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A new VHF tag and attachment technique for small cetaceans

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Abstract

The use of telemetry in cetacean research has steadily increased in recent years. The type of tag used, the attachment technique, and the lengths of deployment vary greatly, affecting the behaviour and information collected from tagged animals. A new VHF tag was trialed on the inshore bottlenose dolphins (*Tursiops aduncus*) of Moreton Bay, Australia, using a new attachment technique. Tags were attached to three female bottlenose dolphins in November 1997. The observed short and long term reactions, and minimal dorsal fin damage from the tagging technique are discussed.

Keywords: radio telemetry, VHF, bottlenose dolphin, *Tursiops aduncus*, Australia.

Introduction

Telemetry studies offer unique insights into the ways in which cetaceans use their aquatic habitat (e.g. Martin & da Silva, 1998; Hooker & Baird, 1999). For small cetaceans, tags are either deployed remotely (Hanson & Baird, 1998; Schneider *et al.*, 1998; Stone *et al.*, 1998) or attached to animals that are captured and released (Scott *et al.*, 1990; Martin & Smith, 1992; Martin *et al.*, 1994). Capture and handling allows tags to be attached to animals for periods of weeks or months. Tags have been bolted through animals' dorsal fins (Irvine *et al.*, 1982; Scott *et al.*, 1990), attached using harnesses (Tanaka, 1987; Tanaka *et al.*, 1987), attached to narwhal tusks, *Monodon monoceros* (Martin *et al.*, 1994; Dietz & Heide-Jörgensen, 1995), and attached to dorsal ridges of belugas, *Delphinapterus leucas*, and Amazon river dolphins, *Inia geoffrensis* (Martin & Smith, 1992; Martin & de Silva, 1998).

Advances in electronics have seen a dramatic reduction in the size of telemetry packages, allowing radio-tagging of small marine wildlife, for example little penguins, *Eudyptula minor* (Collins *et al.*, 1999). Bolting large radio packages to dorsal fins has caused discolouration, necrosis, and migration of bolts out of the dorsal fin (Irvine *et al.*, 1982). Tags that harm animals are counterproductive to research not only from the damage to animals, but also because abnormal behaviour by a tagged animal could yield misleading results for research (Scott *et al.*, 1990).

Material and Methods

Here, we describe a new attachment technique for a compact radio tag on inshore bottlenose dolphins, *Tursiops aduncus*, in Moreton Bay, south-east Queensland, Australia (27°15′S, 153°15′E). The tags were two-stage VHF transmitters (150 MHz, 80 pulses/min, 100 μw power output), fitted with two-month lithium batteries and 25 cm wire antennae (Sirtrack, Havelock North, New Zealand). The tag housing was made from a marine epoxy resin, rectangular in shape with all upper edges rounded to improve hydrodynamic efficiency. Tags measured 4 × 2 × 2 cm, weighed 20 g in air, and had 40 cm of monofilament fishing line (20 kg breaking strain) attached to each corner.

Three capture attempts were made between 17 and 19 November 1997, within Moreton Bay, using the seine-net technique described by Asper (1975); and by Wells *et al.* (1980). Once captured, a dolphin was raised on board an 18 m vessel, to be weighed, measured, sexed and tagged.

The tags were attached on the centre rear of the trailing edge of the dolphin's dorsal fin (Fig. 1). This position was chosen for the tags attachment, as it is the area of the dorsal fin where the attachment technique would be least likely to contact major blood vessels (Pabst *et al.*, 1999). Four, 14-gauge hypodermic needles were inserted through the dorsal fin at the same spacing as the tag corners. The fishing line (attached to each corner of the tag), was

Figure 1. Tag attached to the centre rear of trailing edge of dorsal fin.

passed through the needle from the bevelled end, before the needle was withdrawn (Fig. 2). The line was then looped around a 22 mm mild steel washer with the rim filed down to 3 mm width (Australian Standard mild steel washer are plated with a minimum of 40 μ zinc and have an approximate carbon content of 28%), and threaded back through the dorsal fin (Fig. 3). The free end of each line was crimped onto itself with a size 3 non-corrosive leader sleeve. Washers were anticipated to corrode in seawater over approximately three months, allowing the tag to pull out. This estimation was based on observed corrosion rates of washers used by professional fisherman within Moreton Bay (L. Nash & P. Spinner, pers. com.). The tag housing and the washer had a 5 mm neoprene backing (wetsuit material), to reduce chafing against the dolphin's skin (Fig. 3). Dolphins were freeze-branded on both sides of the dorsal fin, anterior to the tag position, using stainless-steel branding irons cooled in liquid nitrogen and applied to the skin for 10 sec (Blanshard, 1996).

