

## Male-male aggression renders bottlenose dolphin (*Tursiops truncatus*) unconscious

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### Abstract

Intraspecific aggression constitutes a significant proportion of conspecific behaviours among many mammal species. Agonistic interactions among male bottlenose dolphins (*Tursiops truncatus*) have been documented in several different regions, including escalated aggression involving coalitions comprised of several males. However, despite many hours of direct observation most of these encounters are evidenced by minor injuries and often, physical wounds are not visible. Herein, we describe a unique encounter involving a long-term male alliance competing with a 'solo' male that resulted in the temporary loss of consciousness of the lone male following repeated physical blows to his head region. This observation supports the increased fitness experienced by males in alliances and illustrates the potential severity of aggressive interactions among adult bottlenose dolphins.

Key words: aggression, unconscious, social structure, *Tursiops truncatus*, alliances, dolphin

### Introduction

Many types of intraspecific interactions have been documented among cetaceans, ranging from social affiliative behaviours (e.g., Herzing, 1996) and copulation (Payne & Dorsey, 1983; Reynolds *et al.*, 2000), to aggression (e.g., Connor *et al.*, 2001; Herzing, 1996). Overtly aggressive behaviour among males is prominent among the interactions observed and has been documented for both dolphins (Connor *et al.*, 2001) and whales (Clapham, 1996; Connor *et al.*, 2000). This is perhaps most notable for bottlenose dolphins (*Tursiops truncatus*), with conspecific aggression between males often involving interactions among several

individuals, as male alliances compete with one another to maintain consortships with females (Connor *et al.*, 1999; Connor *et al.*, 1992). Agonistic behaviours ranging from posturing and acoustic threats, to physical violence have been observed during such events. However, despite repeated observations of male–male interactions, neither fatal nor serious injuries have been reported. Herein, we describe an observation of a 'knock-out' following an aggressive interaction between male bottlenose dolphins in the Bahamas.

### Materials and Methods

The event was observed by two of the authors (KMP and JWD) on 30 June 1996 in the shallow inshore waters of the Sea of Abaco in the north-east Bahamas (26°25.905'N, 076°59.956'W). At 1434 h, a group of four adult-sized bottlenose dolphins were encountered during photo-identification surveys conducted from a 5 m rigid-hull inflatable vessel powered by a 70 hp outboard engine. All four dolphins were easily recognized and distinguished individually based on their pattern of unique dorsal fin nicks (Würsig & Würsig, 1977; Scott *et al.*, 1990), and these individuals were well-known to the authors from previous encounters. Their individual identifications were later confirmed by comparing high quality, black and white dorsal fin photographs to an existing catalogue, compiled over five years of previous study. *Ad libitum* behavioural observations were recorded using a micro-cassette recorder and later transcribed. Concurrent with surface observations, underwater observations were periodically made using a dive mask while hanging over the side of the boat. Underwater observations enabled periodic collection of subsurface behavioural data and confirmation of the sex of individual dolphins via direct observation of the genital region. Throughout the encounter, the sea state was Beaufort 1 to 2 and the water depth varied from 1.8 to 2 m. The seabed was clearly visible at all

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times during underwater observations, with underwater visibility at least 5 m.

### Results

The dolphin group was comprised of three adult males (Tt89, Tt52, Tt73), two of which (Tt52 and Tt73) constitute a stable male alliance (Parsons, 2002), and one adult female (Tt30). The 'solo male' (Tt89) was noticeably larger than both the allied males, who were of similar size, and the female. Erect penises were observed on two of the males (Tt73 and Tt89), and the sex of the third male (Tt52) was known from observations made during previous encounters. The female was known to have had two calves between 1990 and 1995, but did not have a dependent calf at the time of these observations. Throughout the encounter, the group maintained a triangle formation, with the female adopting a position in front of the three males, at a distance ranging from one to five body lengths. During the 84-min encounter, a continuum of overtly aggressive behaviour was observed among the three males, ranging from repeated jaw claps, tail slaps, rostrum-to-belly or flank, lunging, and biting. Most of these behaviours occurred at, or near, the water's surface. All of these behaviours were directed from one or both members of the alliance towards the solo male, or vice versa. At no time was aggression observed between the two allied males. All of the agonistic displays were observed among the males, and the female did not appear to be in physical contact with any of the other dolphins at any time during the encounter.

