SUSITNA HYDROELECTRIC PROJECT

PHASE II PROGRESS REPORT

BIG GAME STUDIES

Volume IX BELUKHA WHALE

Donald G. Calkins

ALASKA DEPARTMENT OF FISH AND GAME
Submitted to the Alaska Power Authority
April 1983

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PREFACE

In early 1980, the Alaska Department of Fish and Game contracted with the Alaska Power Authority to collect information useful in assessing the impacts of the proposed Susitna Hydroelectric Project on moose, caribou, wolf, wolverine, black bear, brown bear and Dall sheep.

The studies were broken into phases which conformed to the anticipated licensing schedule. Phase I studies, January 1, 1980 to June 30, 1982, were intended to provide information needed to support a FERC license application. This included general studies of wildlife populations to determine how each species used the area and identify potential impact mechanisms. Phase II studies continued to provide additional information during the anticipated 2 to 3 year period between application and final FERC approval of the license. Belukha whales were added to the species being studied. During Phase II, we are narrowing the focus of our studies to evaluate specific impact mechanisms, quantify impacts and evaluate mitigation measures.

This is the first annual report of ongoing Phase II studies. In some cases, objectives of Phase I were continued to provide a more complete data base. Therefore, this report is not intended as a complete assessment of the impacts of the Susitna Hydroelectric Project on the selected wildlife species.

The information and conclusions contained in these reports are incomplete and preliminary in nature and subject to change with further study. Therefore, information contained in these reports is not to be quoted or used in any publication without the written permission of the authors.

The reports are organized into the following 9 volumes:

Volume I.	Big Game Summary Report
Volume II.	Moose - Downstream
Volume III.	Moose - Upstream
Volume IV.	Caribou
Volume V.	Wolf
Volume VI.	Black Bear and Brown Bear
Volume VII.	Wolverine
Volume VIII.	Dall Sheep
Volume IX.	Belukha Whale

Summary

Belukha surveys were flown in Upper Cook Inlet between May 17 and Aug. 27, 1982. A concentration area was identified nearshore from the mouth of the Little Susitna River to the mouth of the Beluga River. Exact timing of use of the area has not been determined, however, the concentration appeared to build up in late May and lasted through mid-June. It is probable that this concentration was in part associated with calving and breeding although no calves were positively identified because of generally poor viewing conditions. The concentration appeared to involve 200 to 300 animals, however accurate counts were not possible because of, again, poor viewing conditions. The Belukha concentration near the mouth of the Susitna River appeared to coincide with the arrival of large numbers of eulachon which spawned in the lower Susitna River in late May and early June. This run of eulachon was estimated to total several million fish. King salmon are probably not particularly important to this concentration of belukhas although large male belukhas probably do take some king salmon. Probably the only other salmon species from the Susitna River system available in sufficient numbers to be considered significant prey to the belukhas concentrated in late May and early June would be the sockeye. No information is presently available which would allow conclusions on belukha predation on salmon smolts from the Susitna River.

Given the present state of our knowledge, we cannot accurately predict impacts on Cook Inlet belukhas from the proposed dams on the Susitna River. It is possible that the overall population could suffer reduction in numbers both directly by alterations in the habitat, particularly the concentration area near the mouth of the Susitna River and indirectly by reduction of available food species.

Introduction

The belukha whale (*Delphinapterus Leucas*) is a small, toothed whale, which inhabits arctic and sub-arctic waters. As adults, belukhas are all white in coloration, range from 3.1 to 4.4 m in length and weigh 480-1200 kg. Males generally are larger than females. Newborn calves are a dark gray color, shaded with blue or brown. This coloration is gradually lost as the animal approaches the age of maturity.

Belukhas range throughout Cook Inlet, concentrating in the upper Inlet in the spring and summer, and moving to the lower Inlet during the winter. There is some evidence which suggests that during winters of heavy ice in Cook Inlet some of the belukhas may leave the Inlet entirely and move across the north Gulf of Alaska to as far away as Yakutat Bay (Calkins 1979). In the north Gulf of Alaska, belukhas have been sighted in Shelikof Strait, near Kodiak Island, in Prince William Sound, and in Yakutat Bay (Fiscus, Braham and Mercer 1976; Harrison and Hall 1978; Calkins and Pitcher 1978; Calkins 1979; and Calkins, unpub. data). There is some evidence which indicates that some parts of these areas formerly had large numbers of belukha, at least seasonally, but now the population appears reduced (Calkins, unpub. data).

The Cook Inlet stock of belukha whales was estimated at 300 to 400 animals by Klinkhart (1966). Recent surveys in the Inlet have shown

that the population exceeds 400 animals (Calkins unpub. data). However, all surveys of belukhas in Cook Inlet have consisted of aerial counts of shoreline areas. No complete systematic census of Cook Inlet belukhas has been completed, therefore no accurate estimate of the stock can be made. The best information we presently have is that there are over 400 whales which inhabit Cook Inlet in the summer.

Some evidence exists which suggests that the Cook Inlet stock is genetically isolated from other belukha whale stocks. The next nearest stock of belukhas is the population which inhabits Bristol Bay. We know of no instance where any interchange has taken place between these two stocks. Fay (Pers. Comm) suggests that some morphological differentiation has taken place in Cook Inlet. He was able to examine a small series of skulls from Cook Inlet and compared them to other areas. However the Cook Inlet sample was too small to conclude that craniological morphology has actually changed in this stock.