Tagged animals were tracked for up to 45 days and photographed from a 5.8 m rigid-hulled inflatable boat or from land. Tracking was attempted once every two days until all transmitters ceased operation. Dolphins were not sighted or a radio signal received on every occasion. Animals were tracked using a Model CE12 receiver (Custom Electronics, Urbana, USA), with an omnidirectional and Yagi (directional) antennae (Sirtrack). From January to December 1998, animals were located by their identifiable freeze-brands and photographed during *ad libitum* surveys.

Results

Five bottlenose dolphins were caught. Two adult females with calves were caught together on 17 November, and a single adult female was caught on 19 November. VHF tags were attached to the three adult females, and they were freeze branded Q11, Q13 and Q15, respectively. The larger calf was also freeze branded Q12, but neither calf was tagged.

Of the three tags, Q13's tag transmitted for 45 days with seven fixes and 19 sightings in 12 months. Q13's tag was last heard on 29 December 1997 and her next sighting was without a tag on 14 March 1998, so tag detachment occurred between 46 and 117 days after attachment. Q11's tag stopped transmitting after two days but Q11 and her calf was subsequently resighted 8 times in total in 12 months, always in association with Q13 and calf. Q11 was last seen with the tag attached on 25 December 1997, 38 days after attachment, and was not sighted again until 28 September 1998, so no

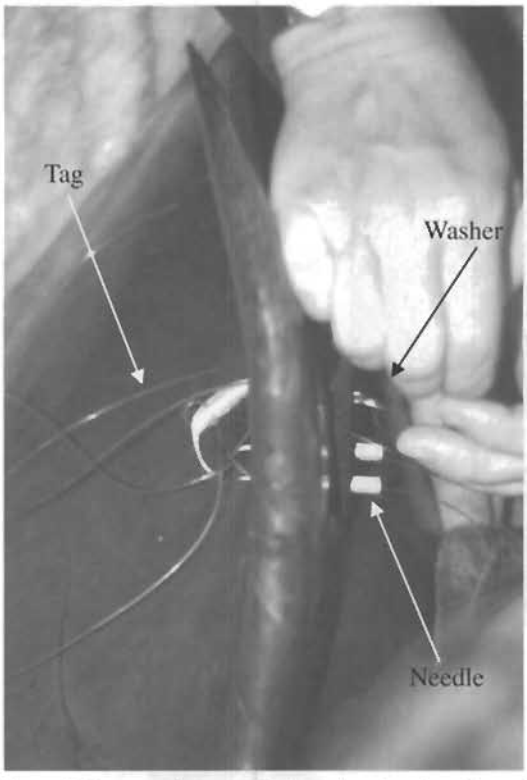

Figure 2. Tag attachment technique showing threading of fishing line through needles and washer.

realistic estimate of tag detachment time could be made. Q15 was radio-tracked 6 h after tagging, but was then neither re-sighted nor heard from for five months. Q15 was subsequently resighted 14 times over 12 months. Q15's first sighting, which was without her tag, was 150 days after attachment. Receiving range of the tags from the boat at sea level in calm sea conditions (Beaufort <3) with the omnidirectional antennae was approximately 2 km and with the Yagi antennae was approximately 3.5 km. Damage to the animal's dorsal fins was minimal. After the tags were shed, Q13 and Q11 had one nick each in the lower back edge of their fins, while Q15 showed no marks from her tag (Fig. 4).

Discussion

Dolphins' short-term reactions to capture and tagging vary. Both Irvine *et al.* (1982) and Mate *et al.* (1995) reported long-distance movements (10 to 15 km) of some tagged bottlenose dolphins immediately after release. In contrast, Martin and da Silva (1998) reported that post-capture behaviour changes were limited to a few minutes after release for Amazon river dolphins, if any occurred at all. Animals in our study showed limited short-term reactions to tagging, with Q11, Q13 and calves seen close to their capture site within a week of capture. Q15 was seen 6 h after tagging, within 1 km from her capture site, behaving normally and showing no wariness of our vessel.

