

Short Note

First Report of Killer Whales Harassing Sperm Whales in the Gulf of Mexico

Amy D. Whitt,¹ Melody A. Baran,¹ Maurice Bryson,² and Luke E. Rendell²

¹*Geo-Marine, Inc., 2201 K Avenue, Suite A2, Plano, TX 75074, USA*

E-mail: amy@azuraco.com

²*Sea Mammal Research Unit, School of Biology, University of St Andrews, St Andrews, Fife, KY16 9TS, UK*

Current affiliation for Amy D. Whitt and Melody A. Baran: Azura Consulting LLC

Killer whales (*Orcinus orca*) are known predators of sperm whales (*Physeter macrocephalus*) (Jefferson et al., 1991; Pitman et al., 2001). Recent findings suggest that variations in predation pressure from killer whales may help to explain differences in social structure across sperm whale populations (Whitehead et al., 2012). In the northern Gulf of Mexico, sperm whales are regularly sighted and thought to be a genetically and acoustically distinct population (Antunes et al., 2007; Engelhaupt et al., 2009). Although only occasionally reported in the Gulf of Mexico, killer whales are thought to be regular inhabitants of the northern portion of the Gulf (O'Sullivan & Mullin, 1997). Knowledge of their occurrence in this region is based on limited sightings data, and the most recent abundance estimates from the northern Gulf of Mexico, based on 2009 survey data, are around 30 animals (Waring et al., 2013).

On 13 September 2011, a prolonged interaction between killer whales and sperm whales was observed from a vessel conducting mid-water trawling operations in the northern Gulf of Mexico. A group of five killer whales appeared to be harassing a group of 19 sperm whales, including two calves. Visual behavioral observations and acoustic data were recorded during this interaction, which lasted over 4 h. No obvious injuries to the sperm whales were observed. Killer whales in the Gulf of Mexico have been seen attacking other marine mammals, including pantropical spotted dolphins (*Stenella attenuata*) (Pitman et al., 2003), but there are no accounts of killer whales attacking sperm whales in this region. Although actual predation could not be confirmed, this event shows that killer whales do interact with, and may prey on, sperm whales in the Gulf of Mexico.

This report describes the behavioral events and concurrent vocalizations recorded during this encounter. Trawl sampling operations were

conducted aboard the National Oceanic and Atmospheric Administration's (NOAA) R/V *Pisces* during two cruises (21 June to 15 July and 7 to 29 September 2011) in the northern Gulf of Mexico as part of NOAA's Natural Resource Damage Assessment (NRDA) following the *Deepwater Horizon* oil spill. Because the location of trawl sampling overlapped with the occurrence of several cetacean and sea turtle species, monitoring and mitigation plans were developed in an attempt to prevent incidental takes of protected species. These plans included the use of visual observations and passive acoustic monitoring (PAM) to help researchers avoid potential capture/entanglement of protected species. Visual observations were conducted from the flying bridge of the *Pisces*, via big eye binoculars (25 × 150 mm) and naked eye, before and during daytime mid-water trawling operations, while PAM was conducted with a towed array prior to deployment of the trawl net during the day and night. The sea state was initially a Beaufort 3 but improved to a 2 or better during the encounter.

During daytime trawling operations on 13 September 2011, protected species observers sighted sperm whales in waters 1,630 m deep southeast of Louisiana (28° 1.05' N, 88° 48.99' W) via the big eye binoculars. They were sighted at 1246 h (CST) and were traveling slowly, approximately 5 nmi in front of the research vessel. Initially, eight to 10 sperm whales were sighted and were divided into a few tight subgroups, each comprised of about two to four whales. One of these subgroups included a very small calf. At 1252 h, one sperm whale fluked up and was shortly followed by another whale fluking up, while several whales remained at the surface continuing in the same direction of travel.

At 1254 h, the sperm whales that remained in view abruptly and simultaneously increased their travel speed while maintaining the same direction of travel. The whales began moving so fast that

upon surfacing, almost the full front of the whales' heads would come out of the water because of their powerful forward momentum. Some splashes or blows were seen closer to the horizon in the general direction of these whales. The sperm whales continued traveling at this fast pace toward the region of the splashes and blows until 1338 h when two killer whales were sighted ahead of and in the travel path of the approaching sperm whales (28° 2.77' N, 88° 47.11' W). Additional sperm whales were already near these killer whales or had also recently converged. Similar sudden traveling behavior has been observed in sperm whales converging in one area prior to being attacked by killer whales off central California (Pitman et al., 2001). In this case, Pitman et al. (2001) suggested that some of the sperm whales may have sounded an alarm call to alert other sperm whales in the area of the impending attack.

