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NOTE

Marine Mammal Science

An observation of sexual behavior between two male humpback whales

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Humpback whales (*Megaptera novaeangliae*) are a species whose social behavior has been studied for decades, but whose sexual behavior remains largely undescribed. Most humpback whales spend the summer months feeding in polar waters and migrate during fall and winter months to tropical waters, where the observed behaviors are related largely to reproduction (Chittleborough, 1965; Craig et al., 2003; Currie et al., 2018). Despite decades of research on humpback whales around the world, reports of penis extrusion by males are relatively rare (Herman et al., 2007; Pack et al., 1998, 2002) and copulation in humpback whales has not yet been documented (Ransome et al., 2021). This is the first report of penetration by a humpback whale, and the first report of sexual activity between two male humpback whales.

Nonreproductive sexual behavior occurs between individuals whose age and/or sex mean that there is no possibility of producing offspring, such as same sex interactions or interactions between immature animals (Furuichi et al., 2014). In many species, the functions of sexual behavior extend beyond reproduction. Heterosexual behavior often occurs in nonreproductive contexts and homosexual behavior is common in the animal kingdom (Bagemihl, 1999). Sexual interactions between individuals of the same sex have been documented for a wide range of species, as reviewed in Bagemihl (1999).

Among marine mammals, there are observations of this behavior in pinnipeds, e.g., walrus, *Odobenus rosmarus*; gray seal, *Halichoerus grypus*; and cetaceans, e.g., Amazon river dolphin, *Inia geoffrensis*; common bottlenose dolphin, *Tursiops truncatus*; Atlantic spotted dolphin, *Stenella frontalis*; killer whales *Orcinus orca*; gray whale, *Eschrichtius robustus*; and bowhead whale, *Balaena mysticetus* (reviewed in Bagemihl, 1999; Ham et al., 2023). In male cetaceans, homosexual activity can involve insertion of the penis of one male into the genital slit (Sylvestre, 1985) or anus (Renjun et al., 1994) of another male. The purpose for nonreproductive behavior is varied; proposed functions include learning or practicing reproductive behaviors, establishing or reinforcing dominance relationships, forming

social alliances, and/or reduction in social tension (reviewed in Bagemihl, 1999; Bailey & Zuk, 2009). Male–male sexual behavior is well studied in common bottlenose dolphins and plays an important role in social interactions among individuals (Caldwell & Caldwell, 1972; Mann, 2006; Östman, 1991). Nonsexual behavior in cetaceans can also be associated with agonism and dominance behavior (Ham et al., 2023). D'Agostino et al. (2017) describe an example of sexual harassment by an adult male southern right whale (*Eubalaena australis*) in Argentina directed toward a calf, suggesting that this behavior can be aggressive in nature in some cetacean species.

Glockner-Ferrari and Ferrari (1985), Herman et al. (2007), Pack et al. (2002), and Tyack and Whitehead (1983) reported observations of penis extrusions in humpback whales in Hawai'i. Tyack and Whitehead (1983) observed the erect penis of a single male escort accompanying a mother and calf pair. They stated that the male appeared to be urinating. Glockner-Ferrari and Ferrari (1985) described an incident in which two males, visually assessed to be one adult and one subadult, rubbed against each other's bodies and the subadult extruded its penis and rubbed it against the genital slit of the adult. No follow-up observations of the pair were reported. Pack et al. (2002) reviewed underwater footage that had originally been gathered for video photogrammetry and reported that in 13 of 630 sightings a penis was extruded, and on four occasions, the penis appeared directed toward another male whale (Pack et al. 2002). These four cases were all in competitive groups, i.e., a group comprised of two or more male humpback whales competing for close access to a mature female (Pack et al., 2002). Herman et al. (2007) reported on ten deployments of Crittercam systems on humpback whales in Hawai'i. These suction-cup tags contained underwater video cameras to record subsurface behavior of males in competitive groups. The authors reported a penis extrusion of one male directed toward another male when the female was not in the vicinity and speculated that it may be a display (Herman et al., 2007). Given that the current knowledge of humpback whale nonreproductive sexual behavior is limited, additional observations will increase our understanding of the contexts in which penis extrusions occur and their significance in humpback whale social interactions.

