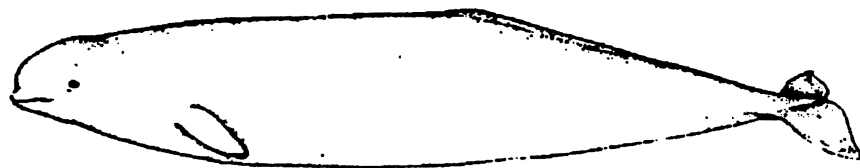
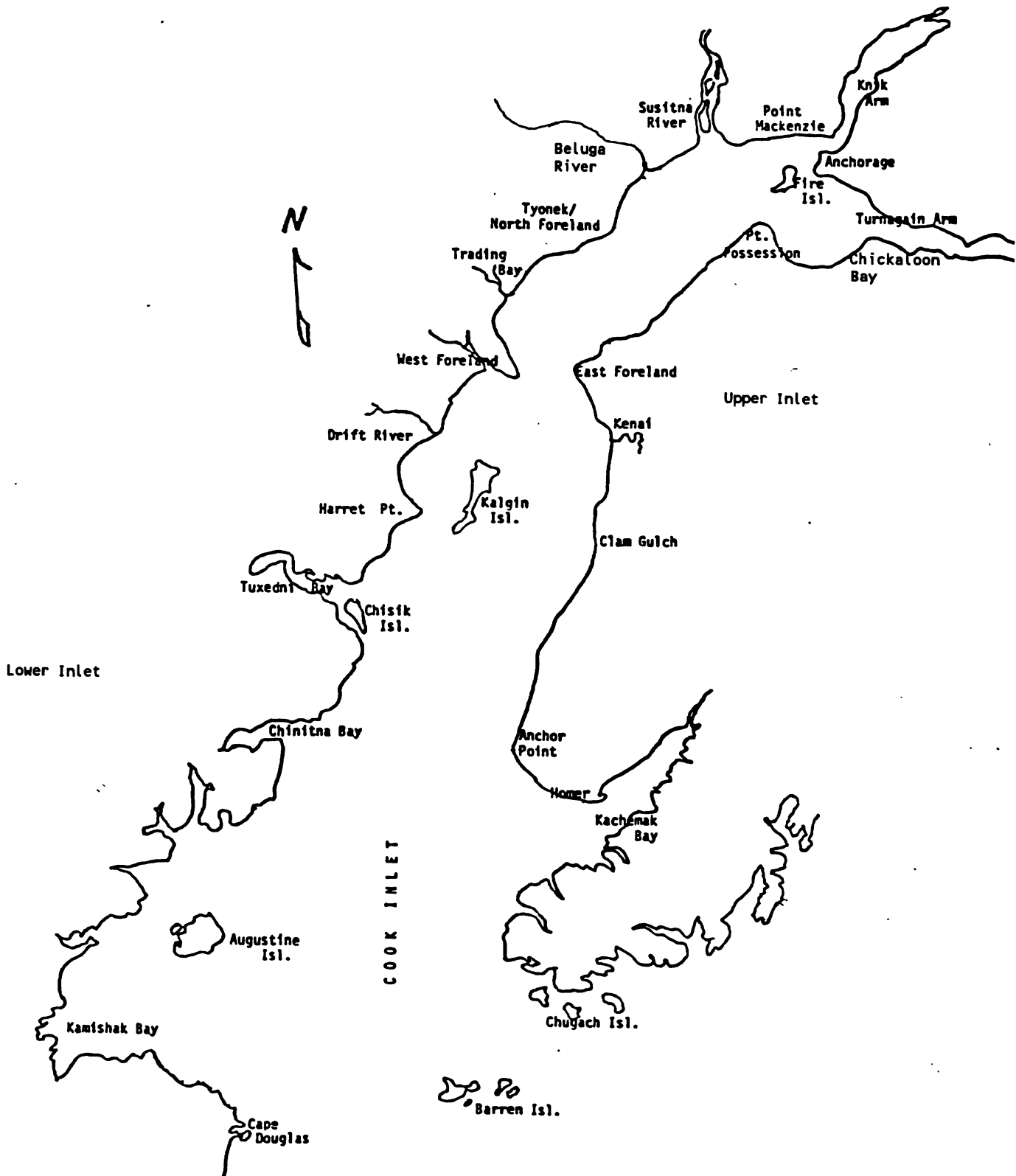