A total of five killer whales were sighted near the sperm whales: one adult male with a very tall erect dorsal fin, two adult females/subadult males with small/medium dorsal fins, one adult female/subadult male with a medium dorsal fin, and one small calf. All of the killer whales had faint, closed saddle patches similar to killer whales observed in the Caribbean Sea (Bolaños-Jiménez et al., 2014). Photographs of the killer whales were compared to those in the National Marine Fisheries Service's (NMFS) Gulf of Mexico killer whale catalog. One of the whales with a small/medium dorsal fin was matched to the catalog and was previously sighted in the Gulf of Mexico on 8 June 1994 and 15 April 2004 (K. Barry, pers. comm., 6 May 2013). None of the other killer whales could be positively matched to the catalog.

The most dynamic behaviors were observed during the next hour (1444 to 1554 h). During this time, the trawl net was still being towed, so the ship could not approach the groups; real-time field notes were taken while the observers viewed the interaction through the big eye binoculars. The killer whale and sperm whale groups were observed in close proximity to each other. The two killer whales with small/medium dorsal fins were the most frequently sighted amidst the sperm whales and were observed rushing (rapid swimming) into the group of sperm whales numerous times. One or two of these killer whales were observed jumping on, over, or in very close proximity to at least a portion of the sperm whale group. During this time, the other killer whales remained approximately 200 to 400 m away from the sperm whales. The sperm whales appeared agitated; they made erratic changes in body position, often rolling on their sides with at least half of their flukes visible out of the water. Additional behavioral events observed for the sperm whales

were similar to those described during a previous interaction between sperm whales and short-finned pilot whales (*Globicephala macrorhynchus*) in the north central Gulf of Mexico (Weller et al., 1996). These included lateral fluke swishes or slashes (portion of the fluke blade is positioned above the water surface and rapidly moved in a lateral or sideways orientation), peduncle arching (caudal peduncle is arched above the water surface), and spy hopping (the head is lifted above the water surface).

No more than three killer whales were observed in the midst of the sperm whale group at any one time. Most of the time it was the two with small/medium dorsal fins that were interacting with the sperm whales, and occasionally the killer whale with the medium fin participated in these interactions. The adult male killer whale and the calf remained approximately 200 to 400 m from the sperm whales and were never observed interacting with the sperm whales. Assuming that the killer whales with small/medium and medium dorsal fins were females or subadult males, this observation is consistent with other accounts of female and subadult killer whales being the active participants in predation on marine mammals, while mature males have no involvement in the attacks or only participate at the very end of the attacks (Arnbom et al., 1987; Jefferson et al., 1991; Pitman et al., 2003; Visser et al., 2010).

The killer whales that were interacting with the sperm whales would periodically move away from the sperm whales and briefly regroup (i.e., move into close proximity to one another) with the other killer whales immediately following surface tail slaps of one of the killer whales, primarily the adult male. All of the killer whales would remain in this tight group only briefly before at least one or two of them moved towards the sperm whales again. This behavior was seen several times before we were able to approach the sighting. Although this behavior could not be confirmed as attack behavior since the observers were too far away to see any direct or indirect signs of wounds, the killer whales' behavior may have been consistent with the wave attack strategy witnessed during observations of killer whales utilizing a "wound and withdraw" strategy to lethally attack sperm whales off Moro Bay, California (Pitman et al., 2001).

Once the trawl net was fully on deck at 1458 h, we slowly approached the sighting, began taking photographs and video footage, and deployed an acoustic array. As we approached, we observed a total of 19 sperm whales clustered tightly (touching) in a parallel formation (side by side). Two of the 19 sperm whales were small calves (~4 m long) and were usually positioned in the center of

the cluster. The rest of the sperm whales ranged between 7 and 14 m in length, and the majority of the whales were 9 to 11 m long. Some sperm whales were observed spy hopping amidst the other tightly positioned sperm whales. Two of the smaller killer whales remained close to the sperm whales as we approached. At one point, a few of the sperm whales rapidly approached these two killer whales who responded by quickly diving.

Acoustic recordings consisted of numerous codas from the sperm whales but little obvious vocal output from the killer whales. We recorded echolocation clicks, codas (+1 and 1+1+3), and “burst” sounds (machine gun sounds often heard in social settings). Intense vocal activity was recorded throughout the encounter. The lack of obvious killer whale vocal output is consistent with previous studies that suggest mammal-eating killer whales may use passive listening instead of echolocation to detect marine mammal prey species to avoid alerting their prey (Barrett-Lennard et al., 1996; Deecke et al., 2005) and also is consistent with the lack of killer whale vocalizations before, during, and after marine mammal predation events in The Bahamas (Dunn & Claridge, 2013).

