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POPULATION CHARACTERISTICS OF HUMPBACK WHALES IN GLACIER BAY AND ADJACENT WATERS: SUMMER 1988

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ABSTRACT

A total of 55 individual whales, including 8 calves (14.5%), were identified in the combined areas of Glacier Bay and Icy Strait from June, 1 to September, 25, 1988. Of this total, 39 whales entered Glacier Bay at least briefly, 16 were observed only in Icy Strait, and 20 were observed in both areas. Considering only surveys during a 'standardized' sampling period of early July to the middle of August, 21 individuals were observed to enter the bay and 28 individuals were observed in Icy Strait. Nine whales, including two calves, were resident in Glacier Bay for periods of least three weeks each and two additional adults were present for at least two weeks each. Seasonal changes in abundance in Glacier Bay were similar to most earlier years with a peak in late June and a slow decline through July and August with only a few whales remaining in September. The abundance of whales in Icy Strait remained nearly constant from June through August and declined rapidly in September. The primary foraging strategy of humpback whales in Glacier Bay was solitary near-shore browsing and their primary prey appeared to be schooling fish. As in some previous years, a "core group" of four to nine whales foraged together cooperatively near Point Adolphus. Because of their remarkable social coherence and predictable presence near the point, this group has become the focus of considerable 'whalewatching' by private and commercial vessels including cruise ships entering the bay under Park Service permit and charter vessels operated under concession agreements to the Park Service. Reproductive histories of individual females continue to provide evidence of variance in reproductive success. Although most females give birth only once every two or three years, Spot (ID #235) returned to Glacier Bay with a calf for the second year in a row. The calf of another female, a member of the Point Adolphus core group (ID #573), disappeared in late June and is presumed to have died. This is the second incident of calf mortality documented in the Glacier Bay area during recent years.

INTRODUCTION

In the years prior to 1978, as many as 24 whales entered Glacier Bay and remained there to feed for a substantial part of the summer. In 1978, however, most of the whales that entered the bay abruptly departed soon after their entry. Two hypotheses were advanced to explain this sudden departure. The first asserted that vessel traffic disturbed the behavior of whales and that the exponential increase of vessel traffic in Glacier Bay during the years prior to and including 1978 forced the whales to "abandon" the bay. The second hypothesis proposed that the whales' departure was the result of a natural decline in the availability of their prey within Glacier Bay.

In 1981 the National Park Service, with the consultation of the National Marine Mammal Laboratory, initiated a multi-disciplinary study of humpback whales to help determine the reasons for their sudden departure in 1978. Studies of the acoustic environment and behavior of humpback whales demonstrated predictable short-term changes in their movement and respiration as a function of vessel traffic and noise (Baker et al. 1982; Baker et al. 1983; Baker and Herman 1989; Dean et al. 1985; Malme et al. 1982; Miles and Malme 1983). The assessment of humpback whale prey showed considerable seasonal and yearly variation in the abundance and primary species of prey in Glacier Bay, as well as a correlation in prey availability and whale distribution in other areas of Southeast Alaska (Wing and Krieger 1983; Krieger and Wing 1984; Krieger and Wing 1986).

Although these studies have corroborated some aspects of both hypotheses, they have not yet demonstrated conclusively the reasons for the whales' departure from the bay in 1978. Given the absence of data on prey abundance prior to 1978 and the difficulty in experimentally determining the levels of vessel activity that could result in abandonment of a habitat, the exact cause of the 1978 departure may never be entirely resolved. Nonetheless, the studies initiated and funded by the National Park Service have answered many questions concerning the behavior and ecology of humpback whales in Glacier Bay and throughout southeastern Alaska (Baker et al. 1985; Baker et al. 1986). It seems certain that these data will be of long-term value to the management of humpback whales in southeastern Alaska and throughout their migratory range.

Here I summarize the results of the ongoing monitoring of humpback whales in Glacier Bay and Icy Strait during the 1988 summer season. This summary provides an additional yearly contribution to one of the longest time-series of data available for a population of living baleen whales (Vequist and Baker 1987; Perry et al. 1985; Jurasz and Palmer 1981).