**Status Report on
Cook Inlet Belugas
(Delphinapterus leucas)**



1992
Prepared by the
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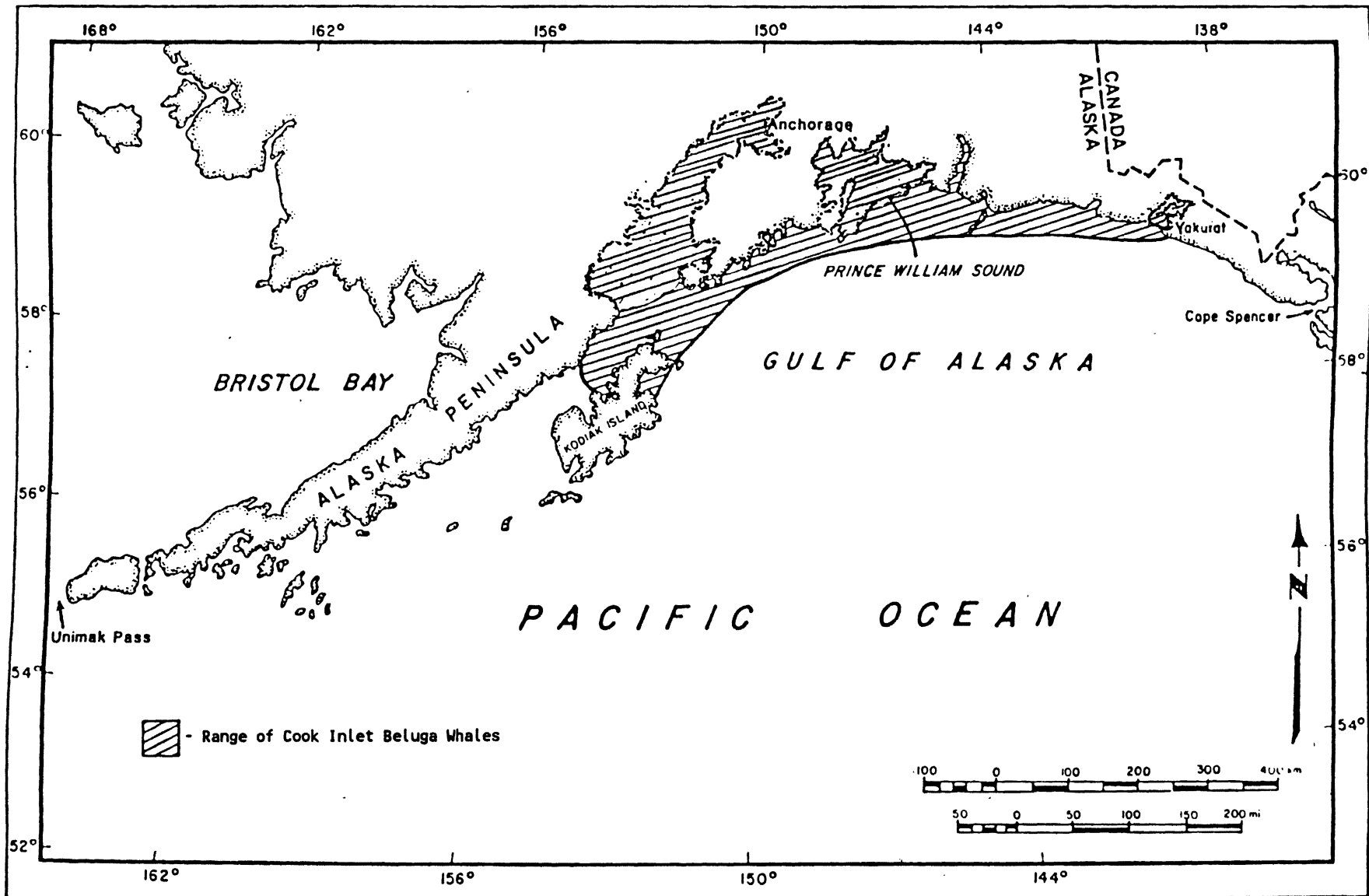
Introduction

