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POPULATION CHARACTERISTICS OF HUMPBACK WHALES  
(*Megaptera novaeangliae*) IN GLACIER BAY AND ADJACENT WATERS: 1991

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Final Report  
~~May 1992~~  
September 1991

## ABSTRACT

Fifty-two individual humpback whales, including four calves (7.7%) were identified in Glacier Bay and Icy Strait between May 22 and September 15, 1981. Twelve of these whales (23.1%) were seen solely in Glacier Bay, while 33 (63.46%) were seen only in Icy Strait. Seven whales (13.4%) were common to both areas. Ten (53%) of the Glacier Bay whales and 23 (57.5%) Icy Strait whales were resident for greater than 20 days. The number of whales in Glacier Bay was low until mid-June and increased steadily throughout July, then gradually decreased after mid-August. Early season use of Glacier Bay concentrated in the lower West Arm in the vicinity of the Hugh Miller Complex and Tidal Inlet. The lower Bay including Bartlett Cove supported consistent whale use throughout July and August. Solitary, sub-surface feeding near shore was the primary feeding mode for Glacier Bay whales. Point Adolphus was the site of the most consistent Icy Strait whale activity from June to early September, with a rapid decline in whale numbers in September. Most Icy Strait whales engaged in sub-surface feeding, some alone and others in the stable "core group". Two whales born in 1987 were re-sighted in Icy Strait for the first time since their birth year. One sub-adult born in 1989 was resighted in Glacier Bay.

## INTRODUCTION

Prior to 1978, as many as 24 humpback whales (*Megaptera novaeangliae*) entered Glacier Bay to feed for a good part of the summer. In 1978 most of the whales that arrived in Glacier Bay soon departed after entry. Two hypotheses were suggested as to the cause of this departure. The first theorized that vessel traffic disturbed the behavior of the whales and the increase in traffic, during the years prior to and including 1978, caused the whales to depart Glacier Bay abruptly. The second hypothesis attributed the whales' departure to a natural decline in prey availability within Glacier Bay.

In 1981, the National Park Service, with the assistance of the National Marine Mammal Laboratory, National Marine Fisheries Service, initiated multi-disciplinary studies on humpback whale behavior, prey availability and the acoustic environment in Glacier Bay and southeastern Alaska (Baker et al. 1982; Baker et al. 1983; Kreiger and Wing 1984; Malme, Miles and McElroy 1982; Miles and Malme 1983; Wing and Kreiger 1984). The studies revealed that short-term temporary behavioral disturbance occurs when vessels pass within one-quarter mile of humpback whales and that a shift in prey distribution may have occurred in Glacier Bay, but did not conclusively isolate the reasons for the sudden departure of whales from Glacier Bay in 1978. Given the absence of prey-related data prior to 1978 and the difficulty of assessing the threshold of vessel activity that could cause abandonment of a habitat, the exact cause of the 1978 departure may never be resolved. The studies did, however, contribute to knowledge of the biology and natural history of the humpback whale in Alaskan waters (Baker et al. 1985; Baker et al. 1986; Vequist & Baker 1987; Perry et al. 1985). Continued long-term monitoring of this species will facilitate the management of this endangered whale throughout its migratory range.

In 1983, a Biological Opinion issued by the National Marine Fisheries Service (NMFS) recommended that the National Park Service (NPS) establish a monitoring program to assess potential impacts of vessel traffic on humpback whales in Glacier Bay. Annual whale counts during a "standardized period" from July 9 to August 16 are used to compare whale abundance between years. Although the monitoring season currently extends from approximately June 1 to September 1, the standardized period does roughly coincide with the summer's

heaviest vessel use in Glacier Bay. The 1983 Biological Opinion dictates that in years when the number of whales identified during the standardized period exceeds the 1982 level, the NPS may increase vessel traffic in Glacier Bay by up to 20%. This criterion has been met only once, in 1987, and in the summer of 1988, the NPS increased vessel entries by 13% percent.

Over 100 individual whales have been photographically identified in the Glacier Bay and adjacent waters since the monitoring program was initiated. A substantial proportion of these whales exhibit strong regional fidelity, as evidenced by the persistence of their annual return. Exchange between these areas indicates that the Glacier Bay/Icy Strait area can be considered as one habitat (Baker 1986, 1987; Baker & Straley 1988; Straley 1989, 1990).

Clearly, a considerable number of the estimated 550 humpback whales (Baker et al. 1990) that summer in southeastern Alaska depend upon the resources in this study area.

This report summarizes the results of the ongoing monitoring of the humpback whale population in the waters of Glacier Bay and adjacent waters during the late spring and summer of 1991.

