

Observations on the Reactions of Sea Lions, *Zalophus californianus* and *Eumetopias jubatus*, to Killer Whales, *Orcinus orca*; Evidence of "Prey" Having a "Search Image" for Predators

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Observations on the reactions of California Sea Lions (*Zalophus californianus*) and Steller Sea Lions (*Eumetopias jubatus*) to the presence of foraging transient Killer Whales (*Orcinus orca*) were made on three occasions. Alert and avoidance responses by sea lions were made in the presence of Killer Whales of typical appearance. In the presence of a single, foraging Killer Whale of atypical appearance, no alert or avoidance response was observed. It is possible that the sea lions did not recognize the atypical whale as a Killer Whale, suggesting that sea lions may have a perceptual "search image" for the detection of predators, based on visual cues.

On a observé en trois occasions les réactions d'otaries de Californie (*Zalophus californianus*) et d'otaries de Steller (*Eumetopias jubatus*) à la présence d'épaulards (*Orcinus orca*) en transit et en train de se nourrir. Les otaries émirent des réponses d'alerte et d'évitement quand mises en présence d'épaulards d'apparence typique, mais n'émirent aucune réponse lorsqu'en présence d'un épaulard d'apparence atypique en train de chasser. Il est possible que les otaries n'aient pas reconnu l'épaulard d'apparence atypique en tant qu'épaulard, ce qui suggère que les otaries pourraient posséder une image de recherche perceptuelle pour la détection de leur prédateurs basée sur la vision.

Key Words: Killer Whale, *Orcinus orca*, transient, California Sea Lion, *Zalophus californianus*, Steller Sea Lion, *Eumetopias jubatus*, prey, search image, foraging behaviour, Race Rocks Ecological Reserve, British Columbia.

The ability of a predator to perceive cryptic prey using a perceptual "search image" has been previously reported (e.g. Dawkins 1971). However, the concept of "prey" using a similar perceptual "search image" to detect potential predators does not appear to have been previously documented. During an ongoing study of Killer Whale (*Orcinus orca*) behaviour and ecology being undertaken around southern Vancouver Island, British Columbia, certain interactions between "transient" Killer Whales (after Bigg et al. 1987), California Sea Lions (*Zalophus californianus*), and Steller Sea Lions (*Eumetopias jubatus*) were noted on three occasions. These interactions suggest that sea lions may use a search image for the detection of potential predators.

Observations of interactions between transient Killer Whales and sea lions were made during 1987 at the Race Rocks Ecological Reserve (48°18'N, 123°32'W), a group of nine small islands approximately one mile off the southernmost tip of Vancouver Island, in the Strait of Juan de Fuca. Race Rocks is a year-round Harbour Seal (*Phoca vitulina*) colony, with seasonally abundant California Sea Lions and Steller Sea Lions (Bigg 1985). Transient Killer Whales feed primarily on marine mammals and have been observed preying on sea lions in local waters (Bigg et al. 1987). Transient Killer Whales vocalize much less than

resident whales (Ford and Fisher 1982), possibly to avoid detection by mammalian prey (Morton 1987; Felleman et al. *in press*). Thus the reaction of sea lions to the presence of Killer Whales might be mediated by visual cues.

Sea lions exhibited alert and avoidance reactions to the presence of transient Killer Whales on two occasions. Vigilant behaviour, high-speed swimming away from the whales, movement into dense kelp beds and continuously lifting the upper body far out of the water were observed.

On 12 October 1987, a lone adult male transient Killer Whale of atypical appearance, photo-identified as X10 (after Bigg et al. 1987), was observed at Race Rocks. This individual has a dorsal fin which is bent over at its base to the left side, with the upper half dragging in the water (Figure 1). He was observed surfacing four times within three meters of approximately 150 California and Steller sea lions that were both in the water, and hauled out on small reefs. His behaviour was categorized as typical foraging behaviour as described for transient Killer Whales (Baird and Stacey 1987, 1988a; Felleman et al. *in press*). The whale moved through narrow channels between several reefs and circled a reef on which sea lions were hauled out. No noticeable reaction by the sea lions was observed.



FIGURE 1. Transient Killer Whale X10 at Race Rocks, British Columbia, 12 October 1987. Photo by Robin W. Baird.

It is possible that the sea lions did not recognize the atypical whale as a Killer Whale. We suggest that sea lions respond to visual cues, such as the dorsal fin of a Killer Whale, which match a perceptual search image. Although sea lions may be formidable prey for a lone Killer Whale, lone Killer Whales have previously been observed preying on sea lions (Lopez and Lopez 1985). Recognition of a predators' behavioural state has been noted as an important factor in reaction to predators by terrestrial ungulates (Estes and Goddard 1967; Kruuk 1972; Schaller 1972). From our observation we suggest that it is unlikely the sea lions recognized the whales' behavioural state since they did not react.