In June 1991 aerial surveys were flown to determine the population size of the Cook Inlet stock of beluga whales. Strip and nearshore transects which paralleled the general outline of the shore were flown.

Because the beluga whale (Delphinapterus leucas) population in Cook Inlet, Alaska appears to be a small geographically isolated population of the species, human-induced perturbations could have a dramatic affect on the stock. The summer concentrations of this stock are exposed to the largest industrialized coastal area and the largest human population in Alaska. This report will discuss the stock's distribution, population size, food habits, reproduction, subsistence harvest and recommendations for monitoring the status of the Cook Inlet beluga whales.

Distribution of the Cook Inlet Population

Belugas are a circumpolar species. They are found in the waters of Canada, Alaska, Russia, Norway and Greenland. In Alaska two stocks are currently recognized: the western arctic stock consisting of belugas that seasonally occupy waters of Bristol Bay and the Bering, Chukchi, Beaufort seas; and the Cook Inlet stock which in some years has occupied areas of the Gulf of Alaska from Kodiak to Yakutat Bay. (Figure 1)



Range of Cook Inlet Beluga Stock
Figure 1.

Belugas have been observed regularly in Cook Inlet from March through November. Sightings have not been documented for the months of December through February. Seasonal concentrations occur at the entrance to Cook Inlet in Kachemak Bay, in early May (Personal communication - Pratt Museum) and in the upper Inlet during late May and June. Sightings of small groups are common throughout the Inlet from July through November.

The largest counts of belugas have been made in the northern most portion of Cook Inlet's estuaries during May and June. Reasons for this concentration are not entirely understood however, beluga stocks commonly concentrate near river mouths in the spring. In Canada, belugas have been clearly seen rubbing on coarse gravel substrates (K. Frost, personal observations). This behavior is associated with their annual epidermis molt which appears to be unique to belugas (Geraci et al. 1990). Warm coastal water may accelerate the breakdown of old epidermal cells and be important for rapid cell growth that occurs during the molt (Finley 1982; Frost et al. 1990).

Other investigations have suggested other factors to explain concentrations of belugas in nearshore waters. One suggestion has been that warm, coastal waters could confer a thermal advantage to neonates (Frakar et al. 1979). Work in aquaria suggest that thermal requirements are critical to the survival of some dolphin species.

Availability of an important food source may also cause nearshore or river mouth concentrations. In Bristol Bay belugas feed in estuaries in the spring and may be drawn by both downstream migrating salmon (Oncorhynchus sp.), smolts, and returning adults and a run of smelt (Osmerus dentax). In Cook Inlet the arrival of belugas in the northern part of Cook Inlet coincides with large runs of eulachon, Thaleichthys pacificus which spawn in the lower Susitna River in late May and early June. During aerial surveys in June 1991 we observed concentrations of whales in the mouth of the Susitna River during a eulachon migration. Belugas were also observed in Chickaloon Bay adjacent to the south shore of Turnagain Arm which does not have a eulachon run.

