

## Killer whales (*Orcinus orca*) attack a school of pantropical spotted dolphins (*Stenella attenuata*) in the Gulf of Mexico

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### Abstract

In June 1994, we observed a herd of killer whales (*Orcinus orca*) attack a school of pantropical spotted dolphins (*Stenella attenuata*) in the Gulf of Mexico. The killer whales cut out up to three dolphins from the school, then proceeded to take turns chasing a single dolphin and keeping it within a confined area for 1.5 h. They could have killed the dolphin at any time, but apparently chose to prolong the encounter instead. An adult female killer whale appeared to use the opportunity as a training session for her calf. The single adult male present did not participate until the end of the encounter. He made several loud percussions by slapping his flippers, dorsal fin, and flukes against the water surface, then he swam to the dolphin and quickly killed it. Neither the role of the adult male killer whale in cooperative feeding situations nor the significance of the marked sexual dimorphism in this species has ever been adequately explained. We suggest that size differences between the sexes may have evolved as an 'ecological sex trait', allowing groups of related individuals to take a wider diversity of prey sizes.

Key words: killer whale, *Orcinus orca*, pantropical spotted dolphin, *Stenella attenuata*, predation, sexual dimorphism.

### Introduction

On 8 June 1994, while conducting a cetacean survey in the Gulf of Mexico aboard the NOAA Ship, *Oregon II*, we observed a group of killer whales (*Orcinus orca*) successfully attack a school of pantropical spotted dolphins (*Stenella attenuata*), a previously unrecorded prey species (Jefferson *et al.*, 1991). In this note, we describe the attack and

offer some speculations on killer whale foraging behaviour.

### Results

Using 25 × mounting spotting binoculars, we first sighted the killer whales at 1355 h at a distance of approximately 4.5 km and immediately turned the vessel to approach them. The location was 28° 14' N, 88° 28' W, 90 km southeast of South Pass, Louisiana, in water 1800 m deep. We estimated initially there were 12 animals, including three adult males in the front of the travelling herd. As we traveled toward the main group, two, possibly three, scattered individuals came over and rode the bow wave of the vessel for approximately 1 min and then sounded. Several minutes later a school of 100–120 pantropical spotted dolphins came into view approximately 1 km in front of the vessel. As we continued travelling toward the largest group of killer whales, we eventually passed close by the dolphins and they came over to ride our bow wave. The dolphins appeared to be either unaware of, or unconcerned about, the presence of the killer whales. All of the dolphins left the bow after approximately 5 min.

Several minutes later, a group of up to six killer whales were approximately 300 m directly in front of our vessel. Four of them rolled over, side-by-side, and arched high out of the water as if preparing for a deep dive. Immediately after they sounded, and approximately 150 m directly in front of them, the dolphin school exploded out of the water in a broad band 200 m wide, heading directly away from us and the whales. Less than 1 min later, the killer whales resurfaced between us and the fleeing dolphins, but this time they were separated and rolling asynchronously in different directions. There were two or three dolphins among them that had apparently been cut out of the main school. For about 2 min the killer whales continued surfacing and rolling in different directions within an area of approximately 100 m<sup>2</sup>, after which they were all

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together with a single dolphin corralled in their midst. We were not able to determine if the other dolphins that had been separated from the school had been eaten or had escaped.

At that time, and for the remainder of the sighting, seven killer whales were present: one adult male, four females (possibly including one or two young males), one juvenile and one calf. For the next 1.5 h (1418 h to 1554 h), we stayed with the killer whales as they played 'cat and mouse' with their captive dolphin. We assumed that the dolphin was an adult male based on its large size, relatively heavy spotting, and fairly prominent post-anal keel (Perrin & Hohn, 1994). Throughout the chase the dolphin tried to elude the attackers, but the killer whales took turns pursuing and wearing it down. On two occasions the dolphin, with a killer whale right behind it, passed directly under the bow of our vessel, but did not attempt to use the ship for cover. It appeared that most or all of the killer whales in the group took part in the chase at one time or another, with the exception of the single adult male, who did not participate until the very end of the episode (see below). At any one time, most of the killer whales were not involved with the chase; instead, they appeared to be leisurely socializing in the vicinity of our vessel. Whenever we closed within 100 m or so of the killer whales, most of them came over and rode our bow wave or swam alongside us while one or two were busy with the dolphin.

