrence in New Zealand; between 1990 and 2016 an average of 300 stranded annually (New Zealand Whale and Dolphin Stranding Database, accessed 6th April 2016). Over this period, there have been 308 mass strandings, with 39 of these mass stranding events involving 50 or more cetaceans. One definition of a mass stranding is a stranding involving more than one cetacean that is not a mother-calf pair (Gercai and Lounsbury in Jepson et al. 2013). Forty-one species have been recorded as stranding in New Zealand; the commonest species to strand is the long-finned pilot whale (*Globicephala melas*, Traill 1809). Long-finned pilot whales are classified as not threatened in New Zealand by Baker et al. (2016) and globally as data deficient in the IUCN red list (Taylor et al. 2008). The largest recorded stranding in New Zealand of 1000 pilot whales (*Globicephala* sp.) occurred on Chatham Island in 1918.

The Department of Conservation (DOC) is the central government organisation charged with promoting conservation of the natural and historic heritage of New Zealand. DOC has 1637 staff and 60 offices distributed around New Zealand, including offshore islands (DOC 2015a). DOC has the statutory responsibility of marine mammal management under the Marine Mammals Protection Act 1978 (MMPA). Also there is a statutory responsibility on DOC in the Conservation Act 1987 (the founding legislation of DOC) to give effect to the principles of the Treaty of Waitangi. The Treaty of Waitangi is an agreement between Maori (the indigenous people of New Zealand) and the Crown (i.e. government) signed in 1840. In practical terms this means that, at a marine mammal stranding, major decisions are made in partnership between DOC and the local iwi/tribe. It is an offence under the MMPA to herd or disturb marine mammals without permission from DOC. However, the penalties do not apply to anyone providing humane care to stranded, sick or injured marine mammals. While DOC is responsible for marine mammal strandings, assistance is often provided by large numbers of volunteers, some affiliated with nongovernment organisations, in particular Project Jonah. Project Jonah has 2200 volunteers trained to assist at marine mammal strandings, and many of these volunteers can be mobilised at short notice (Daren Grover, general manager, Project Jonah, pers. comm. April 2016). A service level agreement exists between DOC and Project Jonah, under which Project Jonah has agreed to provide assistance to DOC and to train people for marine mammal strandings (DOC 2015b). The organisational structure used by DOC during marine mammal strandings follows the Coordinated Incident Management System (CIMS) model (NZFS 1998) which is adaptable to small and large emergency events.

There are five locations in New Zealand where mass strandings have occurred in high numbers: Northland Region, Mahia Peninsula, Golden Bay, Chatham Islands and Stewart Island. These five locations account for 84% of cetaceans involved in mass strandings. Since 1990 nearly 2000 cetaceans have mass stranded in Golden Bay; this is the highest total of these five locations. New Zealand's third largest mass stranding, 345 pilot whales, occurred in Golden Bay in January 1991. Golden Bay

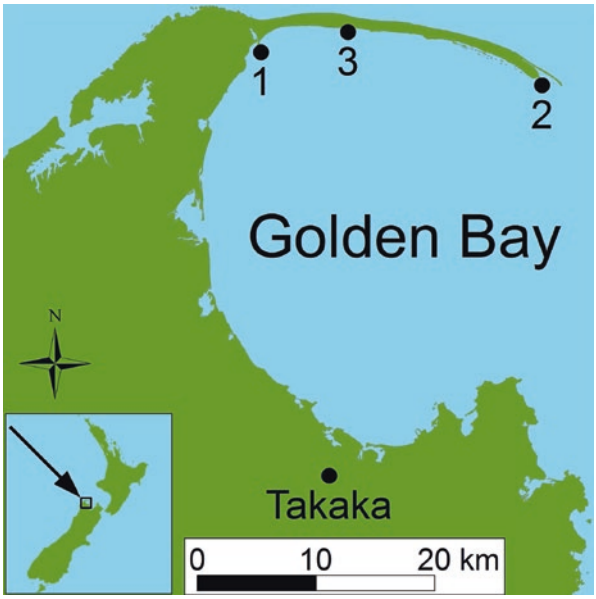

Fig. 9.1 Map of Golden Bay. Numbers *1*, *2*, and *3* are locations of strandings discussed in text as follows: (1) Puponga, 1991; (2) Bush End Point, 2009; (3) Farewell Spit, 2015. *Inset figure* shows location of main map in New Zealand (*Image credit*: Mike Ogle)