METHODS

Vessel surveys

Humpback whales were observed and photographed from a 17-foot Boston Whaler powered by a 50-hp Johnson outboard motor. Surveys for whales in Glacier Bay usually included the entire lower and mid-bay to Sturgess Island or Geikie Inlet. Several of the surveys reached as far into the East Arm as Point George and as far into the West Arm as Lamplugh Glacier and Tarr Inlet. Surveys for whales in Icy Strait were generally confined to the waters just outside of the bay's mouth and the coastline a few miles east and west of Point Adolphus on Chichagof Island. The number of surveys in each area was limited to two or three a week to minimize any possible impact that the monitoring program might have on the whales.

Photo-Identification

Photographs were taken with a Canon A1 camera equipped with a motor-drive and a 70 to 205 mm zoom or a 300 mm telephoto lens. High speed (ASA 400) film was used to obtain clear photographs of the dorsal fin and the ventral surface of each whale's tail flukes for the purposes of individual identification (Katona et al. 1979; Baker et al. 1986). These individual identification photographs were then compared to available photographs (Perry et al. 1985; Perry et al. 1988) to determine the past sighting history of each whale. Individual whales are referred to by an identification number from the University of Hawaii's Kewalo Basin Marine Mammal Laboratory catalog. Individuals previously identified by Jurasz and Palmer (1981a; 1981b) are also cross-referenced to their previously assigned nicknames. Whales not known to have been previously photo-identified are designated by a code referring to the area and sequence of their sighting. For example, AIS-02-88 was the second previously unidentified animal sighted at Icy Strait this summer.

RESULTS AND DISCUSSION

Abundance

A total of 55 individual humpback whales were identified in the combined areas of Glacier Bay and Icy Strait between June 1 and September 25, 1988 (Appendix I). Of this total, 19 individuals were sighted only in Glacier Bay, 16 were sighted only in Icy Strait and 20 were sighted in both areas. Restricting the photo-identification sample to the period from July 1 to August 16, a period comparable to the shorter sampling period in some earlier years (Perry et al. 1985; Baker 1985a), would result in a count of 21 whales sighted in the bay and 28 whales sighted in Icy Strait (Table 1).

Table 1. The standardized and total abundance (in parentheses) of humpback whales (adults and calves) identified in Glacier Bay and Icy Strait: 1982 to 1987.

	1982	1983	1984	1985	1986	1987	1988
Glacier Bay	22 (22)	10 (10)	24 (25)	10 (15)	26 (32)	28 33)	21 (39)
Icy Strait	15 (15)	9 (9)	21 (22)	19 (30)	27 (35)	34 (48)	28 (36)
Combined	33 (33)	17 (17)	39 (39)	27 (41)	42 (51)	49 (59)	43 (55)

