

Epimeletic Behaviour Toward a Seriously Injured Juvenile Bottlenose Dolphin (*Tursiops* sp.) in Port Phillip, Victoria, Australia

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Abstract

Various studies have shown dolphin social relationships to be complex, and this is an area of research that is being continually expanded. This paper describes the first account of epimeletic behaviour observed in a small resident population of bottlenose dolphins (*Tursiops* sp.) in Port Phillip, Victoria, Australia. The presumed mother displayed nurturant epimeletic behaviour, assisting a paralysed juvenile to swim. In addition, two adults and a juvenile dolphin were also present during the observations. The three additional dolphins did not assist in physically supporting the juvenile; however, one exhibited succorant epimeletic behaviour towards the mother and injured juvenile whenever a vessel was positioned close to the group. Once the juvenile was euthanised, the group appeared agitated, showing short dives in a directionally erratic manner. A postmortem revealed that the juvenile's spine was severed, and it was considered that this was caused by a boat propeller.

Key Words: Bottlenose dolphin, *Tursiops* sp., epimeletic behaviour, boat strike injury, euthanasia, Port Phillip, Australia

Introduction

Epimeletic (care-giving) behaviour in cetaceans has been recognised for some time (Caldwell & Caldwell, 1966), and there are several accounts of this behaviour in bottlenose dolphins in relation to the death of a calf (e.g., Cockcroft & Sauer, 1990; Connor & Smolker, 1990; Harzen & dos Santos, 1992; Connor & Peterson, 1994; Fertl & Schiro, 1994; Mann & Barnett, 1999). All of these cases involved calves that were dead when the observations were made. In this paper, we describe observations of an injured juvenile bottlenose dolphin (*Tursiops* sp.) and the subsequent epimeletic behaviours displayed by four other dolphins.

The injured juvenile was subsequently euthanised, and the body was recovered for postmortem. The behaviours of the attending dolphins are discussed, as are possible causes of the incident and implications for the Port Phillip population.

Materials and Methods

Port Phillip is an embayment in Victoria, Australia, of approximately 1,940 km² in area and is home to a resident population of bottlenose dolphins (*Tursiops* sp.) (Dunn et al., 2001). The study population of approximately 90 individuals has been monitored since 1993 and is regularly observed during behaviour and photo-identification surveys conducted by the Dolphin Research Institute (DRI). This population is considered vulnerable to extinction due to its small size, female natal philopatry, restricted home range, and the large degree of associated human activity in the area (Dunn et al., 2001; Hale, 2002). The dolphins in Port Phillip have been shown to be genetically distinct from other nearby *Tursiops* sp. (Charlton et al., in press). While the dolphins utilize the whole bay, the population displays high site fidelity to the south in an area of approximately 60 km² (Figure 1).

Observations were made within the primary survey area in southern Port Phillip from a 6.05 m aluminium vessel powered by a 135 hp Mercury Optimax motor. Behavioural data was collected continuously during the entire observation. Photographs of all individual dolphins involved were taken with a Canon EOS 50, equipped with 100 to 300 mm zoom lens and using AGFA 200 ISO colour slide film, and were later checked against the 90 known individuals in the Port Phillip catalogue.

Results

Initial Reports and Search

On 28 November 2001, a dolphin-swim tour operator reported an injured juvenile dolphin, which

