

Fall and Winter Occurrence of Humpback Whales (*Megaptera novaeangliae*) in Southeastern Alaska

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ABSTRACT

Humpback whales (*Megaptera novaeangliae*) were individually identified during the fall and winters of 1979–86 in southeastern Alaska. Most of the identified whales were seen only once (not resighted) during the study period. Peak sightings occurred in late November and early December, with a slow decline through January. Occasional sightings were made through the rest of the winter. Although whales were sighted in every month of the year, no single whale was documented to remain throughout the winter. There was no apparent delineation by age or sex, as known females in at least three reproductive stages (resting, lactating and pregnant), calves and mature males were present. There is evidence that behaviour associated with mating begins on the feeding grounds, as 'singing' and aggressive interactions between males were observed in the study area. The factors determining the timing of the whales southward migration are more complex than mere seasonal cues and the timing is flexible for individual whales.

INTRODUCTION

During the early 1900s, shore-based whaling in southeastern Alaska took humpback whales, *Megaptera novaeangliae*, and fin whales, *Balaenoptera physalus*, (Andrews, 1909). With the advent of alternative oil sources and the decline in the availability of whales, all whaling stations along this coast were closed by 1922 (Anon, 1971; Rice and Wolman, 1975; Inglis and Haggarty, 1985).

The status of both species in southeastern Alaska from the 1930s–60s is unclear. Fin whales have not returned to their historical feeding areas in southeastern Alaska, but humpback whales are present and have been studied by numerous researchers since 1968 (e.g. Rice and Wolman, 1975; Jurasz and Jurasz, 1979; Darling and McSweeney, 1985; Baker, Herman, Perry, Lawton, Straley and Straley, 1985; Dolphin, 1987).

The North Pacific population of humpback whales, which is thought to number around 1,200 whales (Rice and Wolman, 1982), are seasonal migrants, breeding in the warmer, sub-tropical waters of Mexico and Hawaii and feeding on zooplankton and small schooling fishes in the cool, subarctic coastal waters of Alaska. Humpback whales begin to arrive in Hawaiian waters in November, with numbers peaking in February and declining by late June or early July (Norris and Reeves, 1978). No humpback whales are sighted off Hawaii from July to October (Norris and Reeves, 1978). Humpbacks are sighted off Mexico during every season of the year (Urbán and Aguayo, 1987).

The southeastern Alaskan feeding stock, estimated to be 374 whales (Baker, Herman, Perry, Lawton, Straley, Wolman, Kaufman, Winn, Hall, Reinke and Östman, 1986), arrives in Alaskan waters in late spring and departs southward for the breeding grounds in late summer or early fall (Cuccarese and Evans, 1981). Local residents of southeastern Alaska have noted the year-round occurrence of humpback whales, however, and Berzin and Rovnin (1966) reported the presence of humpback whales in the eastern Aleutian Islands in December. Ingebrigtsen

(1929) reported that, around the turn of the century, humpback whales, including females with near term fetuses, were caught off Norway during the winter.

This paper documents and discusses the presence of humpback whales during the late fall and winter in two areas of southeastern Alaska from 1979–86.

METHODS

Individual whales were photographically identified by natural markings on the ventral fluke surfaces (Katona, Baxter, Brazier, Kraus, Perkins and Whitehead, 1979). Whales were photographed with a 35mm SLR camera with a 70–210 mm zoom lens using high speed black and white print film (400ASA) or colour slide film (200 and 400ASA). Small inflatables and fibreglass and aluminium skiffs equipped with 25hp or 35hp outboard engines were used to approach and photograph individual whales.

All photographs of individual whales were logged with date, social grouping (if determined) and location, and compared with the humpback fluke photographs on file at the Kewalo Basin Marine Mammal Laboratory (KBMML), University of Hawaii Manoa (Baker *et al.*, 1985). Fluke photographs were rated to be of good, fair or poor quality based on sharpness, contrast and fluke angle. Good and fair photographs showed 50% of each fluke at an angle sufficient to show the shape of the trailing fluke edge, the outline of which was also used as a natural individual identifying tag. Poor quality photographs and photographs of calf flukes were excluded from analyses of abundance.