In cetaceans, the male's penis is normally concealed inside the animal's genital slit, presumably to make the body more hydrodynamic, and is externally extruded for sexual behavior (Orbach et al., 2023). Humpback whale penis extrusions appear to be rare and generally occur underwater, rather than at the surface (Pack et al., 1998; Tyack & Whitehead, 1983). Although a few researchers have published observations of select underwater behaviors of humpback whales in the breeding grounds (*e.g.*, Baker & Herman, 1984; Pack et al., 1998) underwater behavior is generally understudied compared to surface behavior, leaving many questions about the sexual behavior of humpback whales unanswered.

The observations reported here were made opportunistically on January 19, 2022. A private vessel (8 m in length and outfitted with twin Yamaha 150 hp outboard engines) encountered a group of two humpback whales approximately 2 km west of the Molokini crater off the island of Maui, Hawai'i (Figure 1). The whales slowly approached the boat, at and just below the surface. The whales were visible from the boat, perhaps 3–5 m below the surface. Whale A was in the lead, followed by Whale B. When the two whales approached the boat, it was observed that Whale A appeared to have an unusual brown coloration of the body, which drew interest in documenting these animals. Photographic observations were made by holding Sony and Olympus cameras underwater from the rear swim step and over the side of the boat. Photographs were taken at a depth of approximately 0–0.25 m. The vessel was in neutral, with the engines shut off. The two whales were observed to be interacting with each other and slowly circled the boat several times. The whale's behavior was observed for approximately 30 min. Whale A was visibly emaciated and covered in whale lice (*Cyamus boopis*), a species of ectoparasite that lives on the skin of humpback whales and can proliferate on whales that are injured and have reduced mobility, leading to the perceived skin discoloration as described earlier (Osmond & Kaufman, 1998). Whale A was swimming slowly in circles around the boat, approximately six times, pursued by Whale B. Whale A was displaying slow and low energy movements. It was slowly attempting to swim away from Whale B but was not making any sudden or powerful movements and did not dive out of sight at any point during the encounter. It is possible that Whale A approaching and circling the boat was an attempt to block or seek refuge from Whale B. However, if so, Whale A was moving too slowly to be effective at evading the other animal. Both whales remained within approximately 5 m of the surface