(40.6°S, 172.8°E) lies in the north-west corner of the South Island, New Zealand. Golden Bay has a population of just under 5000 permanent residents (Statistics New Zealand 2013), but is boosted in summer by seasonal residents and tourists. This semicircular bay faces east into the South Taranaki Bight, and the entrance (between the end of Farewell Spit and Separation Point) is 25 km across (Fig. 9.1). At this broad entrance, the maximum depth is around 35 m, and from this the seafloor gradually slopes up to the shoreline (LINZ 1999). Most of the 90 km shore is comprised of sandy gently sloping beaches with occasional rocky headlands. However, on the southern coastline, rocky headlands dominate, separated by small sandy bays. Along most of the shore, large tidal flats are exposed at low tide. The most extensive tidal flats are at Farewell Spit; here tidal flats are present along the entire 26 km length of the spit and at their widest can extend more than 7 km out from the high tide mark. The maximum difference between low and high tide is 4.5 m (LINZ 2015). The purpose of this chapter is to illustrate issues of marine mammal welfare at stranding events through discussion of stranding events in the Golden Bay area, New Zealand.

9.2 Puponga, January 1991

At 8:30 am on January 24, 1991, the Golden Bay DOC office received a report from a local tour operator that a pod of whales had stranded near Puponga (Stark 1991). Twenty minutes later it was confirmed that an estimated 200–300 whales had stranded. The whales had stranded on the tidal flat directly south of Puponga Point, adjacent to

a river channel (Fig. 9.1 Point 1). Access for people here is relatively easy, with a coastal road only 400 m from the stranding site. Weather conditions were favourable for a whale stranding: low cloud and rain, strong wind and very cold temperature. These conditions would assist in keeping the whales cool and their skin from desiccating. DOC staff were on the scene from 10:40 am with rescue materials (buckets, sheets, slings and whale rescue pontoons). Whale rescue pontoons consist of a lifting mat suspended between two inflatable pontoons and are designed to lift whales of up to about 2 tons (Project Jonah 2012). The tide had reached its lowest point at 10:30 am and had started to return. However, it would not be until mid-afternoon that the water would be deep enough to refloat the whales, and high tide was forecast to be at 4:49 pm. About 300 volunteers (Nelson Evening Mail 24/1/1991) tended the whales by bucketing water over the whales and covering the whales with wet sheets. At the beginning of the day, DOC staff had assessed the whales to be in good condition, but despite this and favourable weather, 20 whales died during the day. As the tide came in and whales floated, they were guided into a group by the rescuers. The pod was released at approximately 3:30 pm, with almost all of the whales departing as one group.

The exception to this was five whales which swam away before the main pod was released. These five animals travelled south-west parallel to the coast for 2.5 km to Taupata Point. Despite attempts with a boat to guide the whales away from shore, the whales could not be stopped from restranding. Shortly after this, another 40 whales also stranded at Taupata Point. It was thought that the earlier five whales were responsible for luring the other 40 in to strand (Stark 1991). Rescuers were sent to these whales, but with the tide now receding, 13 whales could not be moved. To increase the probability of successfully refloating the other 32 whales that lay in deeper water, those whales that could not be moved were euthanised. By 6 pm the remaining 32 whales had been guided out beyond the low tide and half an hour later swam out to sea.

The next day during an early morning search by helicopter, 26 whales were observed stranded at Ferry Point, 15 km south-west of the initial stranding. They were spread out in two groups, 1 km apart from each other. The whales were kept wet and cool through the day by DOC staff and volunteers. Refloating begun at 4 pm and the two groups were brought together. For the next 45 min, people made a human barrier between the whales and the shore, after which the whales appeared to orientate themselves then headed out to sea.

In the initial stranding on the first day, 345 whales stranded; of these 325 were refloated and 20 died. Shortly after this first refloating, 45 of these whales restranded, 13 of which died and 32 were refloated. With another restranding of 26 whales the following day, five more whales died. Of the initial 345 whales stranded, 38 died and 307 (89%) were successfully refloated.