As the Killer Whales in an area may be members of more than one breeding population (Bigg et al. 1987; Baird and Stacey 1988b), some of which specialize in feeding on fish, proximity of Killer Whales to other marine mammals may not always be perceived as a potential threat by the latter. Dolphin (1987) reports non-aggressive Humpback Whale (*Megaptera novaeangliae*) — Killer Whale interactions in Alaska, but unfortunately fails to mention if the Killer Whales observed were the resident type, which feed primarily on fish, or the

transient type. Marine mammals have been reported in close proximity to resident Killer Whales in British Columbia, showing no apparent reaction (Jacobsen 1986). However, even in the presence of resident Killer Whales, sea lions may show interest with an increase in vigilant behaviour (Jacobsen 1986). Killer Whale attacks on marine mammals usually elicit a variety of escape responses (eg. Steltner et al. 1984; Lopez and Lopez 1985). These observations suggest that there may be a variety of cues influencing the reactions of marine mammals to Killer Whales. Further research on the perceptual processes sea lions and other similar prey species use to detect predators and on their ability to discriminate between potentially threatening transient Killer Whales and non-threatening resident Killer Whales is warranted.

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Literature Cited

- Baird, R. W., and P. J. Stacey.** 1987. Foraging behavior of transient killer whales. *Cetus* 7(1): 33.
- Baird, R. W., and P. J. Stacey.** 1988a. Foraging and feeding behavior of transient killer whales. *Whale-watcher* 22(1): 11-15.
- Baird, R. W., and P. J. Stacey.** 1988b. Variation in saddle patch pigmentation in populations of killer whales (*Orcinus orca*) from British Columbia, Alaska, and Washington State. *Canadian Journal of Zoology* 66(11): 2582-2585.
- Bigg, M. A.** 1985. Status of the Steller sea lion (*Eumetopias jubatus*) and California sea lion (*Zalophus californianus*) in British Columbia. Canadian Special Publication of Fisheries and Aquatic Sciences 77. 20 pages.
- Bigg, M. A., G. M. Ellis, J. K. B. Ford, and K. C. Balcomb.** 1987. Killer whales — a study of their identification, genealogy and natural history in British Columbia and Washington State. Phantom Press, Nanaimo, British Columbia. 79 pages.
- Dawkins, M.** 1971. Perceptual changes in chicks: another look at the 'search image' concept. *Animal Behaviour* 19(3): 566-574.
- Dolphin, W. F.** 1987. Observations of Humpback Whale, *Megaptera novaeangliae* — Killer Whale, *Orcinus orca*, interactions in Alaska: comparison with terrestrial predator-prey relationships. *Canadian Field-Naturalist* 101(1): 70-75.
- Estes, R. D., and J. Goddard.** 1967. Prey selection and hunting behavior of the African wild dog. *Journal of Wildlife Management* 31(1): 52-70.
- Felleman, F. L., J. R. Heimlich-Boran, and R. Osborne.** *In press.* Feeding ecology of killer whales (*Orcinus orca*) in the Pacific Northwest. *In* *Dolphin societies*. Edited by K. Pryor and K. S. Norris. University of California Press.
- Ford, J. K. B., and H. D. Fisher.** 1982. Killer whale (*Orcinus orca*) dialects as an indicator of stocks in British Columbia. Reports of the International Whaling Commission 32: 671-679.
- Jacobsen, J. K.** 1986. The behavior of *Orcinus orca* in the Johnstone Strait, British Columbia. Pages 135-185 in *Behavioral biology of Killer Whales*. Edited by B. C. Kirkeveld and J. S. Lockard. A. R. Liss, New York. 457 pages.
- Kruuk, H.** 1972. The spotted hyena: a study of predation and social behavior. University of Chicago Press, Chicago. 335 pages.
- Lopez, J. C., and D. Lopez.** 1985. Killer whales (*Orcinus orca*) of Patagonia, and their behavior of intentional stranding while hunting nearshore. *Journal of Mammalogy* 66(1): 181-183.
- Morton, A.** 1987. [Abstract]. A behavioral comparison of the resident and transient forms of killer whale off northeastern Vancouver Island. *In* Abstracts of the Seventh Biennial Conference on the Biology of Marine Mammals. Miami, Florida, December 5-9, 1987.
- Schaller, G. B.** 1972. The Serengeti lion: a study of predator-prey relations. University of Chicago Press, Chicago. 480 pages.
- Steltner, H., S. Steltner, and D. E. Sergeant.** 1984. Killer whales, *Orcinus orca*, prey on narwhals, *Monodon monoceros*: an eyewitness account. *Canadian Field-Naturalist* 98(4): 458-462.

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