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Two Unusual Interactions Between a Bottlenose Dolphin (*Tursiops truncatus*) and a Humpback Whale (*Megaptera novaeangliae*) in Hawaiian Waters

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Abstract

When two species share a common habitat, interspecific interactions can take many forms. Understanding the dynamics of these interactions can provide insight into the behavior and ecology of those species involved. Two separate, unusual interactions are described in which a humpback whale (*Megaptera novaeangliae*) lifted a bottlenose dolphin (*Tursiops truncatus*) completely out of the water. Both incidents occurred in Hawaiian waters. Based on reports of object play by humpback whales, and the apparent initiation and cooperation of each dolphin being lifted, object (i.e., the dolphin) play by the whale and social play by the dolphin seem to be the most plausible explanations for the interaction. Aggressive and epimeletic behavior by the humpback were also considered.

Key Words: humpback whale, *Megaptera novaeangliae*, bottlenose dolphin, *Tursiops truncatus*, interspecific play, object play, social play, Hawaii

Introduction

Interactions between two species sharing a common habitat may be classified as positive or negative. Positive interactions are beneficial to both species (mutual) or beneficial to one species, while the other is unaffected (commensal). Negative interactions are beneficial to one species but detrimental to the other (predatory, parasitic). Understanding the dynamics of these interspecific interactions can provide insight into the behavior and ecology of those species involved.

Interspecific interactions are commonly reported among many cetacean species (for review, see Frantzis & Herzing, 2002) and appear to vary in their function. For example, different dolphin species interact for reasons that are predatory (e.g., Jefferson et al., 1991), sexual (e.g., Dohl et al., 1974), epimeletic (care-giving) (e.g., Caldwell & Caldwell, 1966), and playful (e.g., Herzing & Johnson, 1997).

Free-ranging bottlenose dolphins (*Tursiops truncatus*) are particularly well-known for a variety of interspecific interactions. A preliminary review reveals bottlenose dolphin interactions with at least 16 different marine mammal species, which include baleen whales (e.g., .Whaley et al., 2006), dolphins (e.g., Coscarella & Crespo, 2009), porpoises (e.g., Ross & Wilson, 1996), pinnipeds (e.g., Bearzi, 2003), and sirenians (e.g., Kiszka, 2007). Some of the functional characterizations of these interactions are described as (1) communal foraging (Norris & Prescott, 1961; Würsig & Würsig, 1979; Herzing & Johnson, 1997; Bearzi, 2003), (2) aggression (Ross & Wilson, 1996; Herzing & Johnson, 1997; Herzing et al., 2003; Wedekin et al., 2004; Coscarella & Crespo, 2009), (3) sexual (Dohl et al., 1974; Sylvestre & Tasaka, 1985; Herzing & Johnson, 1997; Herzing et al., 2003), (4) epimeletic (Brown & Norris, 1956; Norris & Prescott, 1961; Essapian, 1962; Herzing & Johnson, 1997), and (5) playful (Wolman & Jurasz, 1977; Herzing & Johnson, 1997). Bottlenose dolphin interactions specifically with humpback whales (*Megaptera novaeangliae*) are common and have been described as associative (Shallenberger, 1981; Glockner & Venus, 1983; Whaley et al., 2006; Rossi-Santos et al., 2009), communal foraging (Stockin & Burgess, 2005), or involving bow-riding the pressure wave created in front of the whale's head as an energy-saving means of locomotion or a form of play (Wolman & Jurasz, 1977; Shane et al., 1986; Würsig, 2008a).

In this paper, we document two separate cases of a humpback whale lifting a bottlenose dolphin

completely out of the water in Hawaiian waters. The role of aggression, epimeletic behavior, and play are investigated as likely explanations for these unique interactions.

Materials and Methods

Both observations were made opportunistically in waters off the main Hawaiian islands where a large portion of the North Pacific humpback whale population visit each winter season for reproductive purposes (Herman & Antinoja, 1977). The first interaction occurred on 25 January 2004 and was observed by three of the authors (MHD, BKB, and LM) while conducting humpback whale research off the northwest coast of Kauai. The observation was made from a 5.8-m Hobie Hunter outboard vessel. Sea state condition was a Beaufort 2 (winds 6 to 10 km/h) with good visibility. Photographs were taken with a Canon EOS 10D digital SLR camera equipped with a Canon 70-200 mm telephoto zoom lens and a Canon 1.4x extender. Observations were made with the naked eye and through the camera lens.