9.3 Bush End Point, December 2009

From a chartered light aeroplane, on the morning of December 26, 2009, a large pod of stranded whales were seen at the far eastern end of Farewell Spit at an area known as Bush End Point (Fig. 9.1, Point 2). The pilot contacted the local air

control staff who forwarded the report to the DOC emergency duty phone. Normally two DOC staff members would be dispatched to the site to make an initial assessment. However, the site of this stranding was remote and difficult to access; there was no road, and vehicles could only be driven to the site along the 22 km of beach during the hours either side of low tide. The condition of the whales at this stage was unknown. Planning for the worst-case scenario, two additional staff were included in the initial assessment team to assist with logistics, and two rifles were taken in case euthanasia was determined to be the best course of action that would result in the least suffering. On the drive to the site, the four staff members discussed possible scenarios and the logistical issues these scenarios presented. If the whales were in suitable condition for refloating, the most difficult logistical consideration would be getting enough volunteers quickly to the site. A local tour company did have buses which regularly travelled along the beach to this far end of the spit. However, given that the next high tide was at 5:40 pm (and it would not be possible to drive along the beach 1–2 h before this), it was highly unlikely that enough volunteers could be transported to the stranding site in time to attempt refloating the whales on that evening's high tide. While there was limited accommodation associated with the lighthouse at the eastern end of the spit, it would not be enough for the anticipated number of volunteers that would be required to undertake a successful refloating of the pod. If volunteers were taken to the stranding site to attempt a refloat, they would need to be completely self-sufficient, including food, water, hygiene and shelter.

The initial assessment team, including the author, arrived on site at approximately 11 am. The pod was scattered over an area of approximately 4 km × 1 km, across a broad expanse of sandy tidal flat. The sunny, warm and windy weather conditions were not favourable for stranded whales. Without regular wetting, cetacean skin in these conditions soon desiccates, blisters and then peels (Fig. 9.2). At

Fig. 9.2 Without regular wetting, stranded cetacean skin in exposed warm, sunny and windy conditions soon desiccates, blisters and then peels. Dead pilot whales, from a pod of 105, Bush End Point 28/12/2009. *Image credit*: Greg Napp/DOC

this time, an automated weather station, 2 km from the stranding site, recorded an air temperature of 22 °C and a wind speed of 32 km/h, and no rain had fallen in the past 5 days (NIWA 2016). The first few pilot whales approached were already deceased. Carcasses were in the early stages of decomposition, some with up to a third of the skin dried and peeled off. However, some were still alive, but in very poor condition with blistered and/or peeling skin and showing signs of distress. Given the physical state of the whales, it was likely they had been stranded for at least 1 day, possibly 2. Experience from previous strandings led the team to conclude that it was unlikely the surviving whales would live much longer. The decision was made to euthanise the surviving 26 whales to avoid the whales enduring a slow and painful death. This was carried out following DOC guidelines (Boren 2012) by experienced staff using the rifle. A total of 105 pilot whales had stranded, ranging in size from 1.97 to 5.9 m in length. Two years later 21 pilot whales stranded at the same site; when they were eventually discovered, they were all already dead.

9.4 Farewell Spit, February 2015

At 10:50 am Friday morning of February 13, 2016, a staff member of the cafe near the base of Farewell Spit phoned the Golden Bay DOC office to report seeing a pod of over 30 whales or dolphins. He said the pod was 3–4 km away, stranded on the tidal flats of the inner beach (DOC 2015c). At this time, heat haze and distortion across the exposed tidal flats at that distance would have made the stranded cetaceans difficult to see and hence difficult to count accurately.

Two DOC staff members, including the author, were dispatched to assess the situation and arrived at the stranding site an hour after receiving the report. The distance from the base of the spit (and also the end of the road) to where whales were stranded was 6 km (Fig. 9.1, Point 3). A large pod of pilot whales was spread out in a nearly 1 km long strip of animals, orientated parallel to shore and about 500 m out from the high tide mark in the tidal sand flat. An estimate was made from the top of a high dune of 143 whales, but there were several dense groupings, making an accurate count difficult. This information was communicated to the DOC office in Takaka, where preparations had already begun. By 1 pm an accurate count was made while walking through the pod; the revised (and final) total was now 198 whales, of which 24 were dead. The skin of some of the live whales had already formed blisters, due to desiccation from wind, sun and heat. More DOC staff soon arrived, and the local Farewell Spit tour company delivered the first bus load of 34 volunteers at 2:20 pm. Three more bus loads of volunteers arrived over the next 2 h, and a few volunteers had walked the 6 km along the beach from the road end. High tide was predicted to occur at 5:20 pm and to reach a peak tide level at the same height as that morning's high tide. The incoming tide reached the first whales at about 2:45 pm, and by 4:30 pm about 75% of the pod was floating. At this stage there were approximately 100 volunteers and DOC staff on-site and around 170 live whales. Ideally, at this phase of a stranding, two people wearing wetsuits would be required per whale, to guide and hold the whales in chest deep water for up to an

hour until the whales have recovered sufficiently from the stresses of stranding to regroup as a pod and propel themselves back out towards sea. However, at this stage, not only were there not enough people, but some of the volunteers had already become cold and exhausted whilst providing initial care to the stranded whales and so could not safely stay in the water for long. At 5:20 pm the tide started to recede, and while a good number of whales had been directed out away from shore, many were still stranded or had restranded. A count at 7 pm gave a total of 88 dead and 12 stranded live whales. Of these live whales, two were in very poor condition, having more than one third of their skin peeled off as a result of desiccation and abrasion; both these animals were euthanised that evening. Two more died overnight, and the remaining eight were in such poor condition by Saturday morning that these were also euthanised.