The whales that chased the dolphin appeared to continually herd it back toward the rest of the group. Whenever the dolphin got farther than 200 m away, one of the killer whales would move up alongside it or in front of it and turn it back toward the group. How effective they were in confining the dolphin was evidenced by the fact that a drifting longline float in the area remained within a few hundred metres of our vessel throughout the observation period. When the chasing whale(s) seemed to lose interest and head back to the group, the dolphin appeared to have a chance to escape, but, although it might be 100 m or more away, one or two new killer whales bolted from the main group and caught up with it immediately.

Several times during the episode the adult female killer whale with a calf pursued the dolphin in what appeared to be a training session for the calf. The cow stayed behind the calf as it pursued the dolphin, and it did not interfere, unless the dolphin appeared to be getting away from the calf. When that happened, the cow immediately pulled out ahead of the dolphin and turned it back toward the calf.

The pursuing killer whales did not appear to be interested in immediately killing the dolphin, but apparently preferred to 'play' with it. For example,

with the dolphin swimming at full speed, a pursuing killer whale would close in and bump the dolphin's tail with its rostrum, or move in alongside it and butt the dolphin hard on its flanks with its rostrum. Later on, as the 'play' became noticeably rougher, one of the females rammed the dolphin mid-body hard enough that it wrapped around the killer whale's head and was thrown clear of the water. At one point, an adult female swam alongside the dolphin, turned her belly toward it and gave it a hard slap with her flukes. Another time, a different whale leaped out of the water, arched its body, then slammed down on the dolphin with its side.

After 90 min of non-stop pursuit, the killer whales were not as vigorous in their pursuit of the dolphin and they appeared to be losing interest. The dolphin was also clearly weakening and slowing down. At this time, the adult male killer whale rolled over on his back and, with his belly exposed, he vigorously beat the surface with his pectoral fins. Seconds later, while swimming right-side-up, he rolled over sharply and slapped the surface with his dorsal fin resulting in a loud clap. It was also about this time that both the male and some of the other whales began tail-slapping although the male was much more vigorous with his actions. Almost immediately after these displays, the male swam over to the dolphin and made two or three aggressive passes at it, throwing up large amounts of water as it lunged after the dolphin. Then the male surfaced with the dolphin in his mouth and flipped it ahead of him, end-over-end, some 10 m through the air. The dolphin appeared limp with its back bent at an awkward angle as if it was broken. This was the last time we saw the dolphin and it was probably dead by then. Almost immediately after the kill, the male returned to the group, which was milling within 100 m of our vessel. Although the male killer whale might have eaten the dolphin, it appeared that he simply killed it and left it. Two or three other whales remained for several minutes in the area where the dolphin was last seen and they also could have eaten it.

Five minutes later, all of the killer whales were back together and playing with a polypropylene line attached to the longline float mentioned above.

### Discussion

These observations confirm some previously reported behaviours of hunting killer whales and shed new light on some others. Killer whale cows apparently take an active role in teaching their young to hunt and presumed training sessions, similar to what we describe, have also been reported by Baldrige (1972), López & López (1985), Hoelzel (1991), Guinet (1991), Guinet & Bouvier (1995), and Pitman *et al.* (2001) (see discussion in Baird,

2000). What may have been training for the calf, however, appeared to be play behaviour for the other whales. It was clear to us that the killer whales could easily have killed the dolphin at any time during the 90-min chase; instead, they appeared to deliberately prolong the pursuit. Matkin & Dahlheim (1995) also observed episodes where killer whales 'appeared to prolong kills before consuming (or sometimes abandoning) their prey' (see also Baird & Stacey, 1988; Felleman *et al.*, 1991; Baird & Dill, 1995). Although killer whales must be cautious at all times to avoid injury to themselves, even when handling relatively small prey, there can be little doubt they 'play with their food' at times.