## METHODS

### Vessel Surveys

Humpback whales were observed and photographed from a 17' Boston Whaler powered with a 60hp Evinrude outboard motor. Surveys were conducted in Glacier Bay and Icy Strait, as shown in Figure 1. The main body of Glacier Bay (a rectangle defined by four corners: Bartlett Cove, Point Carolus, Geikie Inlet and Garforth Island) was usually surveyed three days per week. Surveys of the upper bay were conducted approximately once a week or when whale sightings were reported by tour vessels. Most upper bay surveys extended as far north as Scidmore Cut in the West Arm and McBride Glacier in the East Arm. Cross Sound was surveyed twice during the 1991 season.

Icy Strait surveys were performed approximately once per week, with the most intensive survey effort along the coastline east and west of Point Adolphus, from Mud Bay to Eagle Point. Surveys of the south and west shorelines of Pleasant Island were also conducted as time and weather conditions permitted. Icy Strait surveys also resulted in a survey of the mouth of Glacier Bay, because that area is crossed while travelling from Bartlett Cove to Icy Strait. Table 1 shows the number of surveys which were

conducted in Glacier Bay and Icy Strait in 1991 and previous years. Table 2 shows 1985-1991 survey effort in terms of hours of search and observation time

Surveys were not conducted in the same area on consecutive days in order to minimize potential impact that monitoring efforts may have upon the whales. On occasions when circumstances such as time, weather or the presence of other vessels prevented whale identification photographs from being taken, consecutive surveys were made.

Table 1.  
Number of survey days for humpback whales in Glacier Bay and Icy Strait, 1985-1991.

year	<u>Glacier Bay</u>					<u>Icy Strait</u>				
	month					month				
	MAY	JUNE	JULY	AUG	SEPT	MAY	JUNE	JULY	AUG	SEPT
1991	7	14	17	13	6	3	7	6	4	3
1990	6	16	18	14	0	4	5	6	8	0
1989	3	17	14	16	1	1	6	6	7	4
1988	0	11	12	12	7	0	5	7	5	3
1987	3	12	12	5	1	2	5	7	7	2
1986	0	13	17	6	0	0	5	3	6	2
1985	0	10	11	10	0	0	7	4	3	1

Table 2.  
Total search and encounter time (hours) for humpback whales in Glacier Bay (GB) and Icy Strait (IS); 1985 and 1988-91.

<u>Year</u>	<u>GB (hrs)</u>	<u>IS (hrs)</u>	<u>Total (hrs)</u>	<u>Total Whale Count (GB and IS)</u>
1991	256	100	356	52
1990	215	115	330	50
1989	231	123	354	42
1988	199	108	307	55
1987	-	-	-	59
1986	-	-	-	51
1985	234	92	326	41

### Photoidentification

Photographs were taken with a Nikon 8008 camera equipped with a motordrive and a 300mm lens. High speed (400 ASA pushed to 1600) black and white film was used to obtain clear photographs of the ventral fluke surface of each whale. Each whale fluke has a distinct black and white pigment pattern that allows for individual identification (Katona et al. 1979). Photographs of the dorsal fin contributed to the identification of individuals, especially in the event that fluke photographs were not obtained. The film was processed and printed by Panda Lab in Seattle, Washington. Contact sheets were used for preliminary data analysis. The season's best photograph of each individual was selected for subsequent printing and cataloging.

Individual identification photographs were compared to previous photographs of Glacier Bay and Icy Strait whales to determine the past sighting history of each whale. Each whale is referred to by an identification number issued by the Kewalo Basin Marine Mammal Laboratory (KEMML) catalog of North Pacific humpback whales (Perry et al. 1988). Whales first photoidentified by Jurasz and Palmer (1981a; 1981b) are also listed by their nicknames. Whales that were previously unidentified in Glacier Bay and Icy Strait were assigned a temporary identification code, for example AIS 91-05 or AGB 91-01. This code refers to where in Alaska the animal was first sighted, Icy Strait (AIS) or Glacier Bay (AGB), the year (91) and whether this was the first, second, third etc. temporary identification code issued for that year and area. Temporary codes were replaced with permanent identification numbers if the whale was seen more than once in a season, or if it had been identified elsewhere or in previous years. Identification numbers less than ID# 950 coincide with those in the KBMML catalog, but those ID#s greater than 950 are unique to the Glacier Bay catalog.

### Prey Assessment

This year, qualitative studies of whale prey were conducted by NPS staff aboard the M/V Drumlin. Hydroacoustic and trawl transects were done both in areas where whales were and were not actively feeding. The results of this study are summarized in a separate report (Sharman 1991, in prep.).