After a period of around 30 min during which individuals of both species remained at the surface but did not interact, the killer whales began moving away from the tightly clustered sperm whales. After remaining submerged for several minutes, all five killer whales were seen surfacing simultaneously (side by side) in what appeared to be very fast travel away from the sperm whales. They were not sighted again.

The sperm whales remained in two tight subgroups for 1 h after the killer whales presumably left the area. The sperm whales were very quiet for about 20 min after the killer whales left the area and then began making clearer codas again, building up over the final observation hour into an intense bout of social vocalizations. No obvious injuries to the sperm whales were observed, and no blood or oily substance was observed in the water around the whales.

This encounter provides a rare insight into the interactions between killer whales and sperm whales in the northern Gulf of Mexico. To the best of our knowledge, this is the first report of killer whales harassing or attacking sperm whales in the Gulf of Mexico. One previous encounter between killer and sperm whales was recorded but not reported by NOAA. During this encounter, a group of six killer whales was observed moving around a tight group of 10 to 13 sperm whales in the northern Gulf (28° 12' N, 89° 17' W) on 15 August 2001 during a NOAA research cruise to locate sperm whales to attach satellite tags and collect biopsy

samples (K. Mullin, pers. comm., 2 September 2013). The sperm whales appeared to be highly agitated and were in a very tight group. The killer whales surfaced close to the sperm whales, but no direct contact or predation was evident. The observation lasted for 1 h and 20 min. During this time, additional sperm whales converged on the area so that over 25 sperm whales were present when the research vessel left the region.

Sperm whales are known to form “rosette” or “marguerite” patterns in which they form a circle with their heads together and tails as a defense strategy when they are threatened (e.g., Nishiwaki, 1962; Pitman et al., 2001; Dunn & Claridge, 2013). However, sperm whales have also been observed in the tight “shoulder-to-shoulder” formation when being attacked by killer whales (Pitman et al., 2001; Weir et al., 2010), and this was the only formation we observed. This “shoulder-to-shoulder” position may be used to protect more severely wounded individuals since the exposed animals on the outside of the tight group receive the brunt of the attack (Pitman et al., 2001). Since we did not observe any obvious injuries or slicks of blood or oil in the water, it is possible that the killer whales were not directly attacking the sperm whales. It is also possible that the killer whales were harassing the sperm whales in an attempt to “test” the prey, particularly to check for young or weakened animals, which would make easier prey as suggested by Jefferson et al. (1991).

Based on the described behavioral events and previously recorded behaviors of sperm whales and killer whales, it is likely that the sperm whales were responding to a perceived threat from the killer whales. Although there is no concrete evidence to explain the intentions of the killer whales, this event provides suggestive evidence that killer whales may prey on sperm whales in the Gulf of Mexico.

Acknowledgments

We are grateful to the Commanding Officer and crew of the R/V *Pisces* for their assistance and cooperation and especially to Chief Scientist Tracy Sutton for his support. Thanks also to Yvonne Barkley, Eddie Hughes, and Jeff Jacobsen who helped collect data on this encounter. Thank you to the rest of the *Pisces* research team. Thanks to Keith Mullin for providing information on NOAA's previous account of killer whales with sperm whales in the Gulf and to Kevin Barry for matching our photos to the NOAA killer whale catalog. All data were collected under Marine Mammal Protection Act Permit No. 779-1633.