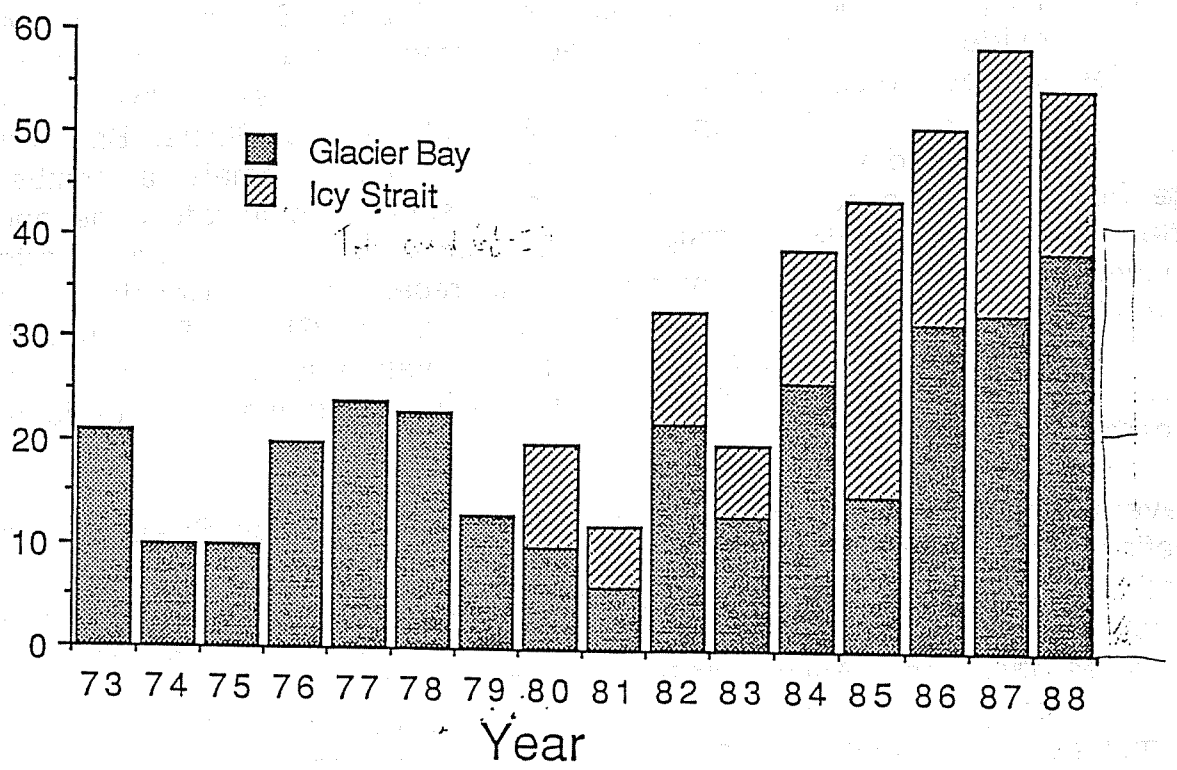
Note: Standardized abundance refers to the number of whales sighted during a sampling period extending from early July to mid-August used in the years 1982 to 1984 (Perry et al. 1985).

21
+ 28
49

55
- 49
6 - 68 ≈ 15

The 1988 summer season is the seventh season during which comparable information on whale abundance has been collected in the Glacier Bay - Icy Strait area. For Glacier Bay, these annual censuses show considerably variation. In the combined Glacier Bay - Icy Strait areas, however, the number of whales has increased steadily, with the exception of low counts in 1983, until this year when somewhat lower numbers were observed than in 1987 (Figure 1).

Figure 1: Annual abundance of individually identified humpback whales in the Glacier Bay and Icy Strait area combined.



Birth Rates and Juvenile Survival

Of the 55 whales identified in Glacier Bay - Icy Strait during ~~1987~~ 1988, 8 were calves (a crude birth rate of 14.5%). This compares to a crude birth rate for this area of 6.8% in 1987, 15.7% in 1986, 4.5% in 1985, 17.9% in 1984, 0.0% in 1983, and 18.2% in 1982 (Baker 1986; Baker 1985a; Perry et al. 1985). Although a Chi-square Test of Independence indicated that the magnitude of yearly differences is not significant (Chi-square [6] = 8.9; $p > 0.05$), the consistent alternation of years with high and low birth rates across a seven year period is unexpected from chance alone (assuming that the first year could be either high or low, the chances of six alternating years is $0.5^6 = 0.0156$, below the $p = 0.05$ level of chance accepted as significant in most statistical tests). This suggests that the observed biennial cycle of birth rates among female humpback whales in the Glacier Bay area may be due to some environmental or social synchronization.