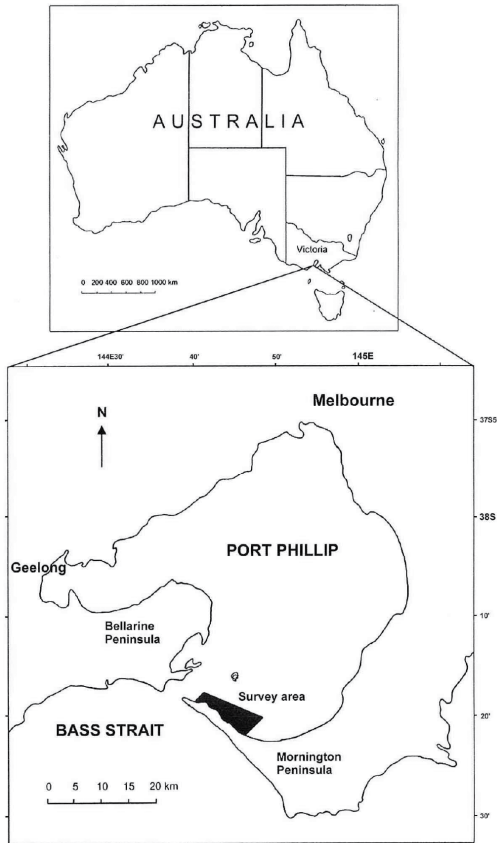


Figure 1. Geographic location of Port Phillip, Victoria; the primary survey area in southern Port Phillip is highlighted.

was last sighted just inside Port Phillip Heads at approximately 1530 h. At that time, it was reportedly in a larger group with two adults close by it. DRI researchers and local fisheries officers began searching shortly afterward, but were unable to locate the dolphin until 1210 h the following day.

Observations

The group was comprised of three adults and two juveniles, including the injured juvenile, and was located approximately 600 m offshore. Upon arrival, the adult dolphin closest to the injured juvenile was visually identified as Ripplé, a female dolphin that has been frequently observed since 1993. Photo-identification later confirmed Ripplé's identity, and the two other adults present were identified as known individuals (#01-5001 and Echo). The identity of the other juvenile dolphin was unknown as it did not have any identifiable markings. The group was resting, a behaviour characterized by low activity and no obvious directional movement. The injured juvenile was in the infant position with Ripplé (Figure 2) and appeared unable to swim unassisted.

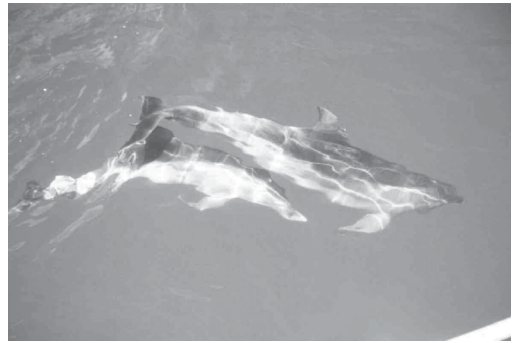


Figure 2. The injured juvenile swimming in "infant position" below Ripplé, 29 November 2001 (Photo by Rod Barber, Fisheries Officer)

Ripplé used her rostrum and head to push the juvenile to the surface from below. A large wound was observed just anterior to the flukes. Although observations were made at a distance to reduce causing further stress, the other dolphins (predominantly Echo) often placed themselves between the vessel and Ripplé and the injured juvenile. DRI researchers remained with the group until fisheries officers arrived at approximately 1230 h on a rescue vessel. They spent 15 to 20 min with the dolphins to assess group behaviour and mobility of the injured juvenile. The Senior Fisheries Officer also noted that one of the other adults was patrolling around Ripplé and the juvenile. This dolphin swam towards the rescue vessel in an intimidating manner on several occasions and appeared very protective. The other two dolphins traveled alongside, although not as closely (Rod Barber, Mornington Fisheries, pers. comm.).

The Senior Fisheries Officer contacted a veterinarian at the Melbourne Zoo, and on description of the injury, was advised that it was mortally disabling. Under the Victorian Cetacean Contingency Plan (Warneke et al., 1999), which outlines actions to be taken by government representatives in such situations, disabling physical injuries satisfy the veterinary criteria for euthanasia. This includes a dislocated or broken tailstock, major mutilation of the tail flukes, or extensive deep lacerations to the body. The location of the group was also a major factor in the decision to euthanise as they were in the direct path of passenger and car ferries and, therefore, considered to be at risk of further injury.