Aerial surveys on August 1 and 2, 1991 to enumerate harbor porpoise in Cook Inlet did not find any belugas below the upper Inlet (Dalheim pers. comm.). Belugas have appeared in the lower Cook Inlet by November (Fall et al., 1984). Calkins (1983) believes that during heavy ice years, some belugas may leave Cook Inlet entirely. Sightings outside of Cook Inlet have been made near Kodiak Island in March and in Shelikof Strait in July (Harrison and Hall, 1978). During late May of 1976, a group of 21 belugas was sighted in Yakutat Bay, 640 km (400 miles) southeast of Cook Inlet (Calkins and Pitcher, 1977).

Belugas do not routinely occupy Prince William Sound. Hall (1979) observed no belugas in his 2,945 cetacean sightings of

Prince William Sound. Harrison and Hall (1978) reported the sighting of a single individual near the Montague Strait entrance to Prince William Sound in March, 1976.

In 1988 a single beluga was observed by sport fishermen inside Aialik Bay, near Seward, Alaska. Color photos show the animal to be a sub adult milling about several small boats. They reported that no other belugas were observed in the vicinity.

Factors that could influence beluga distribution in Cook Inlet are sea ice in the winter, availability of prey, and habitat requirements pertaining to molting or neonate survival. The lack of food availability is most likely to influence the southern shift in distribution of belugas during the winter. Their northward return in the late spring coincides with the arrival of migratory prey species.

Abundance Estimates

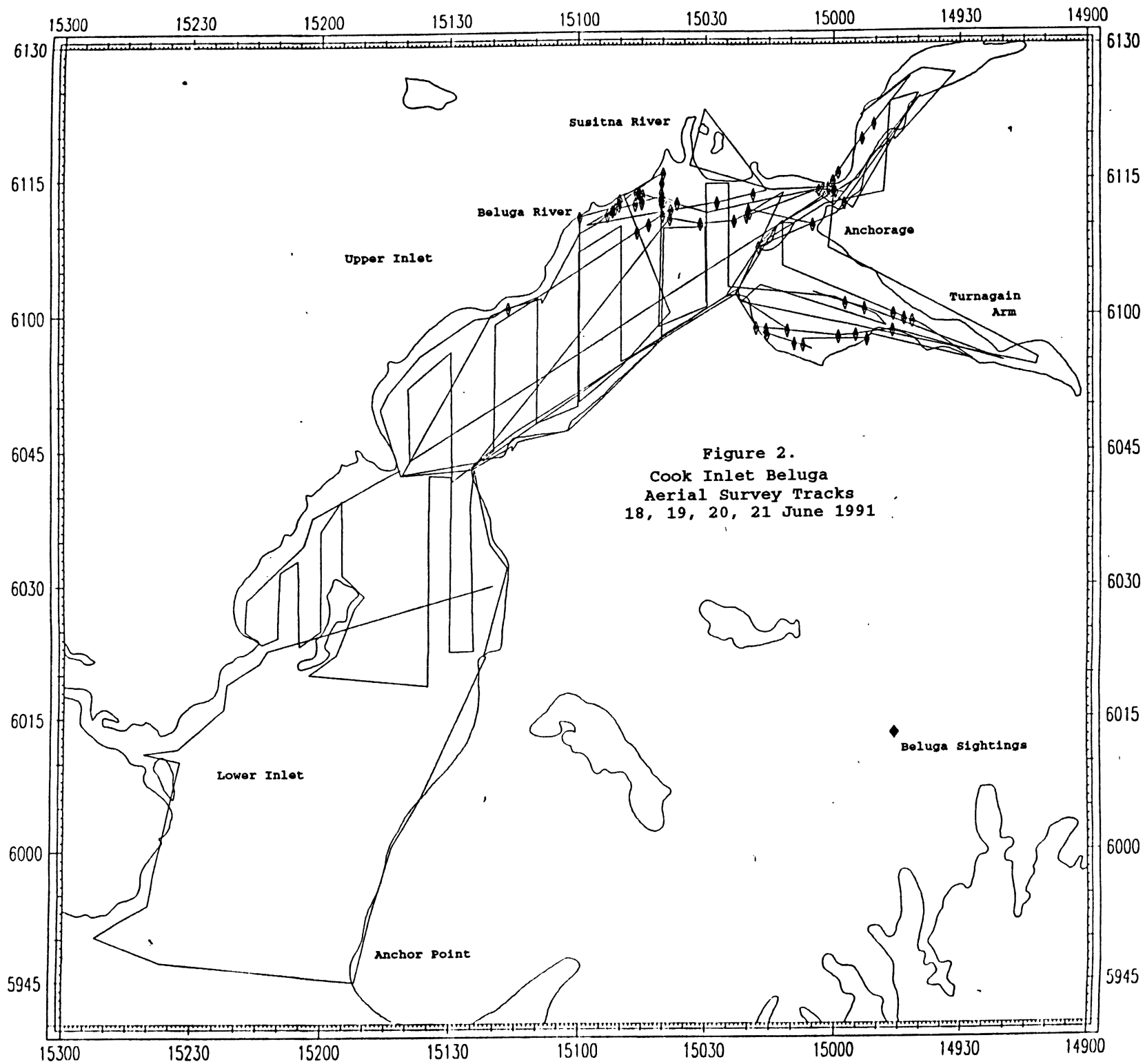
There are at least 40,000 to 55,000 beluga whales world-wide (Braham, 1984). A minimum of 15,800 to 18,400 belugas are estimated to summer in Alaska and western Canada (Hazard, 1988).