## RESULTS

### Counts

A total of 52 individual humpback whales were photoidentified in Glacier Bay and Icy Strait between 21 May and 15 September 1991 (Appendix 1). Of this total count, 7 whales were common to both areas, 33 were photo-identified exclusively in Icy Strait and 12 exclusively in Glacier Bay. Limiting the sampling period to the interval between the first week in July to mid-August (09 July-16 August), in order to be comparable between study years (Perry et al. 1985), resulted in a standardized count of 16 whales sighted in Glacier Bay and 34 in Icy Strait. Table 3 shows the numbers of whales identified during standardized and entire monitoring periods for the past 10 summers. The total number of whales identified in Glacier Bay in 1991 is the third lowest since 1982. The number of Glacier Bay whales identified during the standardized period is the fourth lowest since 1982. Survey effort for the 1991 monitoring season was comparable to that in recent years, as shown in Tables 1 and 2.

A slightly higher proportion of the season's whales were seen in Icy Strait and a lower proportion in Glacier Bay this season in comparison with other years. This is illustrated by Figure 2, which shows the relative numbers of whales identified in Glacier Bay and Icy Strait in recent years. A number of individuals which are usually sighted in Glacier Bay apparently remained in Icy Strait (Baker 1985; Straley 1989, 1990).

Many whales which were identified this summer are individuals who show strong fidelity to the Glacier Bay/Icy Strait region. There are eleven whales which have been seen each year from 1985-1991. Six whales were identified six out of those seven years, and six individuals were seen five out of seven years. One whale was seen four out of the seven years.

### Seasonal Distribution

**Glacier Bay.** Whale activity in Glacier Bay was very low in late May and early June, increased in mid-June, peaked in mid-July and declined gradually until late August. The maximum number of whales sighted in Glacier Bay during a single survey was 6, occurring on 5 July, 24 July and 5 August. Figure 3 shows the dates upon which new individuals were identified in the Glacier Bay/Icy Strait area.

Table 3. Standardized and total counts of humpback whales (adults and calves) identified in Glacier Bay and Icy Strait 1982-1991.

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
<u>Glacier Bay</u>										
standardized	22	10	24	10	26	28	17	20	16	16
total	22	10	25	15	32	33	39	24	26	19
<u>Icy Strait</u>										
standardized	5	9	21	19	27	34	29	19	24	34
total	15	9	22	30	35	48	36	30	34	40
<u>GB/IS Combined</u>										
standardized	33	17	39	27	42	49	41	33	36	45
total	33	17	39	41	51	59	55	42	50	52

Note: Total counts refer to the number of whales sighted during the entire monitoring season. Standardized counts refer to the number of whales sighted between 09 July and 16 August each year.

There were few if any whales in Glacier Bay during May. In early June, one whale was identified in the vicinity of the Hugh Miller Complex. Later in June, whale activity concentrated in Whidbey Passage and Bartlett Cove. Bartlett Cove supported intensive and consistent whale use throughout from mid-June to late August, with a one week respite during late July. Nine different whales were identified in Bartlett Cove over the course of the summer, but four individuals (#535 Quits, #1021, and #235 Spot with her calf) accounted for the vast majority of the sightings. Beardslee Entrance and the eastern shore of Sitakaday Narrows were also the site of substantial whale activity in July and early August. Two whales were identified in the East Arm, both in the vicinity of Nunatak Cove. In late August most individuals moved out of the lower Bay, but intermittent whale sightings in the mid-bay and the lower West Arm continued. Figure 1 shows the location of 1991 whale sightings in Glacier Bay and Icy Strait.

Icy Strait. Icy Strait whale activity concentrated at Point Adolphus throughout the summer, although sightings were made along the coastline from Mud Bay to Eagle Point. Pleasant Island Reef was frequented by a small number

of whales, from June to mid-September (Figure 1). The maximum number of whales sighted in Icy Strait was 19, occurring on 23 July and 27 August. Whales were present at Point Adolphus in low numbers in May, with a large influx of new individuals in early June (Figure 3). The number of whales in Icy Strait remained relatively constant throughout July and August, marked by two days in late July when pulses of new (and apparently transient) whales were identified in the area. In early September, many whales departed the area, leaving a small number of whales at Point Adolphus.

#### Local Movement and Residency

Seven individual whales (13.5%) were sighted in both Icy Strait and Glacier Bay, each making one or more round-trips between the two localities. Five of these whales began in Icy Strait and made transits into Glacier Bay, while two of these began in Glacier Bay. See Appendix 1 for the complete sighting records of each whale.

A large percentage (53%) of the whales which did enter Glacier Bay remained 20 or more days, long enough to be considered residents. Using the same residency criterion, 57.5% of the Icy Strait whales were also considered resident. In total, thirty-three individuals (63%) were resident in the Glacier Bay - Icy Strait area. Table 4 shows the number of resident whales in the study area from 1985-1991. Under the assumption that resident whales were continuously present between sightings, 10 of the Glacier Bay whales resided there for 20 or more days, as shown in Table 5. Two of these individuals appear to have been primarily resident in Glacier Bay but their presence in the Bay was interrupted by a single sighting in Icy Strait. Whale #1021 was seen in Glacier Bay from 21 June to 27 August (an interval of 68 days), with one intervening sighting in Icy Strait on the 08 August. Whale #159 was sighted in Glacier Bay between 05 July to 16 August (interval =39 days), with one Icy Strait sighting on 10 July. Because of the short distance separating these adjoining waters, more individuals may have made brief undetected trips into adjacent areas. Twenty-three of the Icy Strait whales (57.5%) were resident in that area for 20 days or more.