The second observation took place on 25 January 2006. The captain (TT) of a whale-watching vessel notified one of us (MHD) of a humpback whale lifting a bottlenose dolphin out of the water off the northwest coast of Maui. MHD and another observer (CAV) proceeded to the area of the reported sighting in an 8.5-m inflatable, rigid-hull vessel and relocated the animals. Sea state was a Beaufort 2 (winds 6 to 10 km/h) with good visibility. Photographs were taken with a Canon EOS 20D digital SLR camera equipped with a Canon 75-300 mm zoom lens. Observations were made with the naked eye and through the camera lens.

Results

Kauai Observation

At 1412 h, 1.8 km offshore of Kekaha, Kauai (21.960 N, 159.745 W), a pair of humpback whales was followed traveling slowly together (< 5 m apart) to the southeast along the coastline. The whales were observed for the next 1 h and 53 min from a distance of 50 to 150 m. The bottom depth ranged from 40 m at the start of the encounter to 18 m toward the end of the encounter. At 1421 h, a group of eight bottlenose dolphins was observed, also traveling southeasterly about 100 m ahead of the two humpbacks. The boat moved to within 15 m of the dolphins to obtain dorsal fin photo-identifications. At 1427 h, two adult-sized dolphins (approximately 3 m in length) reversed direction and approached the humpback whales. The dolphins positioned themselves directly in front of one humpback still at the surface and appeared to surf the pressure wave created by the whale's head as it swam. The two dolphins could be differentiated since one of them had a distinctive cookie cutter shark (*Isistius brasiliensis*) bite on the right side of the body and a notched dorsal fin. During the next two breaths by the same whale, each dolphin independently was seen lying across the whale's rostrum as it surfaced, oriented perpendicular to the whale's body. At 1430 h, the whale stopped and slowly raised its rostrum upward while lifting the well-marked dolphin out of the water (Figure 1a). Once completely clear of the water, the dolphin remained arched, on its side, balanced over the end of the whale's rostrum (Figure 1b). The dolphin appeared to cooperate, with no discernible effort to free itself or escape. When the whale was nearly vertical, with its eye nearly breaking the water surface, the dolphin slid down the dorsal side of the rostrum (Figure 1c) while swinging its flukes upward (Figure 1d). This entire lift sequence lasted about 3 s, ending when the dolphin entered the water tail first.

Immediately following this event, the dolphin that was lifted rejoined the other dolphin and both individuals porpoised back toward the main dolphin group, about 400 m ahead of the whales. The pair of humpbacks were followed for another 35 min as they continued on a slow, southeasterly direction. The sex of the whales and dolphins was not determined.

Maui Observation

At 1742 h, a humpback whale calf was seen resting at the surface about 800 m offshore of Mala Wharf on the northwest side of the island of Maui, Hawaii (20.887 N, 156.694 W). Observations were made for the next 29 min from a distance of 100 to 150 m. The bottom depth was about 18 m for the entire encounter. Within a few seconds, an adult bottlenose dolphin (about 2.5 m in length) surfaced 15 m from the calf. The dolphin was positioned vertically with only its head and rostrum exposed above the water. At 1747 h, the humpback mother surfaced next to the calf about 5 m from the dolphin. The dolphin submerged and at 1748 h, it resurfaced while resting its ventral side on top of the mother's rostrum. The calf submerged. At 1749 h, an escort humpback surfaced, took three breaths, and submerged 20 s later while the mother remained at the surface and lifted the dolphin out of the water with her rostrum (Figure 2). The dolphin was lifted a total of six times over the next 8.5 min (1749 to 1757 h). During four of these lifts, the dolphin was lying on its right side over the mother's rostrum (Figures 2b, 2c, 2e & 2f). During the remaining two lifts, the dolphin was positioned on its ventral side (Figures 2a &