The first aerial surveys for beluga in Cook Inlet were conducted in 1962 - 64 (Klinkhart, 1966). In August of 1978, Murray and Fay (1979) surveyed and counted whale concentrations in the central Inlet. Calkins surveyed the upper Inlet area in 1979,

1982 and 1983. He reported the highest minimum direct count for a single day was 479 animals on August 21, 1979. During aerial surveys of upper Cook Inlet between 17 May and 27 August, 1982, 200-300 belugas were seen in one concentration area (Calkins, 1983).

Surveys in Cook Inlet have been limited to the concentration areas in the upper Inlet (Hazard, 1988). The estimates for the size of the population from these aerial surveys have generally ranged between 200 to 500 individuals.

Our 1991 surveys which included systematic strip and nearshore transects covering 1,600 nautical miles (Figure 2) substantiated for the first time that the Cook Inlet beluga stock is found primarily in the northern portion of the Inlet during the month of June. Our highest count for one day was 242 belugas all found in the upper Inlet estuaries. Aerial strip surveys and nearshore transects which paralleled the general outline of the lower Cook Inlet shore, south to Anchor Point on the east side of the Inlet and Chinitna Bay on the West side of the Inlet produced no sightings. A subsequent NMFS harbor porpoise aerial survey using a sawtooth pattern on August 1 and 2 from upper Cook Inlet to the Barren Islands in the Gulf of Alaska produced no beluga sightings below the upper Inlet (Dalheim pers. comm.).



Unfortunately, upper Cook Inlet is very turbid and aerial sightings of belugas can only be observed as they surface to breathe. By tracking radio tagged belugas under similar turbid water conditions in Bristol Bay Frost (1987) found that a correction factor of 2.72 was needed for unseen animals. Using the highest one day count of 242 animals and multiplying by Frost's factor there were an estimated 653 belugas in the Cook Inlet stock in 1991.

Food Habits

The only information on the food habits of belugas in Cook Inlet concerns the consumption of salmon. In January 1986, thirteen Floy spaghetti tags were taken from the stomach of an adult male beluga, found dead in the upper Cook Inlet. All the tags had been placed on adult salmon migrating up the Susitna River at mile 20, 22 and 80 (Calkins, 1989). It is assumed that the beluga consumed the salmon after they spawned and subsequently were flushed downstream since whales have never been observed in the upper portions of the Susitna River. Based on interviews with Tyonek residents, belugas are said to feed on salmon, eulachon and tomcod that approach river drainages to spawn (Fall et al., 1984). Observations of Cook Inlet belugas chasing silver salmon in Eagle River which drains into Knik Arm were made in 1991. Observers report belugas crashing into the river banks in an attempt to capture prey (Gossweiler, pers. comm. 1991).

