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# FASTEST DOCUMENTED MIGRATION OF A NORTH PACIFIC HUMPBACK WHALE

An individually identified humpback whale, *Megaptera novaeangliae,* migrated between Sitka Sound, southeastern Alaska (57°01′N, 135°20′W) and the northwest coast of the island of Hawaii (20°00′N, 155°45′W) in 39 d. This is the shortest documented migration time for a North Pacific humpback, which travels annually between summer high-latitude feeding areas and winter calving grounds in tropical waters (Rice 1978; Darling and Jurasz 1983; Baker *et al.* 1985, 1986). The transit time reported here is half the shortest previously reported transit of 79 d (Baker *et al.* 1985), demonstrating that migrating humpbacks can travel at relatively high speeds over long distances. This find-

ing also suggests that humpbacks may stay on the feeding grounds longer than previously believed, without sacrificing a substantial proportion of the breeding season.

North Pacific humpback whales feed on zooplankton and small, schooling fish in coastal waters along the rim of the North Pacific Ocean basin, north of approximately 37°N, including the Bering Sea and the Okhotsk Sea, as determined by commercial whalers (Nishiwaki 1966, Rice 1978) and more recently by photographic identification of individually recognized whales (Darling and Jurasz 1983, Baker *et al.* 1986, Perry *et al.* 1990, Calambokidis *et al.* 1993). In the eastern North Pacific feeding humpbacks are found in geographically distinct feeding herds along the coast of California, Oregon, Washington, British Columbia, and Alaska (Darling and McSweeney 1985, Baker *et al.* 1986, Calambokidis *et al.* 1993). Photographic identification studies have found no known exchange of individuals between the California to Washington feeding area and the feeding areas in Alaska (Calambokidis *et al.* 1993), and very little exchange between Prince William Sound and southeastern Alaska (Baker *et al.* 1986; Perry *et al.* 1990; von Ziegesar 1992; Straley, unpublished data). Southeastern Alaska is inhabited by the largest known, discrete humpback whale feeding aggregation in Alaskan waters (Baker *et al.* 1986, Straley 1994). Humpback whales occur there in all months of the year (Baker *et al.* 1985, 1992; Straley and Gabriele 1995; Straley 1990, 1994), with peak numbers occurring during late summer. Individual humpback whales may remain in southeastern Alaska waters for more than seven months, although no individual whale has been documented to remain all year (Straley 1990; Baker *et al.* 1992; Straley and Gabriele 1995; Straley, unpublished data).

Whales from various feeding areas gather on tropical wintering grounds at approximately 20°–27°N in the Hawaiian islands, western Mexico, and the Ryukyu and Ogasawara islands of Japan (Rice 1978, Darling and McSweeney 1985, Baker *et al.* 1986, Urbán and Aguayo 1987, Perry *et al.* 1988, Darling 1991, Darling and Mori 1993, Uchida *et al.* 1993). The primary wintering grounds for southeastern Alaska humpback whales are in the main Hawaiian islands, while California humpbacks tend to use winter grounds off Mexico (Darling and Jurasz 1983; Baker 1985; Baker *et al.* 1985, 1986; Darling and McSweeney 1985; Perry *et al.* 1988, 1990; Calambokidis *et al.* 1993; J. Urbán, personal communication to JMS). Most whales appear to utilize a single wintering area, although some individuals have been sighted in more than one wintering area within or between years (Darling and Jurasz 1983; Darling and McSweeney 1985; Baker *et al.* 1986; Darling and Cerchio 1993; Pacific Whale Foundation, unpublished data; J. Urbán, personal communication to JMS). Humpback whales generally do not feed in their wintering grounds (Mathews 1937, Dawbin 1966), although rare occurrences of feeding behavior have been observed (Salden 1989, Baraff *et al.* 1991, Gendron and Urbán 1993).