Photographs of individual whales were also filed with the North Pacific humpback whale fluke identification catalog located at the National Marine Fisheries Service, National Marine Mammal Laboratory, Seattle, WA, USA.

The study was conducted in two areas of southeastern Alaska (Fig. 1) during the fall and winters of 1979–86: (1) Seymour Canal (the primary study area) which is a long, narrow fjord along the east side of Admiralty Island,

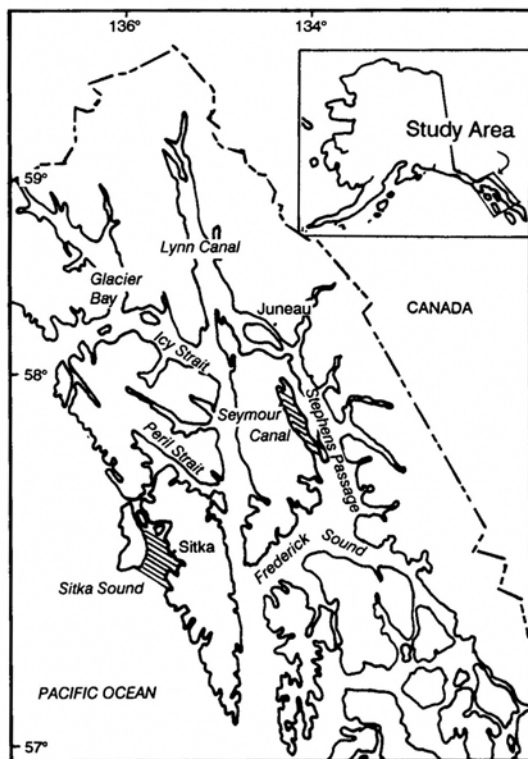


Fig. 1. The southeastern Alaska study areas.

bordered by Stephens Passage to the south; and (2) Sitka Sound which is located near the city of Sitka along the outer coast of southeastern Alaska, bounded by Baranof Island and the Pacific Ocean. Sitka Sound is one of the principal entrances to the inside waters of southeastern Alaska, hence it is a transition zone between the waters of the archipelago and the Gulf of Alaska. As such, it is exposed to rougher seas and more severe weather than are inside waters such as Seymour Canal.

During the fall and winter, survey efforts were opportunistic and often sporadic as dictated by the weather and limited daylight (4hrs/day useable light). On average, it was possible to work on the water on one day in three.

All observations occurred during the day except on a few occasions where humpbacks were observed at night from a larger vessel in Seymour Canal. Study periods ranged from October to March (Table 1) but centred around late November to early January and were variable for area and year. Late winter and early spring (March) sightings were documented for Sitka Sound, but identification photographs were not consistently taken, and are not included in the data analyses.

Shore-based and skiff surveys were conducted for most years and locations (Table 1).

Population estimates were calculated using the open population Jolly-Seber estimator (Seber, 1982). Seasons 1 and 2 were pooled because there were no resightings in the second season.

Table 1
Fall and winter study periods and areas

Area	Study period
Seymour Canal	18 November 1979 - 7 March 1980
	18 November 1980 - 7 January 1981
	18 November - 4 December 1981
	23 November - 10 December 1982
	8 November 1983
	1 December - 9 December 1985
Sitka Sound	29 November - 10 December 1986
	8 October 1980 - 16 November 1980
	14 December 1981
	20 October 1982 - 23 January 1983
	6 November 1983 - 6 February 1984
	26 October - 20 December 1984
5 October - 21 November 1985	
15 October - 22 December 1986	

RESULTS

Seasonal distribution and numbers

Seymour Canal

The larger aggregation of whales was found in Seymour Canal during late fall and early winter. The general pattern was for a peak in sightings in late November with a gradual decline through December. A few scattered sightings were made in January and February. Peak counts obtained from shore or skiff surveys ranged from 26 to 61 whales per year (Table 2). Total whales photo-identified per year ranged from a low of 0 in 1983 and 1984 (no surveys) to a high of 82 in 1982 (Table 3). Over the eight year study period, 247 photo-identifications were made of 181 different whales in Seymour Canal. Most (70%) were sighted only once, with very few (5%) identified in 3 or 4 seasons (Fig. 2). Estimates of total numbers, using an open population estimator (Jolly-Seber), resulted in an average yearly population estimate of 205 whales (SE=47, CV=23% (Table 4).