Thirty-eight minutes into the encounter (at 1512 h), one of the alliance members (Tt52) executed a series of tail-slaps, repeatedly contacting the melon region of Tt89's head, which was submerged just below the water's surface. Immediately following the tail-slaps, the solo male (Tt89) rolled laterally under water until oriented in a belly-up position, and passively sank to the bottom (water depth approximately 2 m) where he remained motionless, dorsal-side down for several seconds. Dolphins often adopt particular behavioural states associated with sleep and resting (Gnone *et al.*, 2001), however, to the best of our knowledge wild dolphins have never been observed resting supine ('belly-up') on the seabed. Moreover, dolphins have previously been observed to sink passively in stressful (Pryor & Kang, 1980) or submissive (D. Herzog, pers. comm., April 2003; D. Claridge, K. Parsons & J. Durban, unpublished data) circumstances, however, these behaviours usually culminate in the animal resting on their sides or belly, or sinking in a vertical orientation. Therefore, based on his immobile, belly-up posture and the violent interaction that preceded the passive sink,

we inferred that this dolphin was most likely unconscious. Tt89 remained supine and motionless for 13 s, until he actively resumed a typical 'dorsal-up' orientation and resurfaced. This sequence of events was concurrently witnessed by both surface and underwater observers.

Upon resurfacing, aggressive actions between Tt89 and the male alliance resumed. For the following 30 min, 50 s, we observed a series of behavioural events commencing at 1514 h with Tt52 executing a full leap while Tt73 swam belly-up underneath Tt89. Tt73 resurfaced and side-lunged on top of Tt89's dorsum. Then, Tt73 rolled and adopted a belly-up position underneath Tt89's flukes, and Tt89 executed a series of tail-slaps. At 1523 h the alliance members exchanged positions, and Tt52 head-lunged on top of Tt89's peduncle and appeared to be biting the solo male. At 1535 h, while the males were alternately lunging on top of one another, Tt30 (the female) consumed a fish while crater-feeding (Roszbach & Herzog, 1997) nearby. As previously observed, the female dolphin was never physically involved in the aggressive events, and on four separate occasions she was observed foraging and successfully crater-feeding while within ~2 body lengths of the three males. At 1543 h, we lost sight of the solo male as he departed the encounter location, leaving the female tightly associated with the male alliance. The encounter ended at 1558 h at 26°25.717'N, 077°00.078'W, 0.33 km south-southwest of where the dolphins were first encountered, when we lost sight of the dolphin group.

### Discussion

There is a long history of observational studies on wild bottlenose dolphins and aggressive behaviour has been observed on numerous occasions, most notably among coalitions of males competing for access to females (*Tursiops* sp.; Connor *et al.*, 2001; Connor *et al.*, 1992). The outcomes are usually evidenced by relatively minor tooth-rakes (Connor *et al.*, 2000) with neither fatal nor serious injuries documented as the result of conspecific aggressive interactions among adult male dolphins. However, there is mounting evidence of bottlenose dolphins inflicting serious or lethal injuries in other circumstances. Most notably, post-mortem examination of both harbour porpoise (*Phocoena phocoena*) and neonatal bottlenose dolphin carcasses, indicating multiple traumatic internal injuries (in the absence of external wounds other than parallel tooth rakes) have been attributed to attack by bottlenose dolphins (Patterson *et al.*, 1998; Ross & Wilson, 1996). These examples highlight the potential severity of dolphin aggression.

It is possible that the severity of aggressive interactions between adult dolphins could be underestimated because of reliance upon external marks or scars as a measure of severity. The observation of a 'knock-out' presented in this note suggests that serious injuries can result from such aggressive behaviours, while apparently leaving no physical evidence. Unconsciousness is a potentially serious condition for a dolphin. Because dolphins are voluntary respirators (Ridgway, 1972; Williams *et al.*, 1990), prolonged periods of unconsciousness could prove fatal. On this occasion Tt89, the solo male, recovered and a subsequent encounter on 13 August 1997 reaffirmed the survival of this dolphin. It is interesting to note that the injured dolphin was fighting with two male dolphins that associated as a stable alliance (Parsons *et al.*, in press), and this allied pair was apparently successful in out-competing the larger solo male for prolonged access to the female. Aggression among mammals is often escalated by the presence of male alliances or coalitions (Waser *et al.*, 1994) and our observation of this directed agonistic behaviour indicates how membership in male alliances could lead to an increase in reproductive fitness for allied individuals.