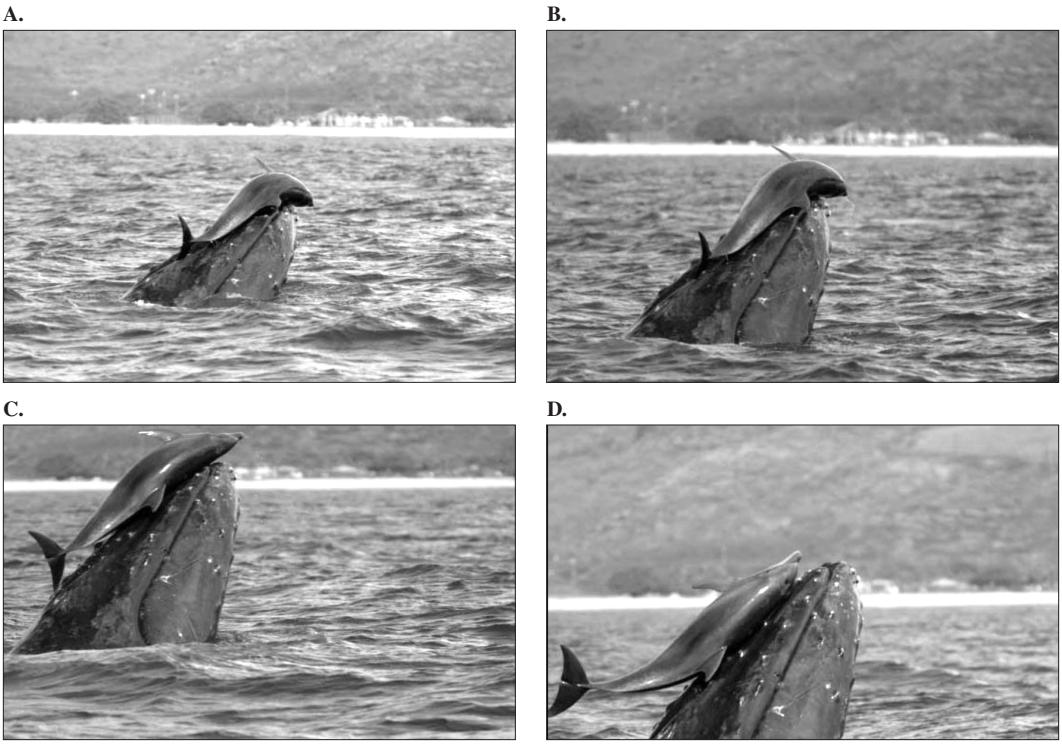

Figure 1. A bottlenose dolphin slowly lifted out of the water by a humpback whale 1.8 km off the northwest coast of Kauai, Hawaii, on 25 January 2004 (photos by L. Mazzuca)

2d). Each lift lasted from 4 to 45 s. At 1752 h, prior to the last two lifts, the mother slapped her left pectoral fin twice on the water's surface, then rolled inverted with her genitals exposed for about 1 min. The last lift occurred at 1753 h, after which the dolphin moved away and was no longer seen near the humpbacks. The whales were left briefly to try and locate the dolphin, and a single bottlenose dolphin was seen traveling rapidly north about 600 m from the humpbacks. This was likely the same dolphin as no other dolphins were seen in the area.

At 1758 h, the mother was observed in a vertical position with only the tip of her rostrum exposed above the water. A few seconds later, the calf surfaced next to her, also in a vertical position with its rostrum partially exposed, occasionally physically touching the mother. The pair continued resting at the surface in a vertical position for 11 min until 1809 h, when the calf rolled on top of the mother's rostrum. At 1810 h, the mother lifted the calf slightly out of the water with her head, enough for the calf to roll off the right side of her rostrum. At 1811 h, the mother rolled onto her back exposing her genital area above the surface and was last seen in this position when we left the area to return to the harbor. The sun set at 1813 h.

The bottlenose dolphin in this encounter was determined to be a female based on photographs showing mammary slits on each side of an extended, single genital-slit opening (Figure 2e). A comparison of dorsal fin photographs confirmed that the interacting humpback whale and bottlenose dolphin seen off Kauai were both different from the interacting humpback whale and bottlenose dolphin seen off Maui.

Discussion

This paper presents the first two documented instances of a humpback whale lifting a bottlenose dolphin out of the water. Three possible explanations could help to understand this unique interaction: (1) the whale was responding aggressively toward an antagonizing dolphin; (2) the whale was demonstrating epimeletic behavior toward the dolphin; or (3) the whale, dolphin, or both were engaged in play behavior.