Belugas feed in the upper 100 m of the water column and are known to consume at least 100 different species of fish and invertebrates in other parts of their circumpolar range. Smelt, capelin, eulachon, herring (Clupea harengus) and various species of cod are common in their diet.

Dense concentrations of prey are believed to be essential for successful foraging by belugas (Lensink, 1961; Hazard, 1988). Thus large aggregations of belugas could reflect feeding on dense prey concentrations of eulachon in the upper Cook Inlet drainages. Beginning in May and continuing on through August, all five North Pacific salmon species appear in the areas that belugas frequent.

Belugas are known to exhibit differential food preferences by age and sex. In general, young animals take small prey such as shrimp and adults take large fish (Hazard, 1988). Male belugas have been found to take larger fish than females (Seaman et al., 1982). Since food is swallowed whole (Fay, 1971; Fraker, 1977), prey size would be limited by the capacity of the esophagus. Presumably, Cook Inlet beluga feeding patterns would be similar, although food habits have not been studied.

Reproduction Parameters

Knowledge of reproduction parameters and rates is vital to understand the dynamics and status of the population. Very little is presently known about any of the reproduction parameters for the

Cook Inlet beluga stock.

Calving Areas

Throughout their circumpolar distribution, calving occurs during the late spring to early summer with the female producing one calf. Calving is known to occur in coastal areas where belugas congregate in summer, particularly in estuaries. The calving season seems to be more prolonged in lower latitudes and shorter in high latitudes. The young are dark brown or gray and are more difficult to detect than the white adults. Pigmentation is retained to about age 6. Whitening of the skin begins by age 6 and is completed by age 13 (Braham, 1984).

In Cook Inlet, the locations of calving areas have not been documented. Calkins (1983) noted that in upper Cook Inlet neonates were not found in June, but were seen in mid-July. He hypothesized that calving begins between mid-June and mid-July and may occur in the large estuaries of the upper Inlet. During our aerial surveys in June 1991 no sightings of neonates were made.

Little is known about sex ratios in wild populations of belugas. Adult males are considerably larger than adult females; however, other sexual features are not distinct and cannot be distinguished in the field. Based on overall harvest samples, Burns and Seaman (1985) reported a 1:1 sex ratio in northern Alaska.

Age at Sexual Maturity

The mean age at sexual maturity of northern Alaska belugas is slightly younger for females than for males. Age of first of pregnancy is 4 to 7 years, with first births at age 5 to 8 (Burns and Seaman, 1985). Braham (1980) determined the average age at first pregnancy is 6 years. Females are about 2.7 m in length at maturation, or about 85% of their full adult length (Braham, 1984). Males reach sexual maturity at age 7 to 9, attain a maximum length of 5 m, and weigh up to 1.4 mt (Brodie, 1971; Sergeant, 1973; Braham, 1984).

The color change to white can be used as a gross index of sexually mature animals in the population (Braham, 1984). In this regard, Murray and Fay (1979) calculated a 1:6 ratio for brown and gray (immature) versus white (adult) animals in their count of 150 belugas in central Cook Inlet in August 1978. They report that this ratio of 0.14 is not significantly different from that observed in harvest samples from the St. Lawrence River estuary in eastern Canada (Vladykov, 1944). Aerial observers were not able to distinguish between immature and adult belugas during the 1991 flights. Extremely turbid waters did not allow for color identification of sub adults.