Humpbacks are sighted in Hawaii between November and May, with peak numbers occurring between mid-February and mid-March (Herman *et al.* 1980, Baker and Herman 1981). Individuals move among the islands while

in Hawaii (Baker and Herman 1981, Darling and McSweeney 1985, Cerchio *et al.* 1991). Different age/sex classes of humpbacks arrive on the Hawaiian wintering grounds at different times (Gabriele 1992), with the peak presence of all classes of reproductively mature whales occurring between mid-February and mid-March. The longest documented humpback whale residence time in the Hawaiian Islands is 74 d (Darling *et al.* 1983). The mean residence time is 15 d (SD = 13.4, $n$ = 256) for the 15% of whales that were sighted on more than one day within a year (Gabriele 1992).

Humpback whales were observed and photographed throughout the year in southeastern Alaska by J. Straley Investigations, and in January through April in Hawaii by the Kewalo Basin Marine Mammal Laboratory. The date, time, pod size, behavior, a verbal description of the location, the film roll number, and the frame numbers of photographs taken were recorded in field notes during whale observations. Photographs of the ventral surface of the tail flukes of diving whales were taken with a 35-mm SLR camera equipped with a 300-mm lens, using 400 ASA black-and-white film. Individual whales were identified by the unique coloration, markings and shape of the trailing edge of their ventral flukes (Katona *et al.* 1979, Jurasz and Palmer 1981). Each research group compared fluke photographs with its own fluke catalog and with published catalogs (Perry *et al.* 1988, von Ziegesar 1992) to determine the identity and past sighting history of each whale. Southeastern Alaska and Hawaii humpback whale fluke photographs taken between 1987 and 1989 were compared by Kewalo Basin Marine Mammal Laboratory staff.

Whale #339 was identified in Sitka Sound on 3 January 1988 and was resighted off the Kohala Coast of the island of Hawaii on 11 February 1988 (Fig. 1). The only subsequent sighting of this whale was made on 1 March 1993, off the Kohala Coast (Table 1). The sex of whale #339 is unknown, although its visits to different wintering grounds, the lack of sightings with a calf and its affiliative behavior in Hawaii (Table 1) seem more consistent with male behavior than with female behavior. The elapsed 39 d between whale #339's January 3rd sighting in Sitka Sound and its February 11th sighting in Hawaii may overestimate the actual transit time because it is unlikely that the whale was photographed on the last day it was present in Alaskan waters nor on the first day it arrived in Hawaii. Latitude and longitude coordinates of the Hawaii and Alaska sightings of whale #339 were estimated to the nearest minute. The approximate point-to-point distance between the Eastern Channel of Sitka Sound (approximate location 57°01′N, 135°20′W) and the Kohala Coast (approximately 20°00′N, 155°45′W) is 4,440 km (2,398 nm), as determined with a GPS (Global Positioning System), using the WGS-84 datum. Assuming that the whale traveled without stopping, on a straight line course between these locations, its average migration speed would be 4.74 km/h (2.56 kn). However, observations of southern hemisphere humpback whales lingering in an area during migration (Dawbin 1966) suggest that the assumption of nonstop travel may not be valid. It is not known whether North Pacific humpback whales migrate on a straight line course between Hawaii and Alaska. Baker and Herman (1981) speculated that