Table 2
Seymour Canal peak daily count per year

Year	Peak number	Date
1979-80	35	25 November
1980-81	34	21 November
1981	28	23 November
1982	61	4 December
1983	26	8 November (aerial survey)
1984	No Survey	
1985	42	3 December
1986	44	3 December

Table 3

Humpback whales photo-identified each year in Seymour Canal. These numbers include whales seen in more than one year

Year	Number photo-identified
1979-80	11
1980-81	9
1981	45
1982	82
1985	46
1986	54

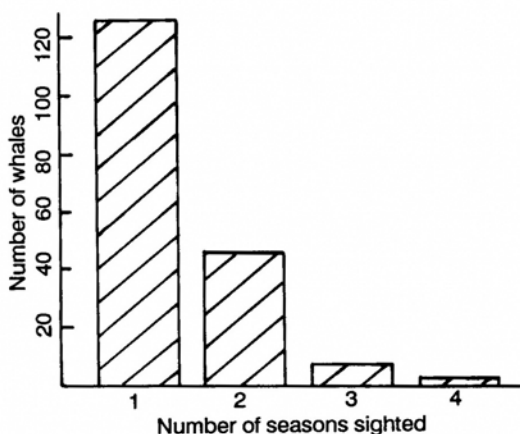


Fig. 2. Numbers of whales sighted in 1,2,3 or 4 years in Seymour Canal.

Table 4

Population estimates for Seymour Canal from mark-recapture, open population, Jolly-Seber Estimator (Seber, 1982)

Year	Number	SE	CV
1979-80/1980-81	230	129	
1981	193	101	
1982	205	50	
1985	190	74	
1986	-	-	
Average	205	47	23%

Sitka Sound

Sitka Sound consistently had fewer whales than Seymour Canal. The seasonal trend was similar, however, with whales arriving in October and staying through December or mid-January, and only an occasional whale sighted in late January and early February. Annual fall and winter peak counts ranged from 2 to 10 whales for the seven year study period (Table 6). Sightings of humpback whales during March were coincident with the spawning of Pacific herring (*Clupea harengus pallasii*). The total number of whales photo-identified was 16 (Table 7). Of these, 14 (87.5%) were seen once in this area and two (12.5%) were seen in three of the seven years. Due to the low numbers of whales identified, no mark-recapture population estimates were calculated.

Table 5

Sitka Sound peak daily count during season

Year	Number	Date
1980	6	14 November
1981	2	14 December
1982-83	5	15 January
1983-84	10	15 January
1984	8	12 November
1985	5	5 October
1986	4	22 December

Table 6

Humpback whales photo-identified each year in Seymour Canal. These numbers include whales seen in more than one year

Year	Number photo-identified
1980	0
1981	2
1982-83	1
1983-84	8
1984	5
1985	0
1986	4
Total	20

Table 7

Reproductive stages of some females during the Fall-Winter 1979-86

No.	1980	1981	1982	1983	1984	1985	1986
1	-	-	-	-	-	PREG	LACT ²
2	-	-	-	-	-	PREG	LACT ²
3	-	REST	PREG ¹	-	-	-	LACT
4	LACT	-	-	-	-	-	-
5	-	-	REST ¹	-	-	-	-
6	-	PREG	LACT	-	-	-	-
7	-	-	-	-	REST	-	LACT
8	-	-	-	-	-	-	LACT
9	-	-	LACT	-	-	-	-
10	-	REST	PREG ¹	-	-	-	-
11	-	-	REST ¹	-	-	PREG	LACT ²
12	-	-	PREG ¹	-	-	-	LACT
13	-	-	-	-	-	PREG	LACT
14	-	-	-	-	REST	-	LACT ²

¹ Data gathered by Dr. C.S. Baker during the summer assisted in documenting reproductive stage of some fall-winter whales.
² summer