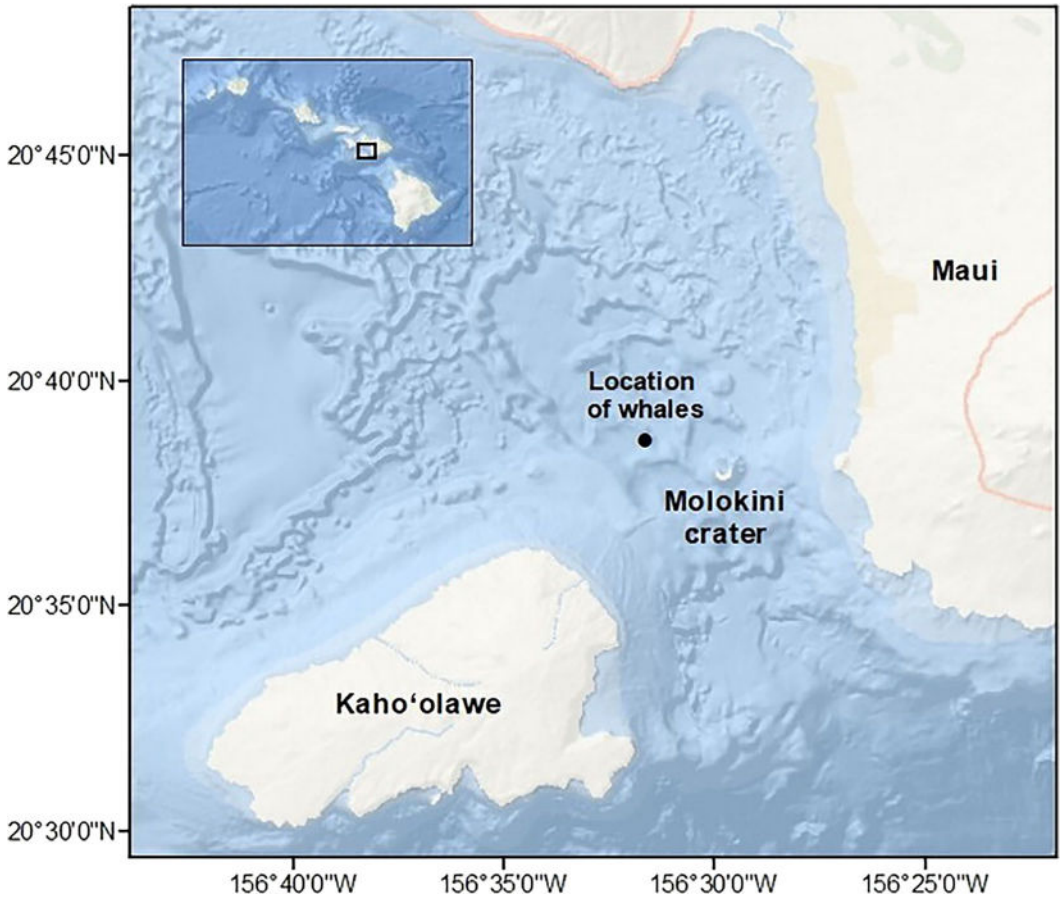

FIGURE 1 Map of Maui, Hawai'i, showing the location of this encounter, indicated by a black circle, on January 19, 2022.

for the duration of the encounter. Whale B had its penis extruded during the entirety of the encounter. Whale B repeatedly approached from the rear of Whale A and penetrated the second whale, appearing to hold Whale A in place with its pectoral fins. The penetrations were shallow, visually judged to be a few centimeters in depth. Each penetration was <2 min in duration. After the final penetration, Whale B dove and did not reappear. Whale A remained near the surface for a few minutes (visible from the boat) before diving. There were only two whales involved in this interaction, with no other whales detected in the surrounding area during the encounter.

Upon reviewing the photographs, it was noticed that Whale A had a significant jaw injury, that likely impaired normal feeding behavior (Figure 2). It was also observed that Whale B had its penis extruded throughout the entire encounter and, at times, would penetrate the genital opening of Whale A, using its pectoral fins to hold Whale A (Figure 3). This grasping behavior appears to be an important component of copulation or attempted copulation for humpback whales. Herman et al. (1980) described a humpback whale using its pectoral fins to grasp a North Pacific right whale in Hawaiian waters and reported that the interaction gave the "strong impression that the humpback whale was engaging in courtship behavior" (p. 274). Pectoral grasping was reported in Pack et al. (1998) when describing a humpback whale penis extrusion directed at a dead male conspecific. This observation was later reinforced by Pack et al. (2002) who reported that each instance of observed penis contact between humpback whales was accompanied by pectoral grasping behavior and suggested that this position could play a significant role in mating behavior between humpback whales.

FIGURE 2 Two adult male humpback whales seen off Maui, Hawai'i, on January 19, 2022. Whale B has its penis inserted into the genital opening of Whale A. An injury is visible on the mandible of Whale A.

FIGURE 3 Two adult male humpback whales seen off Maui, Hawai'i, on January 19, 2022. Whale B has its penis inserted into the genital opening of Whale A.

FIGURE 4 Close up of the genital region of Whale A, which was previously confirmed to be a male through biopsy sampling (D. Steel and S. Baker, personal communication, April 4, 2023).

Tail fluke identification photographs and photographs of the genital region were obtained for both whales and used to identify the whales involved and their sex. The tail fluke photographs were uploaded to the Happywhale.com database (Cheeseman et al., 2022) for automated identification of the individual whales and matching against other photo-identification catalogs. Whale A, the injured whale, was determined to be #PWF-NP_5016, an adult whale first documented by Pacific Whale Foundation researchers in 2020 (Figure S1 shows the tail fluke for this individual). This whale is known to be a male from a previous analysis of a biopsy sample (D. Steel and S. Baker, personal communication, April 4, 2023) and this was further confirmed by photographs of the genital region (Figure 4). Whale B was determined to be #PWF-NP_3754, an adult whale first documented by Pacific Whale Foundation researchers in 1993 (Figure S2 shows the tail fluke for this individual). Whale B was confirmed to be a male from the underwater footage showing an extruded penis. Visual estimates in the field suggested both whales were adults based upon their length and this was similarly confirmed from their sighting histories.

The behavior of humpback whales in the Hawaiian breeding grounds is well studied. Yet, despite this, we are still uncovering new aspects of their sexual and social behavior. Boat-based research efforts on cetaceans in Hawaiian waters began in the late 1960s (Norris & Dohl, 1980), and for the last 40 years multiple research groups have studied humpback whales during their breeding season. Despite this extensive effort, the sightings described here were captured by community scientists. Similarly, a whale watching company operating off Maui, Hawai'i, was the first to document a partial humpback whale birth in 2020 using a pole-mounted underwater camera (Patton & Lawless, 2021). This demonstrates the incredible value of community members working in collaboration with researchers to further our understanding of the natural world.