Pregnancy Rates

A three year reproductive cycle appears to exist for belugas examined from northern Alaska (Braham, 1984; Seaman and Burns,

1985), although some females are said to give birth at two-year intervals (Sergeant, 1973; Burns and Seaman, 1985). An observed pregnancy rate of 0.41 (Sergeant, 1973) or 0.44 (Seaman and Burns, 1981) and a crude birth rate of 0.33 to 0.38 or 32 to 37 months (Brodie, 1971; Sergeant, 1973) was used by Braham (1984) in calculating gross annual recruitment rates (see below).

Reproductive Rates

Belugas are known to live in excess of 30 years, but because of the loss of dental layers in older individuals, aging technique cannot define maximum longevity (Hazard, 1988). Males of 38+ years and females of 35+ years are known (Burns and Seaman, 1985). Although the age of last pregnancy has been estimated at about 21 years by Brodie (1971), Burns and Seaman (1985) have evidence that females are reproductively active throughout their adult life. However, the reproductive rate declines markedly in older animals.

The gross annual recruitment rate (GARR) is defined as the rate of calf production for the total population without correction for mortality. GARR has been estimated for the northern Alaska populations in two ways:

- (1) Estimates based on percentages of calves seen during surveys have ranged from 0.06 to 0.14 (Braham, 1984).
- (2) Estimates of GARR from crude birth rate calculations and

the proportion of mature females in the population have ranged from 0.09 to 0.13 (Braham, 1984), where gross annual reproductive rate $(r) = \text{the crude birth rate } (b) \text{ times proportion of mature females in the population } (p) \text{ divided by } 2 \text{ (assumes that half the population is female)}$.

Lactation

Duration of lactation has not been clearly defined. The total lactation period has been estimated at between one and two years (Brodie, 1971; Sergeant, 1973) or an average of 23 months (range 18 to 32 months; Braham, 1984). Dependent nursing may be considerably shorter than the total nursing period, with calves taking some prey after the first 12 to 18 months (Burns and Seaman, 1985). Females are capable of becoming pregnant again while still lactating. Sergeant (1973) estimated that 25% of females successfully breed during lactation, presumably 10 months after giving birth.

Gestation

Gestation is estimated to last 14 to 15 months (Brodie, 1971; Sergeant, 1973). With this gestation period and peaks of birth in late June to mid-July, breeding in Cook Inlet would be estimated to peak in late April. However, specimens from other areas that were examined indicates that breeding probably occurs earlier than expected from gestation data, perhaps from late February to early April. This timing discrepancy could only be explained if peak

calving occurs earlier than believed, if the gestation period is longer than 14.5 months, or if delayed implantation occurs (Burns and Seaman, 1985).

Natural Mortality and Survivorship

Data on the natural mortality of all the beluga stocks are extremely limited. Causes of natural mortality in Cook Inlet could include entrapment in sea ice, strandings, (caused by 36-foot tidal fluctuations) and predation by killer whales.

Natural Predation

Killer whales (Orcinus orca) are known to attack beluga whales on occasion (Burns and Seaman, 1985), and are their only known predator in Cook Inlet. Killer whales inhabit lower Cook Inlet and are occasionally found in the turbid waters of the upper Inlet. On May 15, 1991, six killer whales were stranded during a low tide in the vicinity of a pod of beluga whales. After refloating, their heading coincided with the location of belugas at the mouth of Turnagain Arm, Cook Inlet. Sergeant and Brodie (1969) hypothesized that beluga whale distribution is influenced by killer whale distribution. The extent of predation by killer whales on the Cook Inlet population is unknown.

Subsistence Harvest

The Alaska and Inuvialuit Beluga Whale Committee reported the following recent harvests for 1987 - 8 whales; 1988 - 12 whales; 1989 - 11 whales; 1990 - 7 whales.

Natives residing in Anchorage harvested most of the animals. Resident natives from the village of Tyonek on the northwest side of upper Cook Inlet occasionally take animals.