Table 4. Proportion of "resident" whales in Glacier Bay and Icy Strait: 1985-1991

Year	1985	1986	1987	1988	1989	1990	1991
GB	40%	38%	30%	23%	46%	38%	57.5%
IS	36%	-	42%	-	-	-	53%
Combined	-	-	57.6%	-	64%	58%	63%

Note: Figures for this table were taken from those computed in annual NPS whale monitoring reports. Missing points could be reclaimed from raw data contained in annual reports.

Table 5. Residence intervals for whales in Glacier Bay: Summer 1991.

Case	ID	First Day	Last Day	Interval
1.	1018	26 MAY	12 SEPT	109
2.	117 WHITE EYES	04 JUNE	03 SEPT	92
3.	AGB91-02	19 JUNE	03 SEPT	76
4.	564 RU TAYLOR	04 JUNE	21 JULY	48
5.	1012	24 JUNE	09 AUGUST	47
6.	235 SPOT AND CALF	19 JULY	02 SEPT	46
7.	535 QUILTS	30 JUNE	13 AUGUST	45
8.	159	13 JULY	16 AUGUST	35
9.	1021	21 JUNE	24 JULY	34
10.	AGB91-03	07 JULY	30 JULY	23

#### Feeding Behavior

Glacier Bay. Most whales in Glacier Bay did solitary, sub-surface feeding. Hydroacoustic evidence (Kreiger and Wing 1984, 1986, unpublished data) indicates that the primary whale prey items in Glacier Bay are schooling fish such as capelin (*Mallotus villosus*) and sand lance (*Ammodytes hexapterus*). Whales #1018 and #117, which frequent the region of the deep euphausiid layer revealed by Kreiger and Wing's studies may also be utilizing this resource.

Lunge feeding was observed infrequently in Glacier Bay: once north of Russell Island (Schroeder, pers. comm.) once in the mouth of Bartlett Cove, and once by two whales in Scidmore Bay. Bubblenet feeding was reported along the northern shoreline of Blue Mouse Cove on one occasion (Schroeder, pers. comm.).

**Icy Strait.** Feeding at Point Adolphus occurred in a single large group, a number of small groups and lone whales, as described in previous years (Baker 1985, 1986, 1987; Straley 1989, 1990). Observations of the behavioral continuity of solitary whales (#219, #157 MD, #530, #516 Garfinkle) and core group members (see below) corroborate previous reports of persistent individual preferences in social/feeding behavior (Baker 1985).

Coordinated feeding by a group of 4 to 10 whales was observed at Point Adolphus throughout June, July and August. This group was composed of a "core" of 5-7 individuals (#587 Gertrude, #166 Frenchie, #236 Leigh, #155 Freckle Fluke, #577 Scoper, #186, #573) which were joined by a variety of other whales on various occasions (Perry et al. 1985). Three females accompanied by a calf (#581, #539 Max, #193) were intermittently present in the group, which is uncommon but has been documented before (Baker 1985; Straley 1989?, 1990). Not all of the "core" members participated throughout the season, although the group was present in all Point Adolphus surveys in June through August. For example, Gertrude (# 587), and Frenchie (#166) were seen in the core group only in June and July, although each was identified in the vicinity of Point Adolphus in August.

The core group was generally observed sub-surface feeding, presumably on herring (*Clupea harengus*), which has been documented to be abundant in that area (Kreiger and Wing 1984, 1986). On August 13, the core group was observed lunge feeding. Coordinated lunge feeding was also observed at Pleasant Island Reef (#545, #237 Dike, #1062) and northwest of Eagle Point (#545, #236 Leigh, #166 Frenchie).

#### Reproduction and Juvenile Survival

Four calves were identified this year, one in Glacier Bay and three in Icy Strait. Spot (# 235) was seen with her calf in Glacier Bay during July, August and September. Max (#539), #193, and #581 were each seen with a calf in Icy Strait.

Three whales that were first identified as calves were re-sighted during 1991. Whale #1042, the calf of #581 in 1987, was sighted in Icy Strait for the first time since its birth year. Whale #1031 (the 1987 calf of #219) was photographed for the first time since its birth year, at Point Adolphus within 1/4 mile of its mother. Whale #1014 (the 1989 calf of #236 Leigh), a sub-adult, was resighted this year in Glacier Bay. One previously unidentified adult (#1062) new to the Glacier Bay/Icy Strait area was sighted in 1979 in Frederick Sound (Perry et al. 1988).