The health of Whale A relative to Whale B may be relevant to the behavior reported here. While we do not know the definitive cause of injury to the jaw seen on Whale A, similar injuries have been observed from ship strikes (Jensen & Silber, 2003). Blunt force trauma caused by collisions with large vessels is known to cause broken bones in large whales (Jensen & Silber, 2003). Unfortunately, these injuries are not always immediately lethal, and the animal can suffer for weeks or months before succumbing to its injuries (Bradford & Lyman, 2015). The body condition and parasite load of Whale A (Figure 5) suggested that it was in poor health, likely had been declining for some time, and may have been dying (Osmond & Kaufman, 1998).

FIGURE 5 Detailed view of the condition of Whale A (bottom individual). This whale was emaciated, and the presence of whale lice caused this whale to appear discolored from the vessel. The injury to the mandible of this whale is visible on the far left.

Animal behavior is shaped by a complex interaction of internal drivers and external stimuli, making it difficult for researchers to assign motive to an observed behavior (Manning & Stamp Dawkins, 1998). Some possible explanations for this behavior are that Whale B was mistakenly trying to mate with Whale A, that it was reinforcing a social relationship with an ailing conspecific, or that it was an expression of dominance over a weak and injured competitor. Agonistic behavior includes displays of strength to make the animals appear larger and/or more physically fit than their competitors, allowing them to gain access to a resource, such as food or a mate (Manning & Stamp Dawkins, 1998). It is plausible that penis extrusion and/or penetration from male whales directed at other male whales is a form of agonistic behavior.

Additional underwater footage collected from humpback whales in Maui Nui has documented additional penis extrusions directed from one male to another during competitive groups (Herman et al., 2007; S.S., personal observation). It is well established that humpback whales fight during competitive groups to win access to a female, but little is known about male–male interactions outside of these situations. At times, Whale A demonstrated an S-shaped posture during the encounter (Figure 3), a position characterized by an arched tail stock, lowered tail flukes, and slight lifting of the rostrum, such that the whale's body resembles the letter S (Helweg et al., 1992). Researchers in Hawai'i previously explored the function of this posture and concluded that it primarily occurred during threatening interactions, such as during competitive groups, or during stressful situations, such as in response to a vessel approach or in the presence of divers (Helweg et al., 1992). Therefore, it is possible that the use of this posture by Whale A meant that this behavior was unwelcome, but that Whale A lacked the energy to engage in avoidance strategies.

Here, we have the first documentation of a humpback whale male sexually penetrating another humpback whale, but also the case of an animal that is injured and unhealthy being penetrated by what appears to be a healthy and strong whale. The most similar situation to the observations presented here is Pack et al. (1998) who described a humpback whale extruding its penis adjacent to the floating body of a male humpback whale that had died in a competitive group shortly before. Whether such behavior would occur between two healthy males is unknown, but it is noteworthy that the observation presented here has strong similarities to Pack et al. (1998). It is striking that the only two observations of such behavior in the scientific literature involve ailing or deceased whales.

In conclusion, the documented instance of male–male nonreproductive behavior presented here, including the unique case of an apparently injured and ailing whale being penetrated by a seemingly healthy counterpart, raise intriguing questions about the nature of such behavior in humpback whales. Drawing parallels with a similar observation by Pack et al. (1998), where a humpback whale exhibited sexual activity near a deceased conspecific, adds to the complexity of understanding these occurrences. The limited data available on this behavior emphasizes the need for further research to explore the motivations, implications, and potential factors influencing such interactions, especially in the context of healthy individuals.

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AUTHOR CONTRIBUTIONS

Stephanie H. Stack: Conceptualization; funding acquisition; investigation; project administration; supervision; writing – original draft; writing – review and editing. **Lyle Krannichfeld:** Data curation; resources; visualization; writing – review and editing. **Brandi Romano:** Data curation; resources; visualization.

ETHICS STATEMENT

Under the Marine Mammal Protection Act, it is illegal to approach humpback whales by any means within 100 meters, unless operating under a special permit. The photographs presented here were collected opportunistically from a private vessel that was stationary with the engine shut off during the encounter. Our observations were made opportunistically as the whales approached the vessel and began to circle it; the vessel did not approach the whales at any time. It is against the law to swim with humpback whales in the USA; the photographers held cameras over the side of the boat and did not enter the water.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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