

Humpback Whales of Glacier Bay: An Update*

By Gary Vequist

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When explorer George Vancouver first sailed the waters of southeastern Alaska in 1794, he charted an ice-filled passage bordered to the north by an immense glacier. Less than 100 years later, the naturalist John Muir navigated this same passage to find that the glacier had retreated 48 miles to the north, leaving behind a new marine habitat - Glacier Bay.

During this period of rapid glacial retreat, the Glacier Bay marine ecosystem developed into habitat suitable for feeding humpback whales. The first documentation of whales appeared in field notes of a 1938 U.S. Geological Survey visit. "At least one whale each day and at times as many as four or five would be feeding close inshore, near the reef ... On more than one occasion they leapt clear of the water."

Systematic studies of the humpback whales in Glacier Bay began in the mid 1970s, when Charles Jurasz realized he could recognize individual whales by the shape of their dorsal fins and the unique patterns of natural coloration on the undersides of their flukes.

Concern about the disturbance of feeding whales, an endangered species, by the increasing numbers of vessels visiting the bay prompted the NPS to consult formally with the National Marine Fisheries Service (NMFS). Following NMFS's recommendations in a 1979 Biological Opinion, the park instituted regulations limiting the number of vessels entering the bay. These regulations proved extremely controversial. The cruise ship industry and tour boat operators challenged reports that vessel traffic disturbed the whales. To help resolve the dispute, NPS initiated a multi-disciplinary study of the behavior, prey availability, and acoustic environment of humpback whales in Glacier Bay and adjacent waters of southeastern Alaska.

Acoustic Environment

Under contract to NPS in 1981 and 1982, Paul Miles and Charles Malme of Bolt Beranek and Newman, Inc. surveyed the acoustic environment of Glacier Bay. Using sound measurement electronics, they collected and compared the radiated noise "signatures" of individual vessels.

Miles and Malme found vessel noises varied considerably both within and between classes. In general, larger ships were noisier than smaller, and the noises of vessels increased with increasing engine speed. Newer diesel-engine-powered cruise ships were almost 10 dB louder than the older steam-turbine-driven ships (since the dB scale is logarithmic, a 10 dB increase is a doubling of acoustic energy). The louder vessels could completely mask whale sounds.

Behavioral Responses

A study of the behavioral responses of humpback whales to vessel traffic was contracted to Lou Herman of the University of Hawaii and C. Scott Baker, then a graduate student at the University. From shore-based stations, teams of researchers tracked the positions of whales and vessels using precision surveyors' theodolites, and recorded the behavior of whales using small portable computers.

Humpback whales exhibited short-term behavioral



Capelin collected during survey of whale prey in Glacier Bay.

changes in response to vessel traffic. These changes were correlated with speeds, sizes, distances, and numbers of vessels. Whales responded to the close proximity of vessels by decreasing blow (breath) intervals, increasing dive times, and by moving away from vessel paths. Researchers noted that whales actively engaged in feeding generally were the most tolerant of vessel traffic and that Park Service guidelines for vessel operations helped reduce the potential for whale disturbance.

Prey Availability

Humpback whale prey studies were conducted by Ken Krieger and Bruce Wing of the Auke Bay Laboratory, NMFS, using quantitative hydroacoustic surveys and net sampling to assess the abundance and species of available prey. Quantitative hydroacoustics refers to the use of computer-integrated fathometers or echosounders to measure densities of biological "targets" in the water column. The computer analyzes the timing and strength of the echo to determine depth, size, and density of the plankton or fish species.

Based on surveys conducted from 1981 to 1984, the distribution and abundance of whales in Glacier Bay showed considerable within- and between-year variation. The local distributions of whales were often associated with high densities of prey and some areas of the bay were used consistently for feeding across years. In Glacier Bay whales fed primarily on schooling fish while whales in most other areas of southeastern Alaska fed mostly on euphausiids, small crustaceans often referred to as krill.

Krieger and Wing's observations of foraging behavior and prey availability in Glacier Bay during the 1980s contrast sharply with those made prior to 1978, when surface swarms of Euphausiids were believed the primary prey of humpback whales. Based on these differences, Krieger and Wing concluded a decrease in Euphausiid densities was the main reason for the change in use of Glacier Bay by humpback whales.

The study of humpback whales, now entering its 16th year, is a rare case of sustained scientific, per-

sonal, and administrative commitment. Long-term monitoring of free-ranging whales can determine population trends. With the exceptions of 1983 and 1985, the numbers of whales entering the bay equaled or exceeded numbers reported during the 1970s. The increases resulted from continued returns by past resident whales and their offspring, and establishment of residency by previously-transient whales.

Habitat Use

The site fidelity of these individuals is one of the most interesting findings of long-term monitoring. Maternally-directed fidelity to a feeding region is indicated by return of animals first identified in Glacier Bay as calves accompanied by their mothers. At least 17 whales sighted in Glacier Bay during the 1970s were resighted in the 1980s. If 30 to 35 years is a reasonable estimate of longevity for humpback whales, some have returned to Glacier Bay for at least half a lifespan.

Records from 41 female humpback whales indicate that on average, mature females give birth only once every 2.7 years to calves that survive their first 6 months and their migratory transit. While not alarmingly low, this calving rate may indicate a slow recovery ahead for the North Pacific population.

Reproductive rates and juvenile mortality are important parameters for judging health and potential recovery of populations. Sighting histories of females in the Glacier Bay area indicate the reproductive rates of these individuals are lower and more variable than whaling records previously suggested for humpback whales.

Footnote: Concern has surfaced over the possible effects of the Exxon Valdez oil spill upon humpback whales. The spill has killed many seabirds and sea otters but it is hoped that significant injury to whale populations will not result.

Between 30 and 40 whales have been identified annually in Prince William Sound in recent years; about 100 individual animals were identified there. Historically, at Kenai Fjords and Katmai NPs few whales have been observed feeding near shore. The NPS does not have marine jurisdiction at those parks, but it has conducted marine bird and sea mammal surveys in the area since the oil spill, as has the USFWS and other federal agencies. Grey whales migrated through the spill area earlier and, although no direct whale mortality was attributed to the spill, concern continues about sublethal effects. Humpback whales traditionally stop and feed there during summer, which could increase their risk of exposure. The NMFS has contracted to increase monitoring of humpback whales in Prince William Sound.

Oil removal efforts will reduce the threat of contamination of whales and whale prey species. Free floating oil is less common; much of the oil remaining is now on intertidal beaches. Whale prey in the spill area already may have been affected, both in quantity and quality. An expanded whale monitoring at Glacier Bay and adjacent waters will serve to evaluate any dispersion of whales from Prince William Sound to that area. Fortunately, Glacier Bay and the rest of Southeast Alaska were not affected by the oil spill, since Southeast Alaska is the summer feeding grounds for over 400 humpback whales.

Vequist is a Resource Management Specialist with the Alaska Region.

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