The crude birth rate (CBR), computed by dividing the number of calves by the total number of whales, provides a measure of the reproductive rate for the local population. Table 6 shows the crude birth rate for the years 1982-1991, and illustrates that the 1991 figure is somewhat low at 7.7%.

Table 6. Crude birth rates for humpback whales in Glacier Bay and Icy Strait, 1982-1991

Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
# Whales	33	17	39	41	51	59	55	42	50	52
# Calves	6	0	7	2	8	4	8	5	6	4
Crude birth rate %	18.2%	0%	17.9%	4.5%	15.7%	6.8%	14.5%	11.9%	12.0%	7.7%

#### Whale/Vessel Interactions

Peak numbers of vessels in Glacier Bay coincided with peak numbers of whales, increasing the probability of whale/vessel interactions. This was especially true during July and August, when two adult whales and a cow/calf pair inhabited Bartlett Cove, an area of high vessel traffic. A large number of warnings (57) and a much smaller number of citations (5) for violations of NPS whale regulations were issued to private and commercial boaters. A detailed report of whale waters violations and enforcement has been prepared by enforcement personnel (Greer 1991 in prep.). No collisions between whales and vessels were reported or observed.

Unregulated whale-watching activity at Point Adolphus has rapidly increased since the mid-1980s (Baker 1987; Straley 1989, 1990). At any given time during June-August Point Adolphus surveys, approximately 40% of the whale groups were being pursued by at least one vessel. On most days between June

and August, as many as four vessels were observed to follow a single group (the "core group") of whales. Cruise ships, tour boats, Glacier Bay Lodge charter boats, kayaks and a variety of private vessels were observed in close proximity to whales.

No entanglements of whales in fishing gear were reported or observed. However, we are reasonably certain that an entangled whale (#AGB90-08, now referred to as animal #1054) which was partially freed by NPS personnel in August 1990 (Straley 1990) was sighted in Glacier Bay a number of times this summer. This match was made using the contact sheets of photographs, and confirmation of this sighting will be made when identification photographs return from being printed. The importance of this sighting in documenting the survival of this individual dictates caution in confirming this identification.

## DISCUSSION

### Counts

The number of whales which were identified in the Glacier Bay/Icy Strait region during the 1991 monitoring season was low in comparison to recent years although a certain amount of variability throughout the study years is evident (Figure 1). The proportion of whales which utilized Glacier Bay as opposed to Icy Strait in 1991 is slightly lower than usual, which is interesting in light of the relative survey effort in Glacier Bay and Icy Strait. The small proportion of whales seen in Glacier Bay this season, in conjunction with the comparatively large number of whales seen at Point Adolphus (see Figure 2), may indicate that particularly rich food resources around Point Adolphus drew in whales from other areas for at least part of the season. Hydroacoustic surveys, which could assess prey availability, were not conducted at Point Adolphus this season.

### Seasonal Distribution

Annual whale distribution varies within Glacier Bay, while Point Adolphus is a reliable site of whale activity in Icy Strait, as demonstrated by the past ten summers of study (Figure 1; Perry et al. 1985; Vequist and Baker 1987). In the past, Glacier Bay whales have shown flexibility in their preferred feeding ranges within the bay, presumably related to fluctuations in

prey types and densities at different locations. This season, whales frequented a number of areas which have supported whale use over some but not all of the past 7 years. Bartlett Cove, for example, was the site of substantial whale activity, as has been the case in some recent years (Baker ; Straley 1990). The timing of whale presence in Glacier Bay and Icy Strait during the monitoring season was comparable to recent years.

#### **Local Movement and Residency**

A relatively small percentage (13.5%) of whales travelled between Glacier Bay and Icy Strait this season. The proportion of Glacier Bay whales which resided more than twenty days (57.5%) was the highest that has occurred in recent years (Table 5), despite a comparatively low count of whales which entered the bay (Table 3; Figure 2). Although observations of interchange of whales between Glacier Bay and Icy Strait bring into question the validity of a residency measurement restricted to either of these areas alone (Baker 1987), "residency" in each area provides an index of habitat use which is useful for between-year comparisons (Baker 1985, 1986, 1987; Straley 1989, 1990). A comparatively large proportion of Icy Strait whales (57.5%) were resident for more than 20 days, and many of these individuals were resident for much longer.

#### **Feeding Behavior**

Most of the feeding patterns observed in Glacier Bay and Icy Strait this season were similar to those observed in previous years. One exception is that the Point Adolphus "core group" has not frequently (if at all), been observed lunge feeding, (Perry et al. 1985) until this season. This occurrence is probably best explained by a difference in prey behavior or availability at Point Adolphus in August. The intermittent presence of three different females with a calf in the core group this year suggests that this is becoming more common (Baker 1985; Baker 1987; Straley 1990).