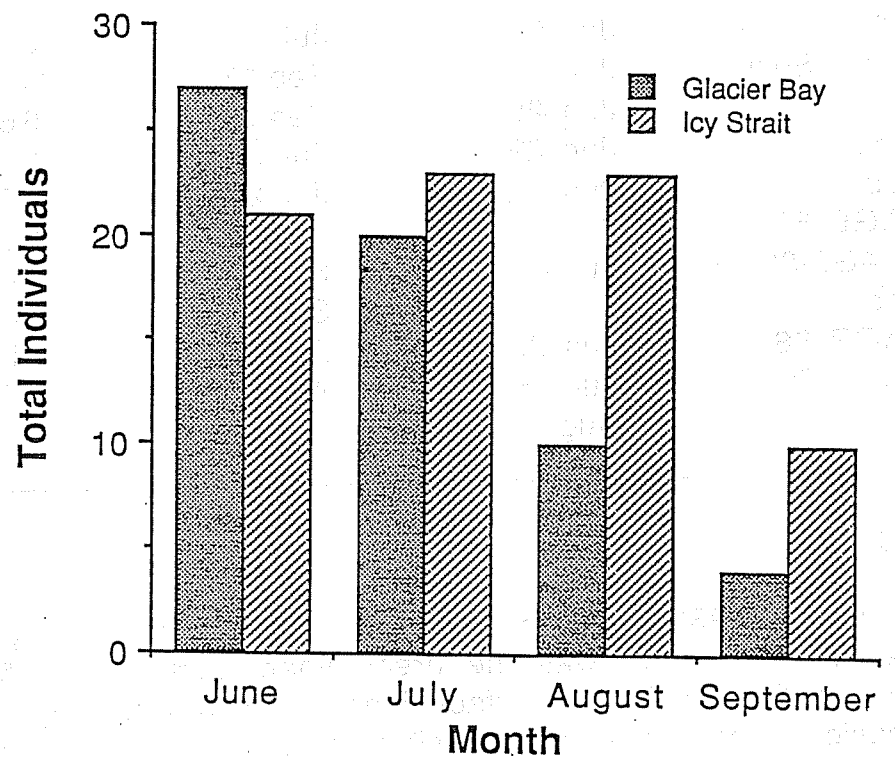
Long-term sighting records of females in the Glacier Bay area continue to provide evidence of variance in reproductive success. Although most females in southeastern Alaska give birth only once every two or three years (Baker et al. 1987), Spot (ID #235) returned to Glacier Bay with a calf for the second year in a row. The calf of another female, a member of the Point Adolphus core group (ID #573), disappeared in late June and is presumed to have died. This is the second incident of calf mortality documented in the Glacier Bay area during recent years. Considering that a total of only 35 calves have been observed in the Glacier Bay area since 1982 and that the maximum period of observation is only a few months each, the loss of two individuals suggests a substantial rate of juvenile mortality.

Several whales, first identified in the Glacier Bay or Icy Strait as calves (defined as an animals less than one year of age and accompanied by their mother), have developed persistent fidelity to this area. Three returning juveniles (defined as an animals five years old or less) were identified in the area this year. Animal #186, the calf of #530 in 1982, returned for the fifth consecutive year. Animal #352, the calf of #530 in 1984, and animal #353, the calf of #581 in 1984, were sighted for the second year since they were identified as calves. A fourth individual, referred to as #193y (Appendix 1), returned as yearling accompanied by its mother (ID #193, referred to as AIS05 cow and calf in Baker, 1986) in 1987 and as a two-year old in 1988. The only adult of known age is Garfuncle (#516), first identified in Glacier Bay as a calf in 1974. He has returned to this area in at least 10 of the 14 years since his birth.

Seasonal Influx and Residency

Seasonal changes in abundance in Glacier Bay were similar to most earlier years with a peak in late June and a slow decline through July and August with only a few whales remaining in September (Figure 2). The abundance of whales in Icy Strait remained nearly constant from June through August and declined rapidly in September.

Figure 2: Seasonal changes in the abundance of humpback whales in Glacier Bay and Icy Strait.



Although the interchange of whales between Glacier Bay and Icy Strait argues against defining 'residency' as restricted to one area alone, some measure of the number of residents in each area is important for historical comparison (Vequist and Baker 1987). It was possible to determine, with reasonable certainly, that 9 individuals were resident in Glacier Bay for periods of at least three weeks (Table 2) and two others were resident in the bay for at least two weeks each.