Literature Cited

- Antunes, R., Rendell, L., Hammond, P., & Gordon, J. (2007, November/December). *Geographical variation of sperm whale coda repertoires in the North Atlantic Ocean*. Proceedings of the Seventeenth Biennial Conference on the Biology of Marine Mammals, Cape Town, South Africa.
- Arnborn, T., Papastavrou, V., Weilgart, L. S., & Whitehead, H. (1987). Sperm whales react to an attack by killer whales. *Journal of Mammalogy*, 68(2), 450-453. <http://dx.doi.org/10.2307/1381497>
- Barrett-Lennard, L. G., Ford, J. K. B., & Heise, K. A. (1996). The mixed blessing of echolocation: Differences in sonar use by fish-eating and mammal-eating killer whales. *Animal Behaviour*, 51, 553-565. <http://dx.doi.org/10.1006/anbe.1996.0059>
- Bolaños-Jiménez, J., Mignucci-Giannoni, A. A., Blumenthal, J., Bogomolni, A., Casas, J. J., Henríquez, A., . . . Luksenburg, J. A. (2014). Distribution, feeding habits and morphology of killer whales *Orcinus orca* in the Caribbean Sea. *Mammal Review*. <http://dx.doi.org/10.1111/mam.12021>
- Deecke, V. B., Ford, J. K. B., & Slater, P. J. B. (2005). The vocal behaviour of mammal-eating killer whales: Communicating with costly calls. *Animal Behaviour*, 69, 395-405. <http://dx.doi.org/10.1016/j.anbehav.2004.04.014>
- Dunn, C., & Claridge, D. (2013). Killer whale (*Orcinus orca*) occurrence and predation in the Bahamas. *Journal of the Marine Biological Association of the United Kingdom*. 5 pp. <http://dx.doi.org/10.1017/S0025315413000908>
- Engelhaupt, D., Hoelzel, A. R., Nicholson, C., Frantzis, A., Mesnick, S., Gero, S., . . . Mignucci-Giannoni, A. A. (2009). Female philopatry in coastal basins and male dispersion across the North Atlantic in a highly mobile marine species, the sperm whale (*Physeter macrocephalus*). *Molecular Ecology*, 18, 4193-4205. <http://dx.doi.org/10.1111/j.1365-294X.2009.04355.x>
- Jefferson, T. A., Stacey, P. J., & Baird, R. W. (1991). A review of killer whale interactions with other marine mammals: Predation to co-existence. *Mammal Review*, 21(4), 151-180. <http://dx.doi.org/10.1111/j.1365-2907.1991.tb00291.x>
- Nishiwaki, M. (1962). Aerial photographs show sperm whales' interesting habits. *Norsk Hvalfangst-Tidende*, 51(10), 395-398.
- O'Sullivan, S., & Mullin, K. D. (1997). Killer whales (*Orcinus orca*) in the northern Gulf of Mexico. *Marine Mammal Science*, 13, 141-147. <http://dx.doi.org/10.1111/j.1748-7692.1997.tb00618.x>
- Pitman, R. L., O'Sullivan, S., & Mase, B. (2003). Killer whales (*Orcinus orca*) attack a school of pantropical spotted dolphins (*Stenella attenuata*) in the Gulf of Mexico. *Aquatic Mammals*, 29(3), 321-324. <http://dx.doi.org/10.1578/01675420360736488>
- Pitman, R. L., Ballance, L. T., Mesnick, S. I., & Chivers, S. J. (2001). Killer whale predation on sperm whales: Observations and implications. *Marine Mammal Science*, 17(3), 494-507. <http://dx.doi.org/10.1111/j.1748-7692.2001.tb01000.x>
- Visser, I. N., Zaeschmar, J., Halliday, J., Abraham, A., Ball, P., Bradley, R., . . . Pace, D. S. (2010). First record of predation on false killer whales (*Pseudorca crassidens*) by killer whales (*Orcinus orca*). *Aquatic Mammals*, 36(2), 195-204. <http://dx.doi.org/10.1578/AM.36.2.2010.195>
- Waring, G. T., Josephson, E., Maze-Foley, K., & Rosel, P. (Eds.). (2013). *U.S. Atlantic and Gulf of Mexico marine mammal stock assessments – 2012* (Vol. 1). Silver Spring, MD: National Marine Fisheries Service. 425 pp.
- Weir, C. R., Collins, T., Carvalho, I., & Rosenbaum, H. C. (2010). Killer whales (*Orcinus orca*) in Angolan and Gulf of Guinea waters, tropical West Africa. *Journal of the Marine Biological Association of the United Kingdom*, 90(8), 1601-1611. <http://dx.doi.org/10.1017/S002531541000072X>
- Weller, D. W., Würsig, B., Whitehead, H., Norris, J. C., Lynn, S. K., Davis, R. W., . . . Brown, P. (1996). Observations of an interaction between sperm whales and short-finned pilot whales in the Gulf of Mexico. *Marine Mammal Science*, 12(4), 588-594. <http://dx.doi.org/10.1111/j.1748-7692.1996.tb00071.x>
- Whitehead, H., Antunes, R., Gero, S., Wong, S. N. P., Engelhaupt, D., & Rendell, L. (2012). Multilevel societies of female sperm whales (*Physeter macrocephalus*) in the Atlantic and Pacific: Why are they so different? *International Journal of Primatology*, 33, 1142-1164. <http://dx.doi.org/10.1007/s10764-012-9598-z>