Aquatic Mammals 2020, *46*(5), 483-487, DOI 10.1578/AM.46.5.2020.483

Short Note

Humpback Whale (*Megaptera novaeangliae*) Resighted Eight Years After Stranding

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When a large whale is stranded, chances of survival are low due to effects of rapid increase in body temperature and compression of internal organs. Older and large whales tend to exhibit faster declines in health than smaller, younger animals (Geraci & Lounsbury, 2005). Transportation for rehabilitation in a suitable facility is generally not feasible and not a common option for large whales (Stewart, 2001b). Although challenging, the best option is to attempt refloating the large animal as soon as possible (Geraci & Lounsbury, 2005).

Moving a great whale without harming the animal is a delicate and complex operation. Before starting the operation, it is necessary to evaluate the whale's physical condition, the stranding site, and the availability of heavy equipment (e.g., tugboats, support vessels, and large pulling cables) (Geraci & Lounsbury, 2005). A stranded whale that is debilitated, disoriented, or injured to the point that its ability to swim is compromised cannot be introduced back to the ocean (Engel & Marcondes, 2005). Suitable physical conditions include the lack of debility signs (i.e., evident spine and/or scapula, and reduced epaxial musculature); the skin must be intact over most of the body—smooth, shiny, and free of large wounds and without proliferation of epibionts; and breathing rates must be consistent and responsive to environmental stimuli (Geraci & Lounsbury, 2005; Gales et al., 2012). Release attempts in places with wide tidal ranges must be made during the high tide to facilitate flotation and decrease negative impacts on the animal. Deep shorelines facilitate the rescue since the pulling length is shorter and boats may come closer to the shore (Engel & Marcondes, 2005). A release is considered successful when the animal survives and resumes typical behavior and social interaction for this species (Wells et al., 1998, 2013; Visser & Fertl, 2000; Gales et al., 2012). However, despite considerable discussion of the optimal physiological and physical conditions to maximize success, there is limited information regarding post-release status and long-term survival of stranded whales.

Herein, we report on a successful refloating of a humpback whale (*Megaptera novaeangliae*) that was resighted 8 y after stranding. On 3 November 2000, a male individual (11-m total body length) was found stranded at 0600 h in Bonete Beach (23º 32' 08.30" S, 45º 11' 13.40" W), Ubatuba, southeastern Brazil (Figure 1). The rescue team arrived at 1000 h and found the stranded animal half buried in the sand in the intertidal zone. The overall physical condition was good, apart from superficial wounds on its back and fluke which probably resulted from scraping in the sand. Since the whale was constantly washed over by waves, it was not necessary to make any additional effort to keep it wet. It was not possible to set up UV protection for the whale as it was difficult to obtain the necessary materials. The stranding site had limited access, being reached only by trail (10 km walking) or by sea. The only viable option was to try to refloat the whale during the high tide (1600 h) for which two vessels from the São Paulo State Fire Department (Corpo de Bombeiros) were quickly mobilized.

A 100-mm-diameter rope was passed under the body and joined at the head, forming a bow

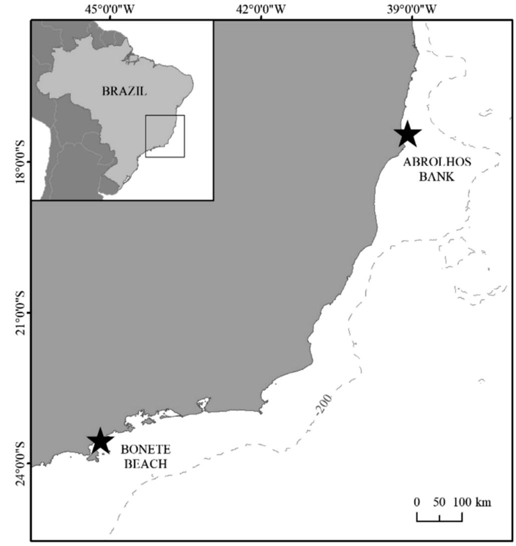

Figure 1. Locations (black stars) where the 11-m male humpback whale (*Megaptera novaeangliae*) was stranded and refloated in 2000 at Bonete Beach, Brazil, and sighted after 8 y at Abrolhos Bank

knot that did not tighten and, thus, did not hurt the whale when tension was applied (Figure 2). The rope was passed under the head when the tide started to rise and the hole in the sand made by the whale's body was filling up with water, facilitating the passage of the rope through the posterior region of the pectoral fins. Cushions were placed posterior to pectoral fins to reduce abrasion from the rope (Figure 3). A 50-mm-diameter rope was attached to the knot and taken to the ship using a second inflatable boat with outboard engine. A skin fragment for genetic analyses was sampled from the middle part of the caudal peduncle and preserved in 70% ethanol. It was not possible to photograph the anterior region of the fluke for individual identification (Katona & Whitehead, 1981).

The cables were softly pulled by the ship, with minimal tension, until the highest tide. This weak tension was important to prevent the whale from heading back towards the beach. As soon as the whale started to float, it was gently pulled away from the shore until depth was sufficient for the animal to start swimming on its own. At this moment, the whale spun on its own axis and the cable, which was at the widest part of the body, slid naturally towards the caudal fin and fell off the animal. The whale swam towards the second ship, which had already moved away from the coast. This ship navigated towards the open sea, where marine traffic is less intense, and was followed by the whale until 2300 h, when the engines were turned off and the animal moved away.