Group composition

Comparisons made between the fluke photographs taken during this study with those published in the KBMML fluke catalog (Perry, Mobley, Baker and Herman, 1988) and collaboration with University of Hawaii researchers provided a description of the sex, relative age and reproductive state of several humpbacks sighted in Seymour Canal and Sitka Sound. Mature females in three reproductive stages (lactating, pregnant and resting) were observed (Table 8). Lactating females with calves less than a year old were seen in both study areas in October, November, December and January. Pregnant females were seen the following year with a calf and resting females were seen in subsequent years as pregnant and then with a calf. Resting refers to females that are post-lactation and pre-conception and are physically able to become pregnant but wait or 'rest' a year or more before becoming pregnant. 'Singing', which is thought to be a mating display specific to mature males (Tyack, 1981; Baker and Herman, 1984a), was heard on 29 December 1979 and 5 January 1980 in Seymour Canal. The 'songs', although not recorded, were heard through the hull of a stationary fibreglass skiff and lasted for 15-20 minutes.

Only one whale was thought to be singing on each occasion. One of the identified whales in the area at the time the song was heard was observed as an 'escort' in Hawaii. Previous studies have suggested that 'escort' whales are males (Glockner-Ferrari and Ferrari, 1985).

Table 8

Sighting histories and seasonal movement for some individual humpback whales in Southeastern Alaska

Number	Dates	Year	Area
22	4 December	1982	Seymour Canal
	13 May	1987	Sitka Sound
68	20-30 December	1979	Seymour Canal
	early November	1985	Kelp Bay ¹
	7 December	1985	Seymour Canal
206	1 August	1986	Frederick Sound
	23 November	1981	Seymour Canal
	1 December	1982	Seymour Canal
	21 June	1984	Sitka Sound
224	mid-August	1985	Sitka Sound
	21 June	1987	Sitka Sound
	1 December	1982	Seymour Canal
268	1 September	1985	Frederick Sound
	11 December	1986	Sitka Sound
	20 November	1980	Seymour Canal
560	8 December	1985	Gambier Bay
	15 June	1986	Sitka Sound
	29 November	1986	Peril Strait
	1 December	1982	Seymour Canal
916	early November	1985	Kelp Bay ¹
	7 December	1985	Seymour Canal
	30 August	1986	Frederick Sound
	5 January	1984	Ulloa Channel
	9 July	1986	Sitka Sound

¹ Photo courtesy of NOAA ship *Fairweather*.

Aggressive behaviour between two individuals and among individuals in groups was observed during early December 1985 and 1986, which differs from the more placid behaviour generally seen during the summer in Alaskan waters. This consisted of headlunges and charging; no body strikes were seen. Such behaviour also is assumed to be performed by mature males (Baker and Herman, 1984a).

Movement between areas and residency

Not all individual whales stayed in one fall or winter feeding area. For example, some whales moved between areas in different years and seasons. Cow 916, photo-identified with a calf in Ulloa Channel, near the town of Craig in southern southeastern Alaska, in January 1984, was next sighted in Sitka Sound with another calf in July 1986. Whale 224 was seen in Seymour Canal in December 1982 but was seen in Sitka Sound in December 1986. Table 9 gives sighting histories and seasonal movements for some representative whales. Whale 268 has been identified in Seymour Canal and Sitka Sound in different years and has been seen in areas between these two areas, as well. This individual has the longest confirmed residency within the same calendar year (5.5 months) of any whale identified in southeastern Alaska during this study. In 1986 the earliest photo-identification of whale 268 was on 15 June and the last sighting was on 29 November. No whale was observed continuously from a fall or winter through the following spring and summer. Over 150 whales have only been photo-identified in a single area and only during the fall or winter.