Aggressive Response by the Whale Toward an Antagonizing Dolphin

Bottlenose dolphins are known to interact with a variety of large whale species, including gray whale (*Eschrichtius robustus*) (Leatherwood,

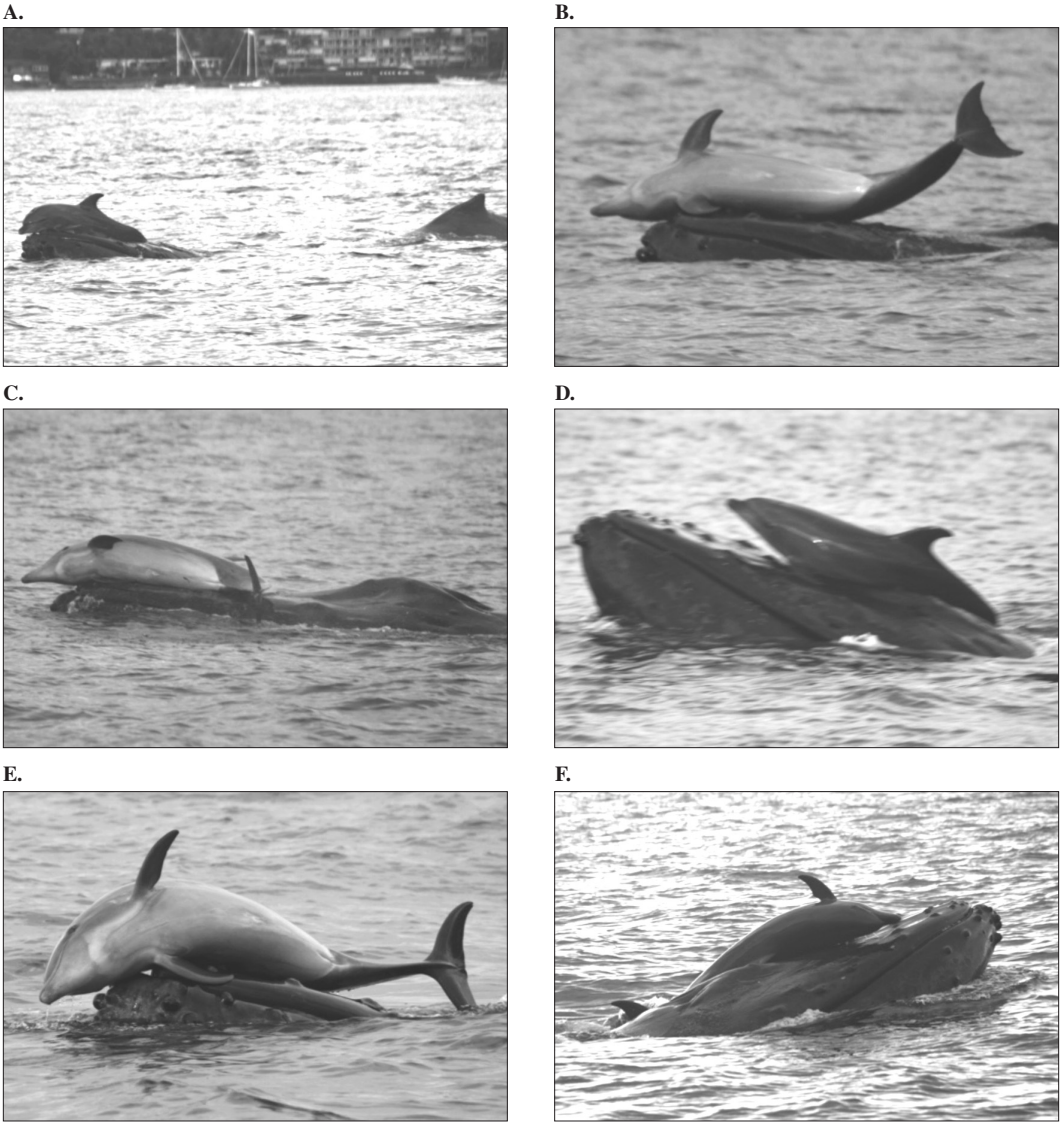

Figure 2. A bottlenose dolphin lifted repeatedly out of the water by a humpback whale about 800 m off the northwest coast of Maui, Hawaii, on 25 January 2006 (photos by M. Deakos)