The juvenile was euthanised by a laterally aimed shot to the head, using a 12-gauge shotgun with solid slugs at approximately 1300 h, 23.5 h since first reported. The response of the remaining dolphins, including Ripplé, was to distance themselves immediately from the rescue vessel, moving to approximately 100 m (Rod Barber,

Mornington Fisheries, pers. comm.). The juvenile was secured with a line (anterior of the dorsal fin) to the stern of the rescue vessel. At this point, the remaining dolphins followed the vessel as it towed the juvenile to shore, often sprinting to remain within 100 m. The dolphin was towed a total distance of approximately 2 km and brought ashore at 1339 h, while the dolphins remained within 100 to 200 m of its location on the beach. The dolphins' behaviour at that time was characterised by short dives (< 30 s) of irregular direction, and they appeared agitated. Once on shore, DRI researchers documented the wound, confirmed the juvenile's sex as female, and took photographs (Figure 3). The laceration covered approximately one third of the peduncle, exposing the spine.

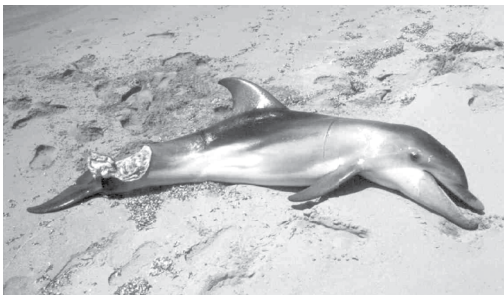


Figure 3. The juvenile dolphin once brought ashore, 29 November 2001 (Photo by Rod Barber, Fisheries Officer)

The researchers returned to the remaining dolphins at 1413 h, and observed them performing a deep dive as they were approached by the vessel. At the same time, another group of dolphins (approximately 20 to 35 individuals) entered the area, followed by two dolphin-swim tour vessels. DRI researchers remained for 45 min, taking photographs and behavioural observations. Shortly after the second group had arrived, a subgroup of approximately six dolphins separated from the main group and traveled offshore. Only Echo was photographed during the time spent with the second group. This group was initially traveling, but within a short period of time it began feeding. They continued to feed for the entire sighting and occasionally interacted with four vessels and the research vessel until the research vessel left at 1456 h.

Postmortem

On 30 November 2001, a postmortem was conducted on the juvenile at the Werribee Open Range Zoo. The dolphin had no obvious pre-existing pathology or parasites, although some lung congestion could have occurred postmortem (Dr. Tim Porters, pers. comm.). The wound was likely incurred no more than 2 to 3 d prior, and the spine had been completely severed with a clean fracture

through a vertebra (the exact vertebra was not recorded) (Figure 4). The veterinarian noted that the wound was caused by a vessel, but could not estimate the size. The stomachs were empty, indicating that the dolphin had not eaten for at least 24 h (Dr. Tim Porters, pers. comm.).



Figure 4. Boat strike injury to the juvenile bottlenose dolphin from a photo taken 30 November 2001; the arrow indicates the completely severed vertebra.

Full morphometric measurements were recorded, and samples were taken for histopathology and genetic analysis. The juvenile was approximately 2.1 m long and all of its teeth had fully erupted, except for the first upper tooth on both sides of the jaw. Histopathology was not performed on the collected samples as it was not standard practice at the time due to lack of resources.

Subsequent Observations

Shore-based observations were conducted at the location where the juvenile was brought ashore for the following 3 d, and although dolphins were sighted, no unusual behaviour was noted. Ripplé was later photographed on 11 January 2002 (43 d after the juvenile was euthanised) and subsequently observed on 22 occasions during 2002. She was photographed with a foetal fold calf in March of 2003, which was her first documented calf since the incident.