Feeding behaviour

Several types of feeding behaviour have been observed during the fall and winter. Vertical, horizontal and echelon lunge-feeding (Jurasz and Jurasz, 1979; Baker and

Herman, 1984b) were observed in nearly all years in Sitka Sound and Seymour Canal. Vertical and horizontal lunge-feeding were always associated with the blowing of bubble-nets to concentrate prey. Bubbles were blown or released at depth, and as they rose, acted as a net to concentrate prey near the surface. When the bubbles reached the surface, usually in a circle or figure eight configuration, the 'net' was completed, and the whales immediately lunged with open mouth through the concentrated prey. Groups of lunge-feeding whales ranged in size from 1-12 whales. Activities presumed to be subsurface feeding also were observed. Whales would dive and, in 3-15 minutes, resurface at or near the same location. Often schooling fish, euphausiids, diving seabirds and other marine mammals were seen near these whales. It can only be assumed that the whales were feeding at depth. In Seymour Canal feeding was not observed at night; on a few occasions when it was observed at dusk, the whales moved toward shore and appeared to rest. They reassembled the next morning at first light and began feeding again. Whether the whales in Sitka Sound continue to feed at night is unknown.

Through echo sounder recordings, visual identification and qualitative sampling, the prey were judged to be mostly euphausiids and Pacific herring. Two fecal samples collected by the author (Seymour Canal, November 1982; Sitka Sound, November 1983) were analysed (B. Wing, pers. comm.). Mostly euphausiid parts were found in both samples. The Seymour Canal sample contained uropods, telsons, antennal scales and a few eyes. The Sitka Sound sample contained carapace remnants, abdominal segments, a few uropods and antennal scales. Identification to species was not carried out. No evidence of fish was found in either sample. Visual observation and qualitative sampling after a bubble-net/lunge-feeding episode, in Sitka Sound in 1986, demonstrated the presence of Pacific herring 20cm in length. Sitka Sound is a major wintering and spawning ground for Pacific herring (Blankenbeckler, 1977; D. Ingledue, pers. comm.).

DISCUSSION

Humpback whales are present in southeastern Alaska in all months of the year. No one whale has been documented to overwinter or stay year-round. Whales present in the fall, winter and early spring appear to be irregular migrants, some being late to depart and others being early to arrive on the feeding grounds. Humpback whales last sighted in Alaskan waters in late fall or winter have been resighted during the same and later seasons in Hawaii or Mexico (Baker *et al.*, 1985; 1986). Overwintering may take place in southeastern Alaska but is probably rare, for it has not yet been detected. No individual has been seen from fall to spring in Alaskan waters.

The Seymour Canal area has the largest known fall and winter aggregation in southeastern Alaska with an estimated 193 to 230 whales per year over the eight years of this study. If the population of whales utilising southeastern Alaska each year is almost 400, as estimated by Baker *et al.* (1986), many of them may be feeding there in the fall and winter. The implications of this are significant. This potential feeding opportunity may be important to whales arriving on the feeding grounds late or those in need of additional calories to survive the migration and the demands of mating or calving on the breeding grounds.

The assumptions of the Jolly-Seber open population estimator may have been violated during this study (Seber, 1982; Hammond, 1986). Most importantly, it is not known whether or not the whales which are present in fall and winter in southeastern Alaska are the same whales each year. The unavailability of whales to be photographed in every year is known as temporary emigration; there is no way to account for this in estimation of population size unless the pattern of absence is known. The violation of the assumption of equal catchability would lead to negative bias or underestimation of population size (Hammond, 1986; Seber, 1982). It is unlikely that all whales have the same 'catchability', as fluking behaviour varies greatly and some whales are much easier to photograph than others. Because the model assumptions may have been violated the population estimates calculated for the fall and winter whales of southeastern Alaska should be used with caution and only as a general indicator of population size.

During the 1987/88 season (not included in this paper), there were numerous reports of pods of humpback whales just off the outside coast of Baranof and Kruzof Islands, areas inaccessible by small skiff. In addition, there are other areas of southeastern Alaska with reported small aggregations of whales during the fall and winter, that have not yet been studied. Both the outer and inner waters need further study if better estimates of numbers of late-leavers and early-arrivers are to be determined and the significance of such behaviour to be better understood.

The factors governing the timing of the southbound migration of humpback whales from Alaskan waters to Hawaii and Mexico appear to be more complex than mere seasonal cues. This timing appears to vary among individual whales and among years. The reasons for this flexibility are unknown but may be tied to factors such as prey availability, oceanographic conditions and individual needs of each whale. This research has only documented the presence of humpback whales in Alaskan waters during the fall and winter months and shown that the timing of migration is irregular for individuals within the Alaskan feeding stock.

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