At 9:45 pm that Friday night, 81 stranded whales were found by a Project Jonah volunteer, 6 km west of the initial stranding site and only 1 km from the road end. This group of whales was most likely from those that had been refloated a few hours earlier. In the past severe injuries (e.g. broken thigh bone, knocked unconscious) have occurred to people working at night around stranded whales in Golden Bay. Since then it has been the policy to not work around stranded whales at night. So at first light, Saturday morning, people began tending to the whales, keeping them wet and 'up-righting' them. By this time 14 of these whales had died, and one more was to die later in the day. High tide was not expected until 6 pm and the whales needed to be kept cool and wet until the tide could reach them at about 4 pm. By 9:25 am, there were about 150 volunteers tending the whales, and this increased to well over 200 volunteers by 11:30 am (Fig. 9.3).

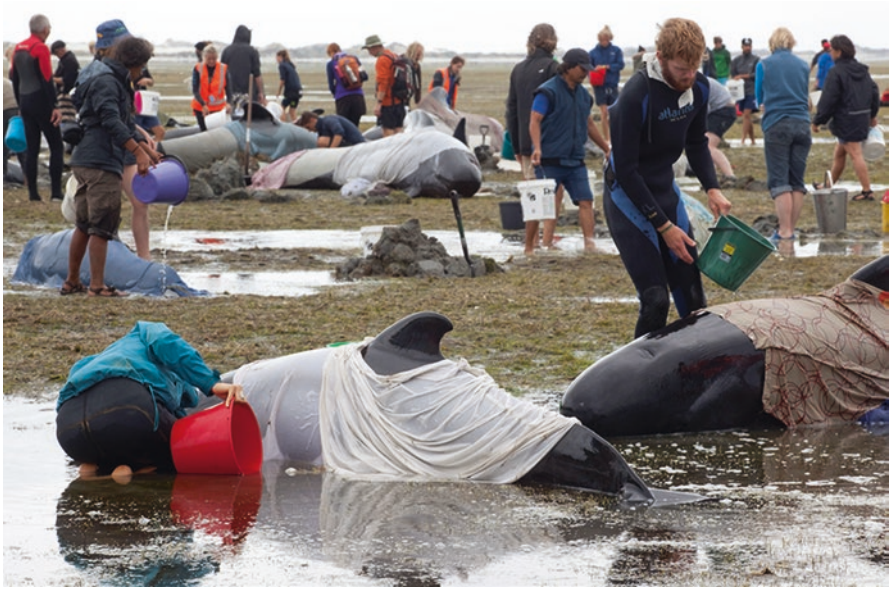

Fig. 9.3 Volunteers keeping stranded long-finned pilot whale (*Globicephala melas*) wet and cool at Farewell Spit, New Zealand, February 2015 (*Image credit*: Murray Hedwig)

The numbers of volunteers continued to increase through the day with over 400 on-site by 1:45 pm (Daren Grover, Project Jonah, pers. comm.). About 100 volunteers in wetsuits were briefed at 3:30 pm on the refloating phase; following this they proceeded to the whales, where the incoming tide had just arrived. When whales are first beginning to refloat, people will often endeavour to keep calves paired with the adult whale it was stranded next to. However, genetic and spatial analysis of stranded whales has shown that calves are often separated from their mothers at strandings (Oremus et al. 2013). Half an hour before the forecast high tide time, many of the larger whales were still not floating and so unable to be moved to deeper water. As high tides vary with many factors and do not always occur at the height or exact time predicted, there was no certainty that the tide would rise any further. Therefore, rather than the usual orderly process of herding whales together then releasing as one group, whales were urgently moved (some using slings and whale rescue pontoons on the larger whales) to a nearby narrow shallow channel that led out to sea (Fig. 9.4).