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#### Literature Cited

- Clapham, P. J. (1996) The social and reproductive biology of humpback whales: an ecological perspective. *Mammal Review* **26**, 27–49.
- Connor, R. C., Heithaus, M. & Barre, L. (2001) Complex social structure, alliance stability and mating success in a bottlenose dolphin 'super-alliance'. *Proceedings of the Royal Society, London B* **268**, 263–267.
- Connor, R. C., Heithaus, M. R. & Barre, L. M. (1999) Superalliance of bottlenose dolphins. *Nature* **397**, 571–572.
- Connor, R. C., Read, A. J. & Wrangham, R. (2000). Male reproductive strategies and social bonds. In: J. Mann, R. C. Connor, P. L. Tyack & H. Whitehead, (eds.) *Cetacean Societies: Field Studies of Dolphins and Whales*, pp. 247–269. University of Chicago Press, Chicago.
- Connor, R. C., Smolker, R. A. & Richards, A. F. (1992) Two levels of alliance formation among male bottlenose dolphins (*Tursiops* sp.). *Proceedings of the National Academy of Science* **89**, 987–990.
- Gnone, G., Benoldi, C., Bonsignori, B. & Fogani, P. (2001) Observations of rest behaviours in captive bottlenose dolphins (*Tursiops truncatus*). *Aquatic Mammals* **27**, 29–33.
- Herzing, D. L. (1996) Vocalizations and associated underwater behaviour of free-ranging Atlantic spotted dolphins, *Stenella frontalis* and bottlenose dolphins, *Tursiops truncatus*. *Aquatic Mammals* **22**, 61–79.
- Parsons, K. M. (2002) The use of molecular and observational data to infer the structuring of bottlenose dolphin populations. PhD. thesis. University of Aberdeen, UK. 174 pp.
- Parsons, K. M., Durban, J. W., Claridge, D. E., Balcomb, K. C., Noble, L. R. & Thompson, P. M. (in press) Kinship as a basis for alliance formation between male bottlenose dolphins, *Tursiops truncatus*, in the Bahamas. *Animal Behaviour*.
- Patterson, I. A. P., Reid, R. J., Wilson, B., Grellier, K., Ross, H. M. & Thompson, P. M. (1998) Evidence for infanticide in bottlenose dolphins: an explanation for violent interactions with harbour porpoises? *Proceedings of the Royal Society, London B* **265**, 1–4.
- Payne, R. S. & Dorsey, E. (1983) Sexual dimorphism and aggressive use of callosities in right whales (*Eubalaena australis*). In: R. S. Payne, (ed.) *Communication and Behaviour of Whales*. Westview Press, Boulder, CO.
- Pryor, K. & Kang, I. (1980) Social behavior and school structure in pelagic porpoises (*Stenella attenuata* and *S. longirostris*) during purse seining for tuna. National Marine Fisheries Service, SW Fisheries Center, La Jolla, CA 92038. Admin Report LJ-80-11c, pp. 86.
- Reynolds, J. E. I., Wells, R. S. & Eide, S. D. (2000) *The Bottlenose Dolphin: Biology and Conservation*. University Press of Florida, Gainesville, FL.
- Ridgway, S. H. (1972) Homeostasis in the aquatic environment. In: S. H. Ridgway, (ed.) *Mammals of the Sea, Biology and Medicine*. Charles C. Thomas, Springfield, IL.
- Ross, H. M. & Wilson, B. (1996) Violent interactions between bottlenose dolphins and harbour porpoises. *Proceedings of the Royal Society, London B* **263**, 283–286.
- Roszbach, K. A. & Herzing, D. L. (1997) Underwater observations of benthic-feeding bottlenose dolphins (*Tursiops truncatus*) near Grand Bahama Island, Bahamas. *Marine Mammal Science* **13**, 498–504.
- Scott, M. D., Wells, R. S., Irvine, A. B. & Mate, B. R. (1990) Tagging and marking studies on small cetaceans. In: S. Leatherwood & R. R. Reeves (eds.) *The Bottlenose Dolphin*, pp. 489–514. Academic Press, San Diego.
- Waser, P. M., Keane, B., Creel, S. R., Elliott, L. F. & Minchella, D. J. (1994) Possible male coalitions in a solitary mongoose. *Animal Behavior* **47**, 289–294.
- Williams, T. D., Williams, A. L. & Stoskopf, M. (1990) Marine mammal anaesthesia. In: L. A. Dierauf, (ed.) *Handbook of Marine Mammal Medicine: Health, Disease, and Rehabilitation*. pp. 735–745. CRC Press, Boca Raton, FL.
- Würsig, B. & Würsig, M. (1977) The photographic determination of group size, composition, and stability of coastal porpoises (*Tursiops truncatus*). *Science* **198**, 755–756.