Table 2. The interval of residency for whales in Glacier Bay: Summer 1988.

Case	ID	Name	First Day	Last Day	Interval
1.	117	White Eyes	Jun 6	Jul 3	27
2.	118	Chop Suey	Jun 4	Sep 13	101
3.	159		Jun 28	Sep 2	66
4.	235	Spot	Jun 29	Jul 26	27
5.	--	calf	Jun 29	Jul 26	27
6.	1012	AGB-87-04	Jun 4	Aug 26	83
7.	1028	AGB-88-08	Jul 26	Sep 9	44
8.	--	calf	Jul 26	Sep 9	44
9.	1027	AGB-88-07	Jun 29	Aug 11	43
10.	232	Notchfin	Jul 18	Aug 4	17
11.	352		Aug 11	Aug 29	18

Foraging Strategies

As is most recent years (1981 to 1985), solitary, sub-surface feeding or browsing (e.g. near-shore feeding) was the predominant foraging strategy of humpback whales in Glacier Bay. Surface lunge-feeding was observed on only a few occasions and it was not possible to determine if the prey was euphausiids or small schools of fish. The foraging strategies of whales at Point Adolphus was dominated by a "core group" of six adults that have associated together repeatedly in previous years (Perry et al. 1985): Leigh, Scoper, Gertrude, #573, Frenchie, and Freckle Flukes (animals #236, 577, 587, 573, 166, and 155 respectively). In addition to Gertrude's calf, these six adults were often joined by as many as three other individuals, most commonly #186 and 353 forming an impressively large pod that displayed a high degree of behavioral synchrony and coordinated movement.

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HUMPBACK WHALES GLACIER BAY (G) AND ICY STRAIT (I) 1988

WHALE ID #	NAME	JUNE 02	04	06	08	10	13	14	16	19	20	22	23	24	27	28
117	White Eyes			G				G								
118	Chop Suey		G			I	G		I	G		G			G	
155													I	I		G
157	MD	I							I				I			
159																G
161	BWM															G
166	Frenchie	I				I			I				I	I		G
186													I	I		G
193													I			G
219													I			G
✓Calf	AIS-88-05												I			G
221			G		G		G		G							
232	Notchfin															
235	Spot															
✓Calf	AGB-88-05															
236	Leigh	I				I			I				I	I		G
237	Dike											G				
278																
352			G													
353									I							G
449																
516	Garfunkle								G				I	I		
530						I			I				I			
✓Calf	AIS-88-04					I			I				I			
535	Quits															
564	RU Taylor		G													
566			G													
573		I				I			I				I	I		G
✓Calf		I				I			I				MISSING			
577	Scoper	I				I			I				I	I		G
581																
✓Calf																
584						I?										G
587	Gertrude								I				I	I		G
✓Calf	AGB-88-03								I				I	I		G
616	Lesser															
834																
879																
941																
✓Calf	AGB-88-06															
	AIS-87-01								I					I		G
	AGB-87-04		G												G	
	AGB-88-01										G					
	AGB-88-02														G	
	AGB-88-04															G
	AGB-88-07															
Cow	AGB-88-08															
✓Calf																
	AIS-88-01													I		
	AIS-88-02															
	AIS-88-03															
	AIS-88-06															
	AIS-88-07															
	AIS-88-08															
	AIS-88-09															