Although the vigorous percussive displays (slapping the water with flippers, tail and dorsal fin) that we observed near the end of the episode have been reported during killer whale attacks on marine mammals elsewhere (e.g., Hancock, 1965; Baldrige, 1972; Baird & Stacey, 1988; Silber *et al.*, 1990; Matkin & Dahlheim, 1995), the significance of these behaviours is not understood, especially within the context of predation (see discussion in Felleman *et al.*, 1991; Baird & Dill, 1995). The bull killer whale that we observed was by far the most demonstrative individual and was so only immediately prior to his joining the chase and killing the dolphin; it appeared that he might have been signalling his intention to end the event. The relatively larger size of adult male appendages (dorsal fin, flippers, flukes) appeared to contribute to his ability to be especially forceful with these displays.

The role of adult male killer whales during hunting episodes is far from understood. For example, it was recently reported that a group of adult female killer whales and their calves repeatedly attacked a herd of sperm whales (*Physeter macrocephalus*) until one of the sperm whales was severely wounded (Pitman *et al.*, 2001). Then, a bull killer whale, that had been standing by for several hours, rushed in and quickly killed the sperm whale. Those authors speculated that the male could have fulfilled some specified role because he seemed to come in, almost as if on cue, even though the females were clearly capable of killing the sperm whale without his help. Similarly, in the dolphin attack described above, the bull killer whale charged in late in the event and delivered the *coup de gras*, although the females could have quickly dispatched the dolphin at any time.

Curiously, to our knowledge, no one has ever offered a satisfactory explanation for the marked sexual dimorphism in killer whales (males reach lengths of 9.5 m and weigh in excess of 6.1 tons; females to 7.7 m and at least 4.2 tons [Dahlheim & Heyning, 1999]). We believe this instance of predation on a spotted dolphin, and the attack by killer whales on a group of sperm whales (Pitman

*et al.*, 2001) could provide a clue. In most species of mammals where males are much larger than females (e.g., sperm whales, elephant seals [*Mirounga* spp.], lions [*Panthera leo*], red deer [*Cervus elaphus*]), males compete for access to breeding females. Although this competition has selected for larger size in males of those species (Andersson, 1994), there is no evidence that bull killer whales use their larger size for intraspecific combat. In most known cases, instead of associating with unrelated females that could be potential mates to be defended from other males, adult males travel with their maternal relatives (Bigg *et al.*, 1990; Baird, 2000). Further, pitched encounters between adult male killer whales have never been reported, despite, in some cases, many years and thousands of hours of field observations. (Visser [1998] reported a possible case from New Zealand, but direct observations were lacking.)

As an alternative to the competition-for-mates explanation, we suggest that size differences in male and female killer whales could have evolved as an 'ecological sex trait' (i.e., dimorphism connected with different life habits; Andersson, 1994). Well-developed size dimorphism among cooperatively foraging groups might allow those groups to take an even wider range of prey sizes than they might be able to otherwise. The killer whale is the only marine mammal that preys upon species larger than itself and it can do this because it hunts cooperatively in packs and perhaps because of the presence of large males. For example, Flórez-González *et al.* (1994) reported that during an attack on humpback whales (*Megaptera novaeangliae*), 'the killer whale females and calves separated the humpback calf from the adults while the two mature male killer whales paralleled the course of the adult humpbacks, preventing them from coming near the calf'. If sexual size dimorphism did evolve as an ecological sex trait in the killer whale it was no doubt facilitated, and perhaps even prompted, by the fact that not only is it a cooperative pack-hunter, but it lives in small, permanent groups of closely related long-lived individuals.

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