#### **Reproduction and Juvenile Survival**

Most female humpbacks give birth at 2-year intervals (Baker, Perry and Herman 1987; Clapham and Mayo 1988; Glockner-Ferrari and Ferrari 1985), with a minority of females achieving a 1-year calving interval. Only a few females identified in this study (#235, #581) have borne calves in successive years

(Baker, Perry & Herman 1987; Baker & Straley 1988). The survival rate of calves in general or especially calves of rapidly-reproducing mothers is not well documented.

The sighting of four year old #1042 is important in that it documents the survival of this individual, given the prodigious reproductive rate of its mother, #581. Whale #581 gave birth in 1987, 1988 and 1989, and was seen in 1990 unaccompanied by a calf. The 1991 photograph of #1042 will be used to ascertain a possible sighting of this individual in 1990 (Straley 1990).

The sighting of four year old #1031 in proximity to its mother (#219) at Point Adolphus is also notable, because sightings of mothers in association with offspring greater than one year old are infrequent (Baker 1987, Clapham & Mayo 1988). These two individuals were not diving or behaving in synchrony, and therefore were not affiliated in any obvious way, but they were observed travelling in the same direction for approximately one hour. Their parallel travel ended when #219 stopped and rested motionless at the water's surface for approximately thirty minutes, while #1031 continued southeast along the shoreline. These two observations from the 1991 season provide additional evidence of maternally-directed return of calves to feeding grounds. Further insights into the social structure of this population will be gained when the sexes of the returning offspring are determined.

Table 6 shows that there is considerable variability in the crude birth rate over the period studied. It is notable that all the lowest CBRs occur in odd-numbered years (Baker 1987, 1985), which would be expected, in a species which undergoes a 2-year reproductive cycle, if the composition of the local population of reproductive females is stable from year to year.

#### **Whale/Vessel Interactions**

Humpback whales are legally protected from "harassment" by the Endangered Species Act (1973) and the Marine Mammal Protection Act (1972), but specific regulations on vessel behavior and close approaches to whales are conspicuously absent in southeastern Alaska, with the exception of Glacier Bay National Park. The number of vessels engaging in unregulated whale-watching at Point Adolphus and elsewhere in Icy Strait has increased since the mid-1980s (Baker 1987; Straley 1989, 1990). One worrisome aspect of this trend is that whale-watching focuses on the large, surface-active "core-group". Members of this group therefore spend a large proportion of their time being closely

followed by one or more vessels. Vessel presence may or may not disturb these whales more than others, but the fact that this group uses underwater vocalizations (Baker 1985b) which apparently help to coordinate their behavior may make them more susceptible to disturbance. In the past few years there have been calves in or on the periphery of the core group (Baker 1985; Baker 1987; Straley 1990). The threat of whale/vessel collisions seems greater in this instance because the calves don't always remain with the group and are thus less predictable in their movements. Additionally, calves on the periphery of the group have been observed to become separated from their mother by the whale-watching boat, an event which is undoubtedly stressful to the calf.

Glacier Bay National Park's monitoring program continues to contribute valuable information on humpback whale population structure, local migration, reproductive rate and feeding behavior of humpbacks in southeastern Alaska. Long-term sighting histories of individually-identified females and their offspring are currently the only means available for measuring the reproductive parameters upon which the recovery of this endangered whale depends. Investigation of annual variability of habitat utilization is also important in assessing the role of Glacier Bay to southeastern Alaska humpbacks. Only by pursuing long term studies such as this will we be able to facilitate the species' recovery both within and outside of the National Park boundaries.