Discussion

The behaviour of the attending female towards the injured juvenile was similar to that observed in reported cases of mothers supporting their dead young. While only DNA testing would confirm that the injured juvenile dolphin was the calf of Ripplé, several factors about this incident lead us to assume that it was. During the observations, the juvenile was always most closely associated with Ripplé and was observed swimming in the infant position below Ripplé, a position to which older calves may return if startled, tired, or distressed for several years (Tavolga & Essapian, 1957; Tavolga, 1966; Cockcroft & Ross, 1990; Gibson,

2006). Although the time a calf spends with its mother usually decreases with age, a strong bond can remain, on average, between 3 to 6 y of age (Wells, 1991; Connor & Peterson, 1994; Gubbins et al., 1999; Grellier et al., 2003). Ripplé was documented with a foetal fold calf in mid-February of 1999 and had been photographed with a calf on 12 out of 25 subsequent observations, the last of which was approximately 4 mo prior to this incident. No identifiable markings were noted in any photographs of the calf associated with Ripplé, and the injured juvenile also lacked identifiable markings. Assuming the juvenile was that calf first observed in early 1999, however, it was approximately 3 y old at the time of the incident. The length of the juvenile (approximately 2.1 m) appears consistent with a dolphin of this age based on unpublished DRI data of strandings in Port Phillip. A genetic study of the Port Phillip dolphins is currently underway, and attempts will be made to obtain a sample from Ripplé to confirm our assumption.

Of the other dolphins identified in the group, Echo had been observed regularly since 1993. While often in the company of other females and calves, the sex of Echo has not been determined yet. The other adult present, #01-5005, was not a well-marked individual and was identified only by its scarring on two occasions in 2001 (the day of the incident and the day prior). The second juvenile did not have any identifying features and was of a similar size to the injured juvenile.

Epimeletic Behaviour

Epimeletic behaviour, as displayed by Ripplé towards the injured juvenile, has been recognized in dolphins for some time and is common in bottlenose dolphins (both in captive and free-ranging animals) (Cockcroft & Sauer, 1990; Connor & Smolker, 1990; Harzen & dos Santos, 1992; Connor & Peterson, 1994; Mann & Barnett, 1999). Published cases of a bottlenose dolphin supporting an injured calf are not available, however.

Caldwell & Caldwell (1966) classified epimeletic behaviour as nurturant (a female supporting her young) or succorant (one or more adults supporting an injured, sick, or dead individual). Further to this, they defined three components of succorant behaviour: (1) standing by, (2) excitement (or assistance), and (3) supportive. If Ripplé was the mother, she exhibited nurturant behaviour towards the injured juvenile. Otherwise, she displayed succorant behaviour as did the four other dolphins present who were all observed to be standing by as they did not play any role in supporting the juvenile or have any physical contact with Ripplé. Echo, in particular, exhibited succorant behaviour towards the mother and injured

juvenile whenever a vessel was positioned close to the group. Other cases have similarly reported that the dolphins involved would not allow vessels to approach too close, often diving with the calf to maintain distance or becoming aggressive when approached (Harzen & dos Santos, 1992; Fertl & Schiro, 1994; Dudzinski et al., 2003). The dolphins also displayed the behaviour described as snagging, which Harzen & dos Santos (1992) documented while observing a mother with a dead calf, where the mother was relatively calm, keeping her head close to the calf, while the rest of her body was submerged except for the dorsal fin.

The pattern of one attending adult with several others standing by has been observed by other researchers. Lodi (1992) reported standing by behaviour in wild rough-toothed dolphins (*Steno bredanensis*) in Brazil. A dead female (approximately 2 to 3 y old) in a group of seven was being solely supported by one lactating female, which maintained the body at the surface during the observation. The others stayed close by, swimming slowly, but did not appear to support either the dead dolphin or the supporter. Harzen & dos Santos (1992) documented three encounters of bottlenose dolphin adults with dead calves, observing an adult dolphin (presumed to be the mother) directly interacting with the calf. The remaining group members appeared to be engaged in normal activities without paying special attention to the attending adult or calf. Mann & Barnett (1999) documented a fatal tiger shark attack on a bottlenose dolphin calf (of a known mother-calf pair) in Shark Bay. The mother immediately went to its aid and pushed the dead calf to the surface, protecting it from further attack. The mother was followed by three other dolphins, which soon left the area, presumably once the immediate threat had passed.