**a.**

**b.**

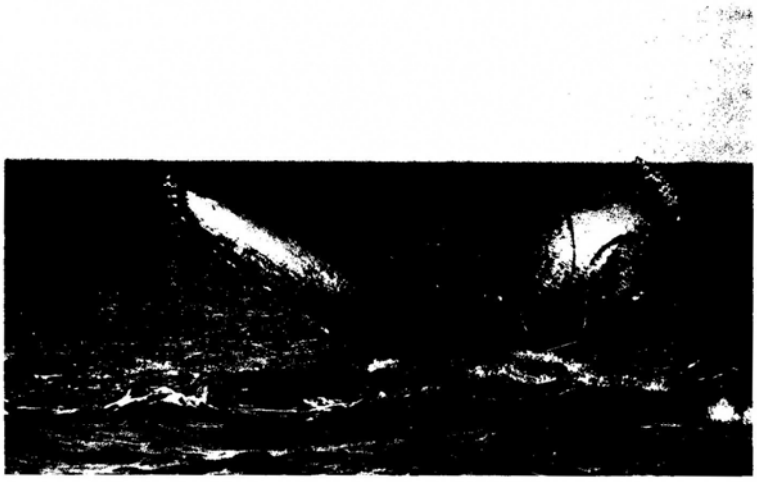

*Figure 1.* Photographs of whale #339 in (a) on 3 January 1988 in Sitka Sound, southeastern Alaska and (b) on 11 February 1988 on the northwest coast of the island of Hawaii, documenting its maximum migration time. Hawaii photograph taken by Kewalo Basin Marine Mammal Laboratory. Sitka Sound photograph taken by J. Straley Investigations.

*Table 1.* Sighting history of whale #339.

| Date | Location | Pod composition | Souce of sighting |
|---|---|---|---|
| 4/14/78 | Islas Revillagigedo, Mexico | unknown | H. Winn (reported in Baker *et al.* 1986) |
| 2/16/81 | "Kohala Coast," Hawaii | with 1 adult | Kewalo Basin Marine Mammal Laboratory |
| 1/3/88 | Sitka Sound, Alaska | with adult female | J. Straley Investigations |
| 2/11/88 | "Kohala Coast," Hawaii | alone, then with 1 adult | Kewalo Basin Marine Mammal Laboratory |
| 3/1/93 | "Kohala Coast," Hawaii | with 1 adult, 2 adults, alone | Kewalo Basin Marine Mammal Laboratory |

humpbacks may migrate along clockwise current gyres in the North Pacific to increase the energy efficiency of migration.

Given the variability of the reported migration transits and the scarcity of data on the subject, it is not yet possible to infer whether a 39-d transit is exceptionally short or how often rapid migrations occur. Baker *et al.* (1985) reported on five migratory transits between southeastern Alaska and Hawaii, with an average maximum transit time of 102 d (range 79–117 d) and an average migratory speed of 1.87 km/h. Dawbin (1966) estimated a migratory rate of 2.88 km/h for a full migratory transit, based on the interval between peaks of whale catches at southern hemisphere whaling stations. Chittleborough's (1953) estimate of migratory rate based on aerial observations of swimming speeds during migration was 8 km/h, with a range of 4.8–14.2 km/h. Shore-based observations of 148 pods in the Hawaiian wintering grounds revealed an average swimming speed of 4.44 km/h and a maximum of 11.4 km/h over short distances (Bauer 1986). The 4.74 km/h average migratory speed we calculated is similar to observed swimming speeds in Hawaii and substantially slower than a humpback whale's maximum swimming speed.

Dawbin (1966) hypothesized that day length and temperature were important migratory cues used by whales migrating away from their feeding grounds, while Baker *et al.* (1985) suggested that prey availability might also influence when a humpback begins migrating toward the wintering grounds. Baker *et al.*'s (1985) assertion is supported by observations that late fall and early winter humpback whale aggregations in southeastern Alaska tend to occur in areas where herring overwinter, such as Sitka Sound (Straley 1990, 1994; Straley and Gabriele 1993). Herring schools move from open passages in the early fall to overwinter in the deep sheltered bays and sounds of southeastern Alaska following the seasonal breakup of the thermocline (Carlson 1984).

The 39-d migratory transit reported here demonstrates that humpback whales can feed for nearly two-thirds of the year in Alaska and still migrate to Hawaii in time for the peak of the breeding season. Maximizing their time on the feeding grounds could have a positive effect on reproductive success of male or female humpback whales. A longer feeding season could help indi-

viduals increase strength and body size, which have been linked with successful male competitiveness in other polygynous mammals (Moss 1983) and female success in meeting the high energy demands of pregnancy and lactation (Ralls 1976, Lockyer 1984). Whale #339 began its migration to Hawaii in early January and had arrived on the wintering grounds by early February, just before the peak presence of reproductive classes (Gabriele 1992), suggesting that this individual did not sacrifice reproductively significant time on the wintering grounds by extending its feeding season.

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