HUMPBACK WHALES GLACIER BAY (G) AND ICY STRAIT (I) 1988

WHALE ID #	NAME	DATE JUNE 29	30	JULY 01	03	05	07	10	11	14	15	16	18	19	21
117	White Eyes				G										I
118	Chop Suey					G	G	G	G						
155				I			I			I		I			
157	MD			I						I		I			
159			G		G	G			G						
161	BWM			G											
166	Frenchie			I			I			I					I
186				I			I			I		I			I
193				I						I		I			
219				I			I			I					I
Calf	AIS-88-05			I			I			I					I
221															
232	Notchfin												G	G	
235	Spot	G							G		G				
Calf	AGB-88-05	G							G		G				
236	Leigh			I			I			I					I
237	Dike														
278													G		G
352															
353				I			I			I					I
449												I			
516	Garfunkle			I			G/I			I					I
530				I						I					
Calf	AIS-88-04			I			I								
535	Quits						G		G		G			G	
564	RU Taylor														
566															
573				I			I			I		I			
Calf				MISSING			-			-		-			
577	Scoper			I			I			I		I			I
581				I			I								
Calf				I			I								
584															
587	Gertrude											I			I
Calf	AGB-88-03											I			I
616	Lesser														
834															
879															
941			G												
Calf	AGB-88-06		G												
	AIS-87-01						G								
	AGB-87-04								G				G		
	AGB-88-01														
	AGB-88-02														
	AGB-88-04														
	AGB-88-07	G													
Cow	AGB-88-08														
Calf															
	AIS-88-01														
	AIS-88-02			I											
	AIS-88-03														
	AIS-88-06											I			
	AIS-88-07														
	AIS-88-08														
	AIS-88-09														

WHALE ID #	NAME	DATE JULY 23	25	26	28	30	31	AUGUST 04	09	10	11	13	14	15	16
117	White Eyes			G?		G									
118	Chop Suey			G							G	G		G	
155		I							I						
157	MD		G		I								I		
159							G				G	G		G	
161	BWM														
166	Frenchie	I							I				I		
186		I			G/I				I						I
193															I
219					I										I
Calf	AIS-88-05				I										I
221															
232	Notchfin			G				G							
235	Spot			G											
Calf	AGB-88-05			G											
236	Leigh	I							I				I		I
237	Dike			G											I
278															
352					I						G			G	
353									I				I		
449															
516	Garfunkle			G					I				I	G	
530		I			I				I	I					I
Calf	AIS-88-04	I			I				I	I					I
535	Quits														
564	RU Taylor														
566															
573		I							I						
Calf		MISSING													
577	Scoper	I							I				I		I
581					I										
Calf					I										
584															
587	Gertrude	I							I						I
Calf	AGB-88-03	I							I						I
616	Lesser				I										
834									I						
879															
941															
Calf	AGB-88-06														
	AIS-87-01														
	AGB-87-04			G											
	AGB-88-01														
	AGB-88-02														
	AGB-88-04														
	AGB-88-07			G								G			
Cow	AGB-88-08			G											

HUMPBACK WHALES GLACIER BAY (G) AND ICY STRAIT (I) 1988

WHALE ID #	NAME	DATE AUGUST 18	23	25	26	29	30	SEPTEMBER 01	02	08	09	12	13	15
117	White Eyes				G									
118	Chop Suey	G			G									
155														
157	MD													
159			G		G				G					
161	BWM													
166	Frenchie			I										
186				I										
193														
219				I										
Calf	AIS-88-05			I										
221														
232	Notchfin													
235	Spot													
Calf	AGB-88-05													
236	Leigh			I										
237	Dike													
278														
352					G	G								
353														
449				I										
516	Garfunkle			I										
530				I										
Calf	AIS-88-04			I										
535	Quits													
564	RU Taylor													
566														
573				I										
Calf				MISSING										
577	Scoper			I										
581														
Calf														
584														
587	Gertrude			I										
Calf	AGB-88-03			I										
616	Lesser													
834														
879				I										
941														
Calf	AGB-88-06													
	AIS-87-01													
	AGB-87-04				G									
	AGB-88-01													
	AGB-88-02													
	AGB-88-04													
	AGB-88-07													
Cow	AGB-88-08				G						G			
Calf					G						G			
	AIS-88-01													
	AIS-88-02													
	AIS-88-03													
	AIS-88-06													
	AIS-88-07													
	AIS-88-08													
	AIS-88-09													