1974), southern right whale (*Eubalaena australis*) (Würsig & Würsig, 1979), and humpback whale (Wolman & Jurasz, 1977; Glockner & Venus, 1983; Shane et al., 1986; Stockin & Burgess, 2005; Whaley et al., 2006; Rossi-Santos et al., 2009). These interactions typically consist of surfing the pressure wave created in front of the whale's head (McBride & Kritzler, 1951; Norris & Prescott, 1961; Leatherwood, 1974; Würsig, 2008a), similar to dolphins bow-riding a ship (Woodcock, 1948; Fejer & Backus, 1960). In Hawaii, bottlenose dolphins are commonly seen surfing the pressure wave produced in front of a traveling humpback whale (Shallenberger, 1981; Glockner & Venus, 1983). This behavior reduces the energy needed for the dolphin to propel itself (Woodcock & McBride, 1951; Fish, 1994) during travel, or could also be a form of play (McBride & Kritzler, 1951; Shane et al., 1986; Würsig, 2008a). As such, surfing the pressure wave created in front of the humpback whale's head was likely the intent of the lifted dolphin off Kauai. The close proximity of the dolphin to the whale's head could be disturbing to the whale, provoking it to lunge forward at the surface during a breath (Würsig, 2008b), perhaps lifting the dolphin out of the water

in the process. Southern right whales have been reported to surge or lunge ahead in the direction of dolphins crossing their heads (Würsig & Würsig, 1979). Head-lunging is a common aggressive display performed by the principal male escort in a humpback whale competitive group (Baker & Herman, 1984); thus, this behavior could have been an aggressive reaction by the whale toward the dolphin. However, the slow speed at which the lifts were performed in both encounters and the lack of a fleeing response by the dolphin as might be expected in response to aggression are inconsistent with the whales behaving aggressively.

Epimeletic Behavior by the Whale Toward the Dolphin

Epimeletic behavior involves giving of care or attention to another individual and is termed *succorant* when directed toward individuals in distress or *nurturant* when directed toward young (Scott, 1958; Caldwell & Caldwell, 1966). Succorant behavior has been reported in at least eight genera of toothed whales (for review, see Félix, 1994; Fertl & Schiro, 1994), including members of at least ten different species (Brown & Norris, 1956; Norris & Prescott, 1961; Essapian, 1962; Gilmore, 1962; Caldwell et al., 1963; Caldwell & Caldwell, 1966; de Moura et al., 2008). Among seven of these genera (*Globicephala*, *Lagenorhynchus*, *Inia*, *Pontoporia*, *Steno*, *Delphinus*, and *Truncatus*), the succorant behavior involved supporting a dead or distressed conspecific at the water's surface (Norris & Prescott, 1961; Pilleri & Knuckey, 1969; Pilleri, 1971; Kasuya & Miyazaki, 1976; Cockcroft & Sauer, 1990; Lodi, 1992; de Moura et al., 2008).

Reports of succorant behavior in baleen whales are much less common. Slijper (1962) reported succorant behavior when a humpback whale supported an injured humpback for 40 min before being harpooned by whalers. Tomilin (1957) reported four occasions of humpback whales on the North Pacific feeding grounds remaining with a conspecific after the latter was harpooned. After a male humpback whale died in a competitive group in Hawaii, three of the whales from the group remained with the dead whale, including one male who remained for over 4 h (Pack et al., 1998).

If the whale in each of our encounters perceived the dolphin as distressed, lifting the dolphin out of the water may have been succorant behavior by the whale. However, no signs of injury or emaciated girth were apparent in the photographed dolphins to suggest poor health. Fast travelling by each dolphin and high energy porpoising exhibited by the Kauai dolphin provide further evidence that these dolphins were healthy and unlikely to be mistaken by the humpbacks as distressed.

In Hawaii, nurturant behavior is observed by humpback whale mothers who occasionally lift their young calf to the surface with their rostrum (Cartwright, 2005). Lifting a newborn to the surface and out of the water immediately after birth is commonly reported for cetaceans (McBride & Kritzler, 1951; Béland et al., 1990; Notarbartolo di Sciara et al., 1997; Stacey & Baird, 1997). Sometimes the nurturant behavior is directed toward the young of a different species such as when two Pacific white-sided dolphins (*Lagenorhynchus obliquidens*) each took turns lifting a neonatal harbor porpoise part way out of the water (Baird, 1998). Given that the humpback mother off Maui began lifting her own calf out of the water shortly after lifting the dolphin suggests that the dolphin lift might have been displaced nurturant behavior in response to a small animal resting on her rostrum.

The sex of the Kauai humpbacks was not determined. However, dyads (i.e., pairs), the most common group type observed on the breeding grounds, are generally composed of a male and a female (Brown & Corkeron, 1995). If the lifting humpback was a female and had previously had a calf, her behavior could have been a maternal response to the physical pressure of the dolphin on her rostrum. The exaggerated lift of the dolphin above the water's surface could have resulted from the mother's habituated lifting of a calf weighing at least four times more than the dolphin.

