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**BEHAVIORAL OBSERVATIONS ON
FIN WHALE, *BALAENOPTERA PHYSALUS*,
IN THE PRESENCE OF
KILLER WHALE, *ORCINUS ORCA***

Detailed observations of baleen whales attacked by killer whales, *Orcinus orca*, are scarce. Most of these records involve attacks on gray whales, *Eschrichtius robustus* (e.g., Scammon 1874; Gilmore 1961; Morejohn 1968; Pike and MacAskie 1969; Rice and Wolman 1971; Baldrige 1972). Although reports exist of killer whale tooth marks on different body parts of fin whales, *Balaenoptera physalus*, sei whales, *B. borealis* (Hoyt 1981), minke whales, *B. acutorostrata* (Jonsgård 1968), and bowhead whales, *Balaena mysticetus* (Tomilin 1967); and although remains of some of these species (fin, sei, and minke whales) have been found in stomachs of killer whales (Nishiwaki and Handa 1958; Tomilin 1967; Rice 1968; Hoyt 1981; International Whaling Commission 1982), we know of only a few reports of direct observations of killer whales attacking mysticetes besides gray whales. These include attacks on 1) southern right whales, *Eubalaena australis* [= *glacialis*] (Cummings et al. 1972); 2) a humpback whale, *Megaptera novaeangliae* (Martinez and Klinghammer 1970); 3) a minke whale (Hancock 1965);

4) a female sei whale with a calf (Gaskin 1982); 5) a fin whale (Pike and MacAskie 1969); and 6) an immature blue whale, *Balaenoptera musculus* (Tarcy 1979). Of these authors, only Hancock (1965) and Cummings et al. (1972) provided some detailed behavioral observations.

In this paper, we describe the behavior of a group of fin whales in the presence of three killer whales and discuss these observations with regard to the available literature.

Field Observations

While searching for gray whales on 2 March 1982 (0850 h), we headed offshore from Tojahui (lat. 26°37'N, long. 109°23'W), a small fishing camp approximately 9 km SE of Yavaros, Sonora, in the Gulf of California, México, in a 5 m dory powered by a 75 hp outboard motor. Sea conditions were excellent with a calm and glassy water surface, no wind, and visibility about 6 km. Twelve km from shore, over a water depth of 50 m, we encountered a large group of 20 fin whales, judged to be adults (estimated total lengths ca. 18-20 m). We stopped the boat and motor within 40-300 m of the whales, and began observing their behavior. The whales formed closely spaced pairs or triplets within <5 m of each other and were lunge-feeding at the surface on dense patches of fish larvae and other macroplankton. The whales continued in this activity for 20 minutes, while forming a large semicircle off the stern of the boat at distances ranging from ca. 50 to 500 m (Fig. 1). None of the whales appeared to be moving in any definite direction.

While we were photographing a pair of fin whales swimming slowly north, 50 m from the boat and parallel to it, we sighted several killer whales ca. 200 m from us and heading in the direction of the pair. The killer whales were moving extremely fast and disturbing the water surface. The pair of fin whales continued swimming in their original direction for 30 m and then abruptly changed direction, by about 65°, increased their speed notably, and moved towards the boat (Fig. 1). At that time the killer whales were 60 m behind the fin whales, and the two sets of whales and the boat were all in straight line. As the killer whales moved to 20 m from the boat, the fin whales disappeared just below the surface, and at that instant, a killer whale's head protruded above the water with its mouth open and teeth visible. There were two other killer whales slightly behind the first one. Judging by the size and shape of their dorsal fins, all three individuals were females or immature males. The pair of fin whales

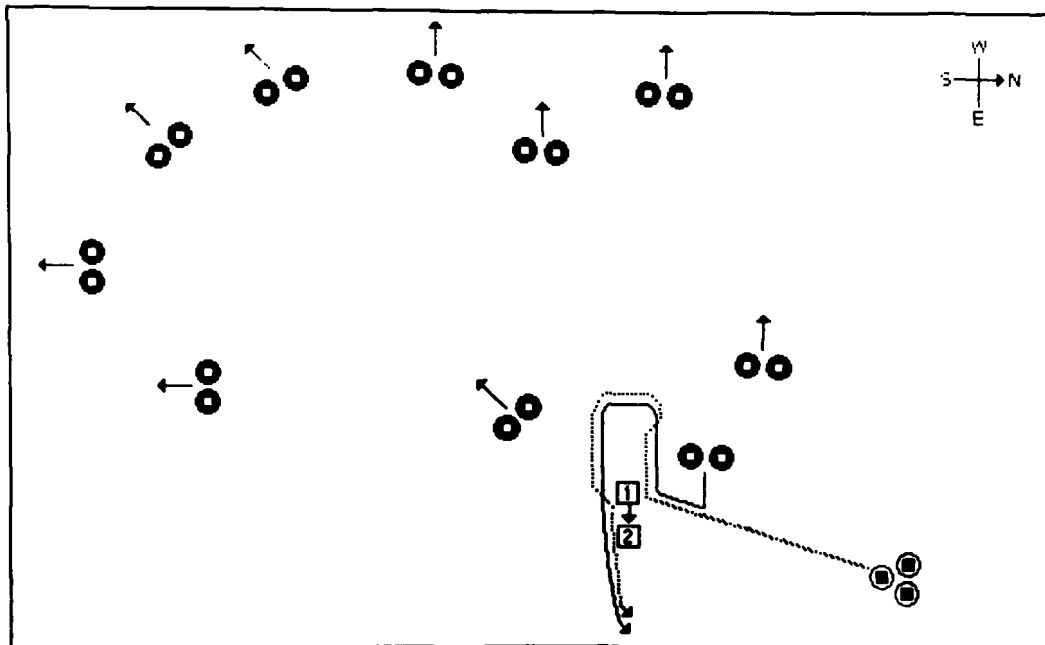


FIGURE 1.—Schematic representation (not to scale) illustrating the sequence of the killer whale–fin whale interaction. Dark squares in light circles = the three killer whales; light squares in dark circles = fin whales; the two numbers inside squares = the boat with observers at initial and final positions; solid and dashed lines with arrows = movements of the principal fin whale pair and the three killer whales, respectively.