Long-term reactions and dorsal fin damage from tagging were reported by Irvine *et al.* (1982), with two of 10 VHF tagged dolphins developing abnormal swimming. Irvine *et al.* (1982) also reported five animals showed dorsal fin damage from bolts ripping out, including one dolphin losing the tip of its dorsal fin due to bolt and tag migration. One of three tagged animals in our study (Q13) spent more time swimming on the surface with her tagged dorsal fin visible, than she did after the tag dropped off. This behaviour was not observed from Q11. The nicks in Q11s and Q13s dorsal fins indicate that the washer may corrode unevenly. This appears to result in one mono-filament strand being left attached and possibly pulling out of the rear of the dorsal fine (Fig. 4). However, this result was not observed on Q15's dorsal fin, so variability between washers may be expected. In the months after capture, tagged animals exhibited no apparent wariness towards boats. It was not determined if Q15's absence from the surveyed area after tagging was due to a reaction to tagging or the possibility that she was tagged at the limit of her normal summer range which extended outside the usual survey range.

The ability to attach tags successfully, the length of attachment and ability to receive transmissions from tags were comparable from other reported tags using bolts (see review Scott *et al.*, 1990), with two tags known minimum attachment length being 38 and 45 days, and minimum transmission of 45 days for one tag. A consideration for the future use of this technique is that the washer corrosion time will vary between environments, particularly in relation to water temperature and salinity. Therefore, we recommend trials on washer corrosion rates be undertaken in all areas when using this technique.

This study suggests that this technique can be used to attach small VHF transmitters to bottlenose dolphins, indicating less damage to dorsal fins, but with similar attachment periods, to other bolted tag attachments. The attachment of these tags is simple, appears to be less intrusive and inexpensive to attach, and caused negligible damage to the dorsal fin.

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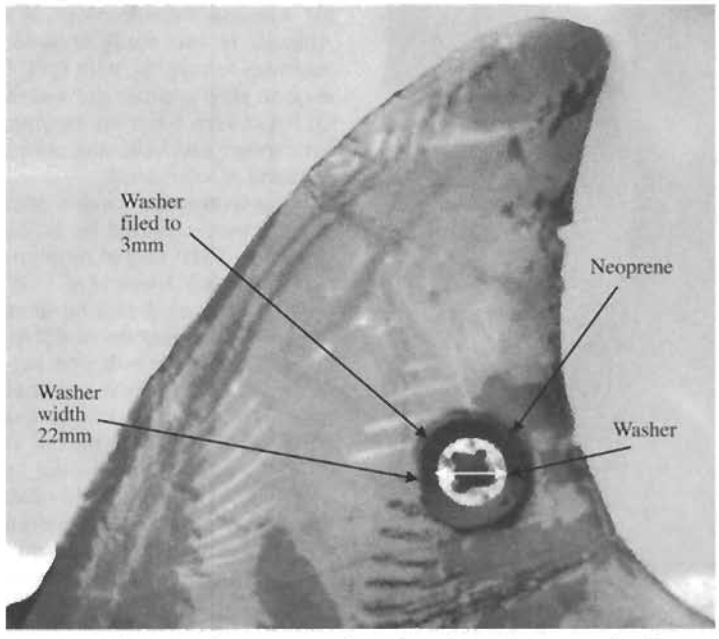

Figure 3. Completed attachment; view of washer and neoprene backing.

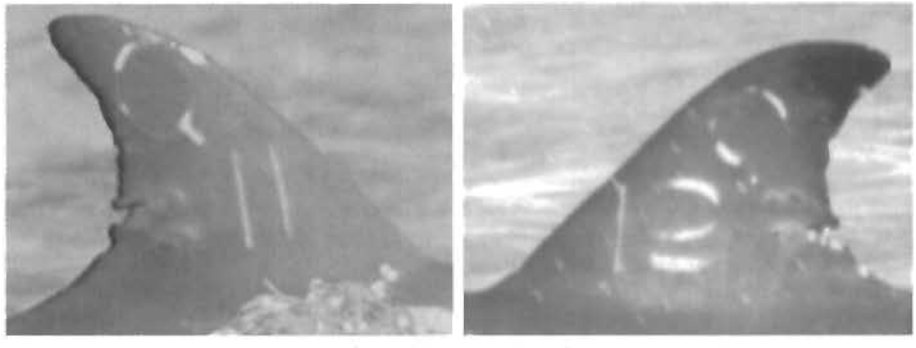

Figure 4. Damage to the dorsal fin's of Q13 and Q11 after the release of the radio tags.

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