The behaviour of the dolphins once the juvenile was retrieved after euthanasia was similar to other cases involving dead young. Reported responses of the attending adult included circling the vessel once the calf was taken from the water or frantic rushes under and near the vessel (Harzen & dos Santos, 1992; Fertl & Schiro, 1994). Other dolphins present were commonly reported to mill and circle around the vessel until either it left or the dolphins themselves moved away from the area (Harzen & dos Santos, 1992; Lodi, 1992; Dudzinski et al., 2003). In this case, after initially distancing themselves when the juvenile was euthanised, the group followed the vessel as it towed the juvenile away and remained close to the area where it was taken ashore, their behaviour appearing agitated. This continued until the research vessel approached and the group deep dove. It was at this time that the second group of dolphins arrived with the

dolphin-swim tour vessels, and Ripplé was not sighted nor photographed again. There are two possibilities for this: (1) Ripplé could have left with the subgroup that was observed to break off shortly after the second group arrived or (2) she remained in the large group that was spread over 300 m and was not approached close enough for photographs or visual identification.

Protective behaviour towards offspring is common among many animal species; however, the role of distantly related or nonrelated conspecifics in these examples is difficult to determine. It has been suggested that epimeletic behaviour is a strong and entrenched behavioural adaptation, which may have particular benefits if those involved are genetically related (Connor & Norris, 1982; Cockcroft & Sauer, 1990; Harzen & dos Santos, 1992). Further genetic analysis of this population may elucidate any such relationships among the individual dolphins involved in this particular case.

Cause of the Incident

Wells & Scott (1997) reported seasonal incidences of boat strikes on bottlenose dolphins in Florida and observed that injuries were positively correlated with periods of higher-than-normal boating activity. They suggested a number of reasons why the strikes occurred: (1) during the summer months, the dolphins shifted their daily ranges from deeper coastal to shallow inshore waters and narrow channels; (2) there was an increase in boat traffic during the summer holidays; and (3) the condition and/or age of some animals made them more likely to be struck. In this case, as shifts in habitat use have not been observed and boat traffic was minimal on both days, it would appear that the final reason proposed by Wells & Scott may be applicable to the injured juvenile. As mentioned, although mother/calf bonds can remain intact between 3 to 6 y of age, the time a calf spends with its mother usually decreases as it gets older (Wells, 1991; Connor & Peterson, 1994; Gubbins et al., 1999; Grellier et al., 2003), and juveniles may be considered more likely to be at risk of such injuries as their independence increases. Although nearly 3 y old, the juvenile may still have been inexperienced at interacting with and/or avoiding vessels. It is unfortunate that histopathology is lacking as it would have given an indication of the health status of the individual prior to being struck. The Victorian Government has only made postmortems and histopathology for all dolphin strandings a standard practice since late 2005.

Implications for the Port Phillip Dolphin Population
While mortality is expected, unnatural deaths in small and discrete populations, such as the Port Phillip dolphins, have an increased potential to impact negatively on the population's future health. This population is considered vulnerable to extinction due to its small size, female natal philopatry, restricted home range, and the large degree of associated human activity (Dunn et al., 2001; Hale, 2002). The biggest anthropogenic threats to the Port Phillip dolphins include habitat degradation, recreational and commercial fishing, shipping, and tourism. Both peninsulas in the south attract thousands of holidaymakers over the austral summer months (December through February), and there is a dramatic increase in both recreational and commercial boating traffic at this time. A dolphin-watch industry has grown around the regularly sighted dolphin population, which is most intense during the summer holiday period.

The incident reported in this paper helps further our understanding of dolphin behaviours, particularly epimeletic responses. Chances to observe such interactions are rare and provide further insight into the complexity of social relationships within a population. This case also highlights that while the Port Phillip dolphin population has long been exposed to boat traffic and may be somewhat habituated to their presence, risk of boat strike is inherent and will most likely be higher for calves or otherwise compromised individuals. Further research is required in Port Phillip to investigate the level of habituation to boat traffic and the possible cumulative effect of short-term impacts.

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