In each case, epimeletic behavior may explain the whale's actions but does little to explain the cooperative behavior by the dolphin, which may be better explained as play behavior.

Play Behavior by the Whale and/or Dolphin

Play is considered important in the social and physical development of mammals and birds (Fagen, 1981). However, defining what constitutes play in animals is an ongoing topic of considerable debate (Fagen, 1981; Burghardt, 2005). Burghardt (2005) identified five criteria for characterizing play in animals: (1) incompletely functional in the context expressed and the behavioral sequence does not produce its usual outcome (e.g., play fighting); (2) voluntary, pleasurable, or self-rewarding; (3) different structurally or temporally from related serious behavior systems (behaviors are incomplete, exaggerated, or precocious); (4) expressed repeatedly during at least some part of an animal's life span; and (5) initiated in relatively benign situations (i.e., when the animal is healthy and free from stress or hunger). The behavior of the bottlenose dolphin in each encounter seems to fit all five of these play criteria.

Animal play can be further differentiated into three types: (1) locomotor play (running, leaping,

sliding, and brachiating), (2) object play (activity directed toward an inanimate object such as manipulating, pulling, pushing, or chewing), and (3) social play (activity directed toward another living object such as rough and tumble behavior or chasing) (Bekoff & Byers, 1981; Fagen, 1981; Burghardt, 2005). Social play is play directed at conspecifics or toward other animals taking on the role of proxy for a conspecific (Burghardt, 2005). Burghardt also notes that social play, while generally considered dyadic and reciprocal, can be one-sided when it is playful for only one participant (e.g., teasing and harassing).

Although object play is commonly reported for free-ranging dolphins with objects such as kelp (Würsig & Würsig, 1980), seaweed (Johnson & Norris, 1994), fish (Mann & Smuts, 1999), turtles (Fertl & Fulling, 2007), and even birds (Würsig, 2008b), it is less commonly reported for baleen whales. Bowhead whales (*Balaena mysticetus*) in the Beaufort Sea were observed manipulating large 10 to 20 m logs with their pectoral fins and tail. They have also been reported to balance the logs on their backs while lifting the end of the log repeatedly 3 to 5 m above the water's surface for brief periods lasting 1 to 2 s (Würsig et al., 1989). A juvenile female humpback whale was observed under water manipulating a large piece of cargo net in waters off Maui, Hawaii (M. H. Deakos, pers. obs., 2002). For over 1 h, she manipulated the net, passing it from her pectoral fin to her rostrum and back to her pectoral fin. The female behaved similarly with a large, floating rope immediately afterwards. In Hervey Bay, Queensland, Australia, a humpback whale, possibly engaged in object play, reportedly used its pectoral fins to flip an overturned loggerhead sea turtle (*Caretta caretta*) (Fertl & Fulling, 2007). These reports of baleen whale play suggest that the humpback whale lifting the dolphin out of the water could have been engaging in object (i.e., the dolphin) play.

The bottlenose dolphin in each encounter appeared to be playing socially and submissively as it allowed the humpback whale to repeatedly lift it out of the water. Submissive social play was documented in two captive bottlenose dolphins that took turns pushing each other around the tank (Kuczaj & Highfill, 2005). Herzing & Johnson (1997) reported interspecific social play by two adult female bottlenose dolphins that propelled two juvenile male Atlantic spotted dolphins (*Stenella frontalis*) through the water by pushing forward on their tail flukes with their rostra.

In conclusion, these observations suggest that the two encounters described herein were interspecific play by the bottlenose dolphins and humpback whales. The dolphins in both cases seemed in good health and capable of fleeing the humpbacks at any time; therefore, they likely initiated what appeared to be social play with the humpbacks. Reports of object play in humpback whales supports the likelihood that both humpbacks observed lifting the dolphin out of the water were engaged in object (i.e., the dolphin) play. However, if both participating whales were female, the maternal instinct to lift a small animal resting on its rostrum cannot be ruled out as an alternative explanation.

While the bottlenose dolphin and humpback whale regularly associate in Hawaiian waters, this is the first published account of the unique and unusual behavior of a humpback repeatedly lifting bottlenose dolphins out of the water. We encourage efforts to document the frequency, duration, and nature of interactions between bottlenose dolphins and humpback whales to better understand the nature and context of such interactions.

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