On 29 July 2008, 7.5 y after the stranding event, a humpback whale was sampled using remote biopsy (Lambertsen, 1987) at the Abrolhos Bank (17° 26' 3.912" S, 39° 4' 55.488" W), northeastern Brazil, which comprises the main breeding area in the Southwestern Atlantic Ocean (SAO) (Andriolo et al., 2006). The whale was part of a competitive group with three individuals. Competitive groups occur in breeding areas when a nuclear female is followed by two or more whales (escorts) that actively attempt to access the female for mating (Tyack & Whitehead, 1982; Clapham et al., 1992). This whale was subsequently identified through DNA analysis as being the individual that stranded in Ubatuba in 2000, 1,095 km away.

Sex determination and genomic DNA extraction from both samples (stranding and biopsy) were carried out as described by Engel et al. (2008) and Cypriano-Souza et al. (2010) at the Laboratório de Biologia Genômica e Molecular, Pontifícia Universidade Católica do Rio Grande do Sul. Microsatellite loci are useful for individual identification and are an alternative to capture–recapture analysis (Palsbøll et al., 2005; Cypriano-Souza et al., 2010). Samples were screened for genetic variation at 10 microsatellite loci (EV1, EV37, EV94, and EV96 [Valsecchi & Amos, 1996]; 199/200, 417/418, and 464/465 [Schlötterer et al., 1991]; and GATA28, GATA53, and GATA417 [Palsbøll et al., 1997]), and genotyping was conducted as described by Cypriano-Souza et al. (2010). Genetic capture–recapture analyses were performed using the program *GENECAP* (Wilberg & Dreher, 2004), which compares each multilocus genotype with other genotypes within a dataset to identify matching samples.

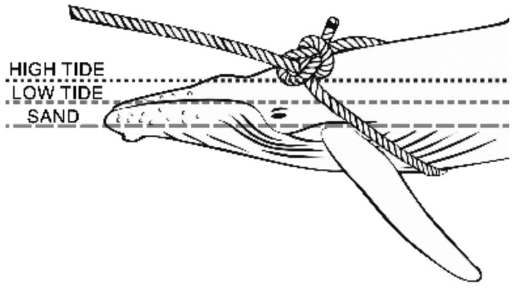

Figure 2. Schematic of cable attachment for the stranded humpback whale during the refloating operation. The cable passes behind the pectoral fins and joins at the head forming a knot that does not tighten, thus preventing injuries. High tide was at 1600 h; low tide was at 1000 h.

Figure 3. Refloating operation showing posterior region of the pectoral fins protected by cushions (*Photo credit:* Paulo Domaradzki)

The program also calculates the probability of identity statistics P(ID), which is the probability that two individuals within the population share the same multilocus genotype by chance, using the Hardy–Weinberg HW P(ID) formulation and a more conservative measure, the Sib P(ID). The lower the P(ID) value, the higher the loci power to discriminate individuals. Thus, our dataset with 10 loci enabled accurate individual identifications, with the HW P(ID) of 2.30 × 10-12, and the most conservative measure, Sib P(ID), of 9.26 × 10-5. Finally, the two samples had identical genotypes and sex assignment, and, therefore, can be confidently assumed to represent the same individual.

Monitoring the success of rescues of stranded whales can be done through radio and satellite telemetry (Stewart et al., 2001; Mate et al., 2005; Gales et al., 2012) or natural marks (Visser & Fertl, 2000; Stewart, 2001a), but there are few reports of successful cases with long-term survival. Visser & Fertl (2000) recaptured a killer whale that was assisted on the beach and resighted 11 times, with the last sighting 22 mo after the stranding event. Stewart et al. (2001) could have followed a released gray whale (*Eschrichtius robustus*) calf that was held in captivity for 1 y; however, due to instrument failure, this whale was satellite-tracked for just 3 d, and it is unknown if it survived any longer. Gales et al. (2012) tracked five long-finned pilot whales (*Globicephala melas*) over a few weeks. These whales were returned to sea after a mass stranding event, reunited again in a group, and showed natural behavior. In Brazil, from 1991 to 2017, at least eight humpback whales between 8- and 13-m total body lengths were refloated after strandings. Four of these whales stranded again and died, and four were never resighted (Instituto Baleia Jubarte, unpub. data). Humpback whale resighting efforts along the species' breeding ground in the SAO are based on a photo-identification catalogue of ventral fluke pigmentation and a genetic catalogue maintained by the Instituto Baleia Jubarte.

The case reported herein represents the longest known period between rescue and resighting of a stranded whale. The 8-y survival after stranding and the resighting as part of a competitive group suggest normal reproductive behavior. This successful rescue shows that it is possible to refloat large whales under some circumstances. The technique of passing the ropes through the posterior region of the pectoral fins was effective for reducing injuries that could have compromised survival. This is not a standard procedure and needs to be evaluated for each case. The beach topography and terrain (sand) were favorable to the rescue, although access to the beach was a limiting factor that could only be circumvented by the existence of a local network of support. The number of stranded humpback whales in Brazil is increasing as a direct consequence of the rapid population growth (Pavanato et al., 2017; Wedekin et al., 2017) and ever increasing interactions with anthropogenic activities. Besides developing adequate refloating methodologies, we emphasize that local rescue networks with trained teams and basic materials are needed to deal with the increasing frequency of humpback whale strandings in Brazil.

Acknowledgments

We thank Aquário de Ubatuba, Fundação Pro-Tamar, Fundamar, Polícia Ambiental do Estado de São Paulo, Corpo de Bombeiros do Estado de São Paulo, and Petrobras for participation in the rescue. We also acknowledge Mr. Messias Maniero and all other volunteers, Paula Baldassin for providing rescue information, Rodrigo L. de Moura for reviewing the text, and Juliana T. Gonçalves for map confection. Projeto Baleia Jubarte and Fundação Pro-Tamar are sponsored by Petróleo Brasileiro S.A. (PETROBRAS). MCN has a scholarship from CAPES (Process 88882.450997/2019-01). David Rosen and three anonymous reviewers made constructive comments for the improvement of this manuscript.

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