and the killer whales were still headed directly towards the boat at an estimated speed of 30–40 km/h. Aware of the risk of staying in the path of these whales, we started the motor and moved 30 m east. Just after starting the motor, the pair of fin whales changed direction by about 110° and headed towards open sea (Fig. 1), probably as a result of our movement. The fin and killer whales continued west for 50 m and were now approximately 80 m ahead of us. During this encounter, we heard at least six clear, high pitched whistling sounds that each lasted about three seconds.

We then observed one of the killer whales turn towards the pair of fin whales. At this moment, the fin whales turned approximately 180° and headed back towards the boat, in the direction of land. The pair, with the three killer whales close but slightly behind them, continued towards the boat. When they were 5 m away and parallel to the boat, we saw the head of one of the fin whales disappearing below the water. At that same moment, the head of one killer whale appeared above the fin whale. At this time we observed a great amount of splashing created by both species. The pair of fin whales then continued swimming east, with many short surface

dives each lasting between 5 and 10 seconds. The killer whales continued their pursuit. All whales were travelling too fast for us to follow them, and they were soon out of sight.

During the time of the killer whale–fin whale interaction, the other fin whales that were not directly involved were all swimming very slowly out towards open sea, showing almost no parts of their bodies and with no visible or audible blows, possibly to avoid detection. We followed them and finally counted at least 13–15 whales, still in pairs or triplets, that after 10 minutes had resumed their feeding activities 0.5 km from the killer whales incident.

Discussion

It appears that marine mammals are successfully attacked and eaten mainly by the larger, usually adult male killer whales (Nishiwaki and Handa 1958; Hancock 1965; Rice 1968; Jonsgård and Lyshoel 1970; Tarp 1979). Apparently, most attacks on baleen whales, where only females or immature killer whales participate, are unsuccessful (e.g., Morejohn 1968; Cummings et al. 1972; this paper).

As demonstrated by several literature reports on killer whale predatory activities (Martinez and Klinghammer 1970; Steiner et al. 1979; Tarcy 1979; Smith et al. 1981), their hunting techniques are characterized by highly developed group coordination. It appears that those attacks involving immature killer whales, in some cases calves (Baldrige 1972; Cummings et al. 1972), are part of a complex learning behavior in which individuals increase and strengthen their individual and group hunting capabilities (described for pinniped hunting by López and López 1985).

Furthermore, Jonsgård (1968) concluded that, under "normal" conditions, it is very difficult for killer whales to kill baleen whales and other large cetaceans that are in good health. He based his conclusions on the absence of such reports during many years of Norwegian whaling in the northeastern North Atlantic. Several authors have provided evidence, in some cases circumstantial, to support Jonsgård's hypothesis, and it is not surprising that most of these observations have to deal with those relatively more accessible coastal species of baleen whales. For example, Andrews (1914) indicated that many gray whales taken commercially were found to survive killer whale attacks, as evidenced by damaged tongues, flippers, and other parts of the body. Rice and Wolman (1971) reported that 57 (18%) of 316 gray whales collected in California under scientific permit, showed evidence of having been attacked by killer whales (e.g., tooth marks on flukes and flippers), and concluded that this indicates a fairly high frequency of unsuccessful attacks. Morejohn (1968) observed an unsuccessful attack by seven killer whales on three gray whales, including a female with a calf. Cummings et al. (1972) described the unsuccessful attack of five killer whales on two southern right whales, ending after 25 minutes with no signs of blood or other evidence of physical harm. As pointed out by Jonsgård (1968), the attack on a minke whale reported by Hancock (1965), was on an animal "trapped" by low tide in a small and shallow bay and was therefore an easy prey. The blue whale wounded off Baja California, México, (Tarcy 1979) was immature and was attacked by about 30 killer whales (including several mature males). Our observation on the apparently unsuccessful attack on fin whales provides additional evidence to support Jonsgård's (1968) conclusion.

Observations on at least three species of cetaceans known to be preyed upon by killer whales, gray whales, humpback whales, and white whales, *Delphinapterus leucas*, show that they sometimes remain completely motionless in the presence of killer

whales (Kellogg 1940; Hubbs 1965; Tomilin 1967; Baldrige 1972), probably in order to avoid detection. After a series of underwater sound playback experiments, Cummings and Thompson (1971) concluded that gray whales recognize the voice of killer whales, that they can easily localize the sounds underwater, and that they flee killer whale vocalizations. Such avoidance, according to these researchers, involves several behaviors, e.g., sound localization, silence, and reduced exposure (including invisible and non-audible blows), that appear to function as protective mechanisms. Similar underwater acoustical experiments carried out by Fish and Vania (1971) with white whales showed similar protective responses in the presence of killer whale sounds.

As noted previously, while the three killer whales were harassing the pair of fin whales, at least six high whistling sounds were audible. These killer whale sounds possibly correspond to the "whistles" (tonal vocalizations) or "screams" (pulsed vocalizations) recorded during cooperative feeding behavior by Steiner et al. (1979). We apparently detected the killer whales visually before the pair of fin whales were aware of them, and possibly the killer whales were silent before the attack in order to avoid detection.

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