Inquiries occasionally are received by enforcement officials concerning the availability of belugas for harvesting near the mouth of the Kenai River. However, no landings have been reported except for the upper Inlet near the Susitna River drainages.

No data on struck and lost animals is available for the Cook Inlet harvest, although estimates of loss elsewhere range from 25 to 85% depending on the method of harvest (Braham, 1984). The NMFS will be collecting Alaska Native harvest data on marine mammals in Alaska and additional information on Cook Inlet beluga subsistence takes may be available in 1993. Based on an estimated 1991 population of approximately 653 whales, it would appear that the population could be sensitive to the current level of harvest.

Fisheries Interactions

There is no published data available on fishery related-mortality in Cook Inlet. Personal communications with both set net

and draft gillnet salmon fisherman reveal few incidents of entanglement or collisions. Over 600 drift boats and 300 set net fishermen are active when belugas are present in Cook Inlet. However, most of the fishing effort takes place south of the area that belugas were found concentrating in during June and July of 1991.

Because of the small size of the population, entanglement data needs to be documented. Gross examinations of several stranded beluga carcasses by NMFS in the northern portion of Cook Inlet have not revealed any evidence of entanglement.

Human-Induced Perturbations

Over 50% of Alaska's human population live on or near the shoreline of the Cook Inlet beluga summer range. Most of the Anchorage Municipality's primary treated sewer waste is discharged into Cook Inlet within the area that the species utilizes. There are also 13 offshore oil production platforms, one onshore petroleum refinery and one natural gas facility serviced by tankers in Cook Inlet. Because of the extreme tidal conditions, recreational boating activities are limited to river boats accessing salmon streams in the upper Inlet and small craft launched from beaches in the lower Inlet.

With industrialized activities in Canada, PCB levels up to 200 parts per billion were detected in beluga blubber. It is believed

that metabolism of PCB's by marine mammals is slower than for terrestrial mammals, and consequently the toxicological effects may be more long-term (Tatsukawa, 1985). Heavy metals also occur in Cook Inlet both naturally and probably from various discharge sources. Sergeant and Brodie (1975) report that mercury levels in excess of 0.5 ppm were found in belugas harvested in Hudson Bay, Canada. There is no information on heavy metals or PCB's relating to Cook Inlet belugas. An attempt will be made by the NOAA's National Marine Mammal Tissue bank to collect and analyze tissue and blubber taken from harvested animals during 1992 and subsequent years.

Recommendations

Distribution, density and abundance

Limited data suggest that numbers of belugas in the northern Alaska stock remained stable over the past 20 to 30 years (Frost and Lowry, 1990). The status of beluga whales in Cook Inlet should be determined by replicating and expanding the 1991 abundance and distribution effort for two consecutive years.

Trend counts

The actual numbers of belugas observed in 1991 indicate a small stock that appears to be isolated. A trend count during late May or early June should be made every year after the two consecutive distribution surveys have been completed. Costly aircraft aerial

surveys must be employed because of the unavailability of natural viewing perches that are found in other beluga stock ranges.

Winter distribution

December through February sightings of the Cook Inlet stock are virtually unknown. The hypothesis is that they remain in the lower Inlet or move into other areas of the Gulf of Alaska avoiding sea ice or seeking prey in yet unknown areas. A combination of satellite tags and/or aerial surveys of belugas should be undertaken in connection with the proposed Department of Interior OCS oil and gas lease area studies of lower Cook Inlet and Kodiak/Shelikoff area of the Gulf of Alaska.

Genetic status of the stock

DNA studies should be pursued through the Alaska and Inuvialuit Beluga Whale Committee to determine whether the Cook Inlet stock is genetically different from the northern Alaska beluga stock.

Life history information

Beluga carcasses from harvested and stranded animals in Cook Inlet should be sampled whenever possible to collect information on age, diet, and reproduction. The use of intrusive collection methods should be avoided. Data collection to determine whether belugas are dependent on any particular estuary in Cook Inlet should be pursued.

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