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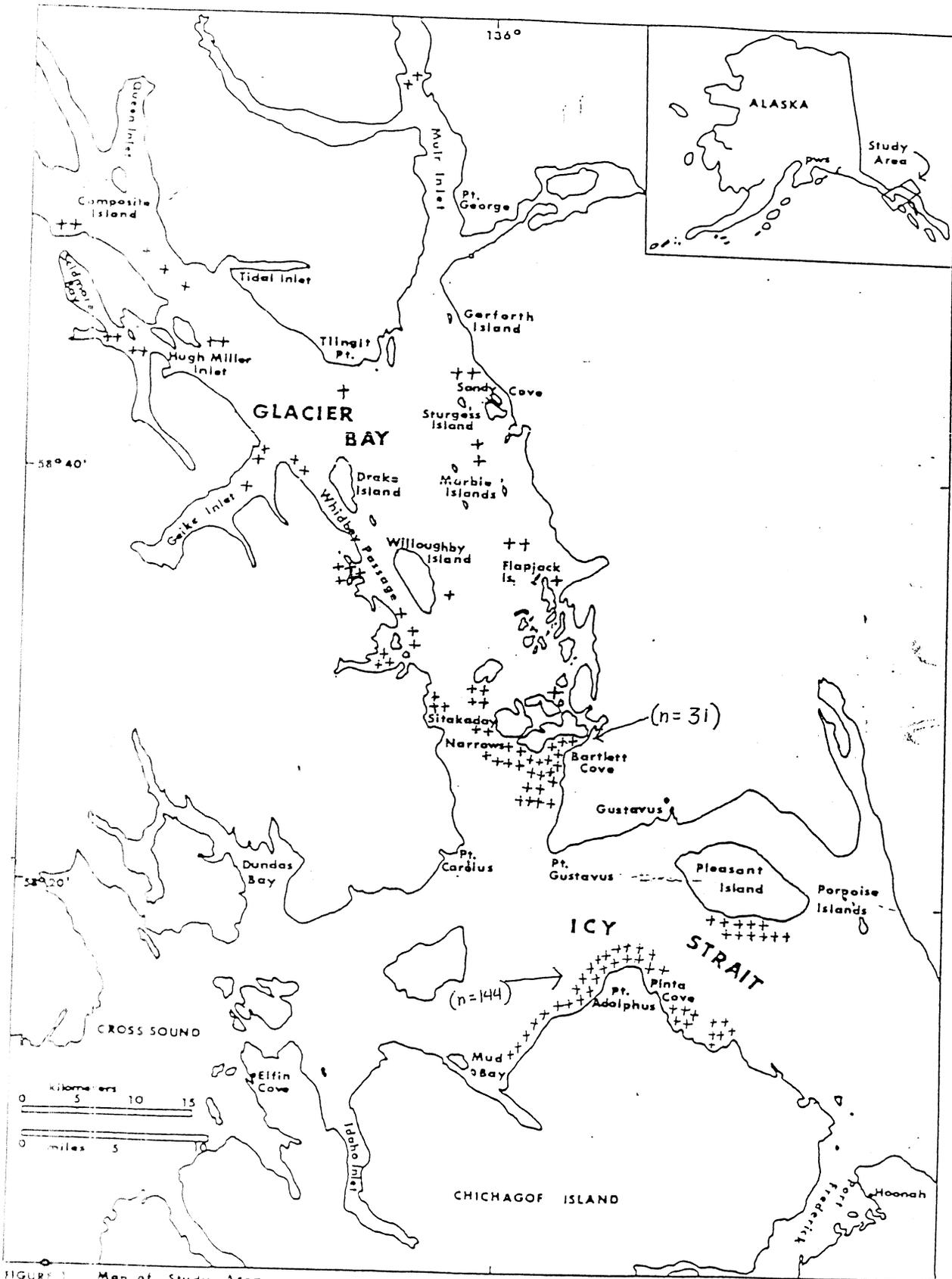