The end result was that many of the pods were released individually, rather than one large group. Earlier, one whale had been moved in a whale rescue pontoon out to a boat and was used as a 'lure' for the other whales. To the staff on the boat, there was no clear indication whether this 'lead' whale had any effect on the remaining whales or not. The boat stayed with the whales until 7:45 pm, when the whales were last seen 'swimming well' and heading out to sea. The total number of whales

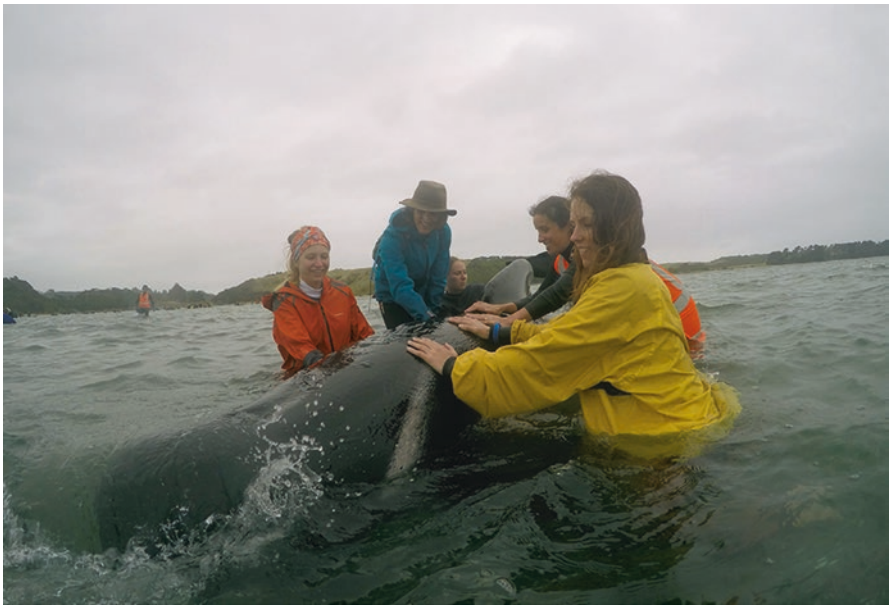

Fig. 9.4 Volunteers guide a pilot whale to deeper water, Farewell Spit 4 pm 14/2/2015 (*Image credit*: Nadia Steenhouwer, Project Jonah NZ)

successfully refloated on this occasion was 66. From the previous evening 12 whales were unaccounted for and also assumed to have successfully refloated. Out of 198 whales of the initial stranding and over 2 days, a total of 78 whales (39%) were assumed to have been successfully refloated and swum back out to sea.

9.5 Discussion

There are many theories for the causes of marine mammal strandings; for examples see those referenced in Evans et al. (2005), Oremus et al. (2013) and Jepson et al. (2013). Many of these theories are difficult to prove and may or may not be relevant for Golden Bay. Nearshore topography is often mentioned as a possible cause of mass stranding. The key topographical features of Golden Bay are its semicircular shape and gently sloping seafloor. This has often resulted in Golden Bay being called a 'whale trap'. Another possibility may be that, because the bay is sheltered from large ocean swells and has gently sloping beaches, sick whales intentionally come here to rest (or die) and are followed in by their pod which then strands.

As illustrated by the stranding survival rates in the three Golden Bay examples detailed in this chapter, the proportion of whales that survive a stranding can be highly variable. Survival rates at mass strandings for all of New Zealand (1990–2016) also tend to extremes, with 56% of strandings having no survivors (100% mortality) and 15% of strandings in which animals all survive (0% mortality). The survival rates for all documented strandings are spread almost evenly between the two extremes, indicating that many factors are likely at play in determining the 'outcome' for a stranded animal. One key factor influencing mass stranding survival rate in many cases is likely to be the time elapsed between when whales first strand and when people start providing care (i.e. wetting and cooling). This factor may account for the lower survival rates recorded for locations where the human population is low and access is difficult (e.g. Chatham Islands, Stewart Island and Fiordland), compared to the higher survival rates near well-populated and accessible areas.

Maximising the survival rate of stranded marine mammals is a key focus for those DOC staff involved in strandings. Current plans to improve stranding survival rates include trialling a purpose-designed wheeled gantry, built by A-Ward Attachments Ltd (Auckland, New Zealand), for lifting stranded whales and transporting them across tidal flats. A protocol is in place with Massey University, to trial the use of 'on the beach' blood analysis of stranded pilot whales (similar to what has been done for dolphins at Cape Cod (Sharp et al. 2014)), to aid in health assessment and triage of the stranded individuals, and proposals to satellite track refloated pilot whales to confirm post release survival have recently been discussed. However, the key factor in maximising mass stranding survival rate is likely to be early detection, followed by rapid deployment of large numbers of volunteers to keep the whales or dolphins wet and cool.

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