FIGURE 1. Map of Study Area

Figure 2

Humpback Whale Counts in Glacier Bay and Icy Strait: 1982-1991

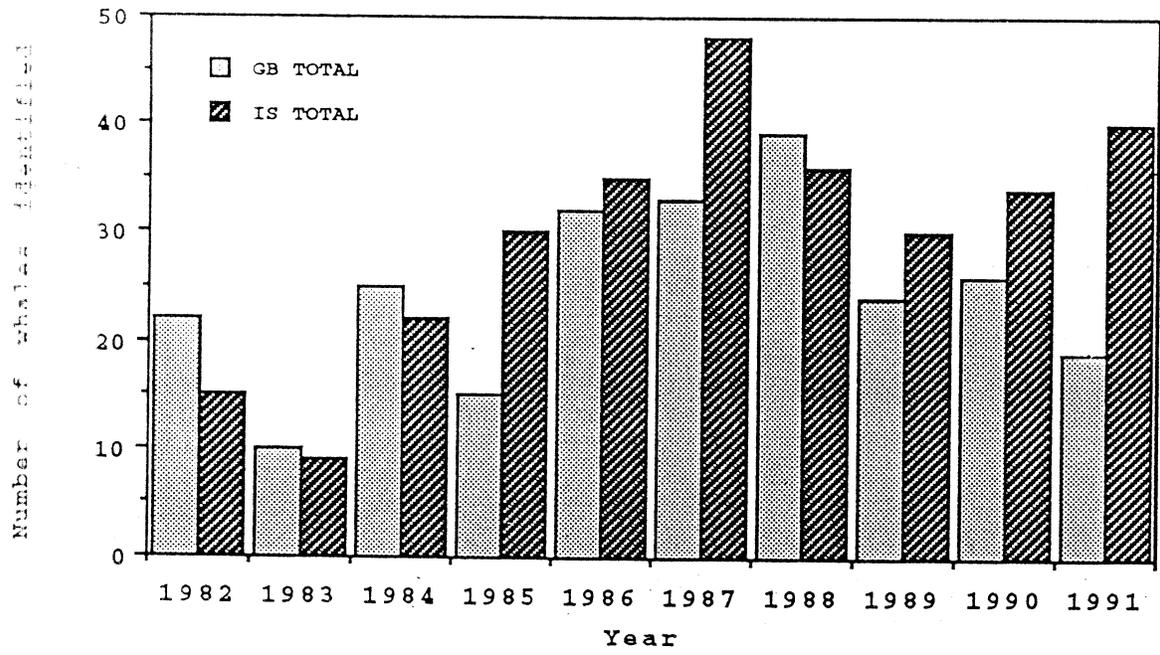
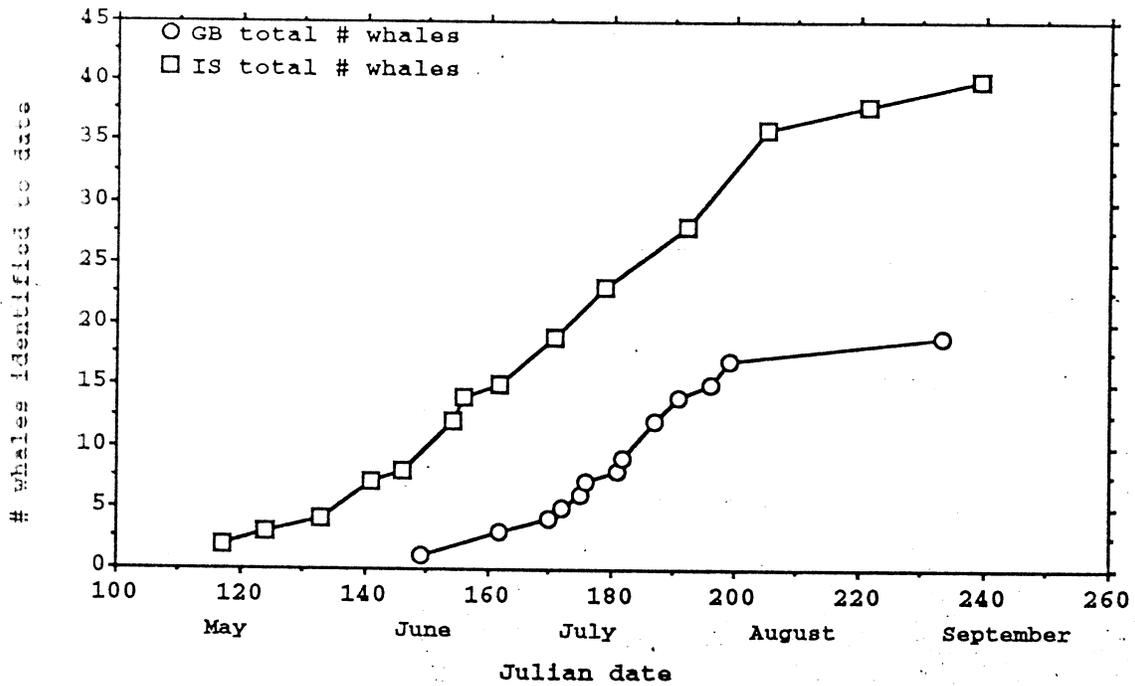


Figure 3. Accumulation of Humpback Whale Sightings in Glacier Bay and Icy Strait: Summer 1991







APPENDIX 1. (continued)  
HUMPBACK WHALES GLACIER BAY (G) AND ICY STRAIT (I) 1991

WHALE ID # NAME	DATE															
	AUGUST							SEPTEMBER								
	01	02	05	08	09	13	14	16	20	22	27	29	01	02	03	12
530						I				I						I
352				I		I		G		I		I				
516 GARFUNKLE						I						I				I
157 MD			G									I				
236 LEIGH								G		I						
577 SCOPER										I		I				
118 CHOP SUEY			G			I				I						I
219						I				I		I				
1018															G	
587 GERTRUDE				I												I
AIS91-1																
586 AIS91-2																
351				I		I										I
166 FRENCHIE										I						
1031																
564 RU TAYLOR																
117 WHITE EYES							G		G						G	
186										I						
801 AGB91-2															G	
237 DIKE				I												
545				I								I				
155 FRECKLE FLUKE						I				I		I				
1055 AIS91-3										I						
1021				I		G	G	G		G	G					
1012			G		G											
1014 AGB91-1																
353						I				I						
200 AIS91-4																
539 MAX						I										
1057 CALF OF MAX						I										
535 QUILTS		G	G		G	G										
159			G					G								
1063 AGB91-3							G									
AGB91-4																
250																
AIS91-5																
875										I						
581				I										I		
1058 CALF OF 581				I										I		
235 SPOT		G	G		G		G					G		G		
1059 CALF OF 235		G	G		G		G					G		G		
573						I				I						
193										I						
1060 CALF OF 193						I				I						
616 LESSER																
941						I										
1042																
AIS91-6																
1061 AIS91-9						I				I						I
1062 AIS91-8				I												
441										I						
221										I						I