Belukhas are known to feed on a broad assortment of fishes and invertebrates in other areas, however no direct information is available on prey selection by belukhas in Cook Inlet. In Bristol Bay belukhas concentrated on rainbow smelt in May and shifted to downstream migrating salmon smolt by June 1. By late June the Bristol Bay belukhas were concentrating on adult salmon (Brooks 1954). Other food species utilized by belukhas in Bristol Bay were flounders, lamprey blennys, shrimp and sculpins (Brooks 1954). In Escholtz Bay belukhas ate safron cod, sculpins and small amounts of shrimp, isopods, snails, polycheatas and octopus (Seaman et. al 1982).

Very little information is available on the belukhas ability to tolerate perterbations in it's environment. We know nearly nothing about the consequence of reducing the food supply or changing the heat budget of the river, however slight these changes might be. We do know that belukhas will abandon areas if the environmental perterbations are great enough as was the case in the St. Lawerence River where belukhas quit using the Manicougan and Outardes Rivers after they were damned for hydroelectric purposes. Also human disturbance can have extraordinary effect as was the case when belukhas failed to return to the Beluga River in Cook Inlet after heavy hunting pressure.

Methods

Shoreline aerial surveys of upper Cook Inlet (Fig. 1) were conducted periodically from May 17 through August 27, 1982 using single engine aircraft with water landing capability. The surveys were generally flown at an altitude of 50 to 75 meters and approximately 500 meters offshore from the local tide water line. When groups of belukhas were sighted the altitude was increased to 200 meters and the groups were circled while two observers counted all belukhas sighted.

Turbid water conditions along with short surface times for the belukhas prevented accurate and complete counts of all belukhas present. The numbers of belukhas counted represents a minimum number of animals which were present at the time of the count. An attempt was made to

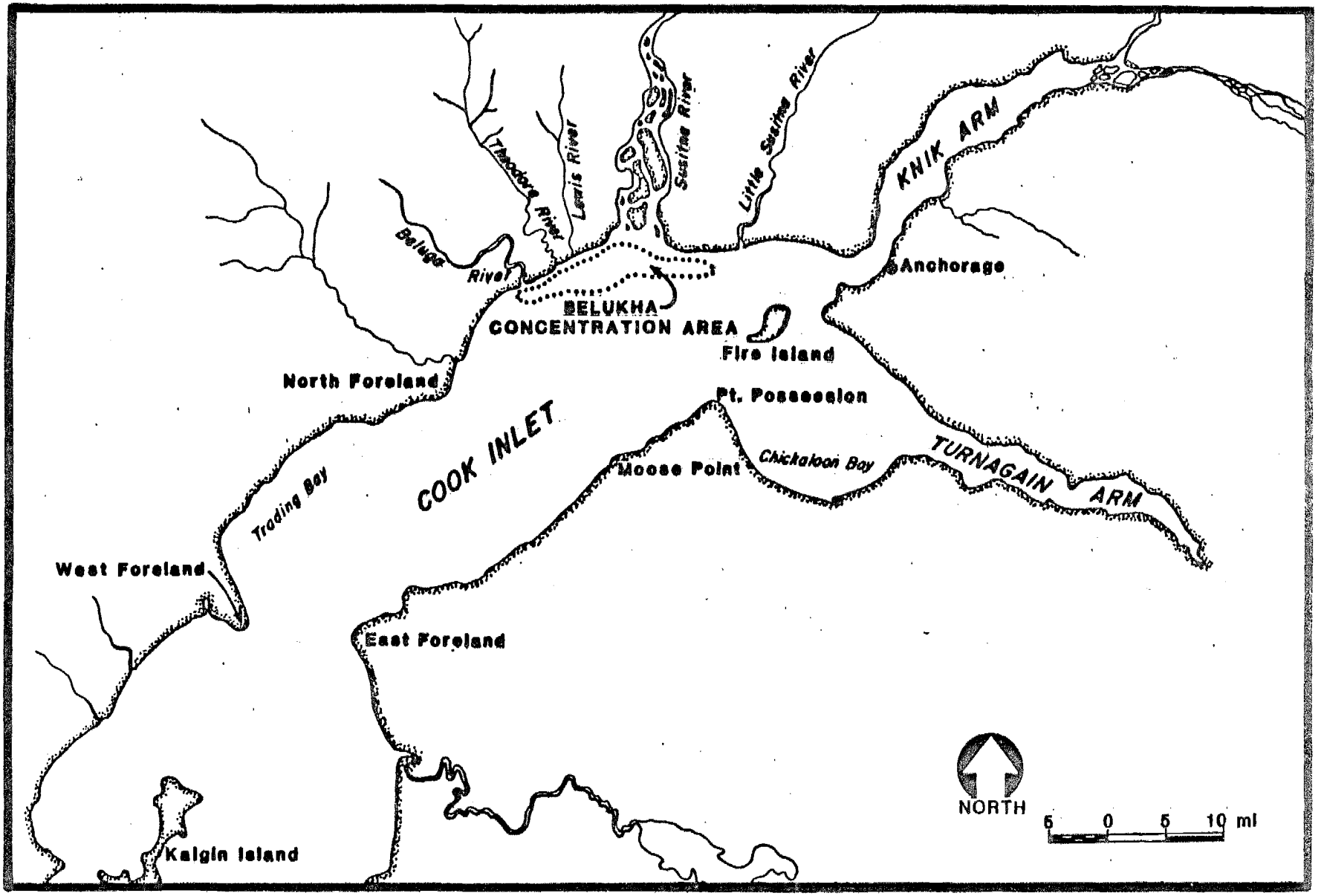

Figure 1. Upper Cook Inlet Belukha study area.

identify calves in all groups observed by circling and observing at lower altitude.

Results and Discussion

Belukha surveys are summarized in Table 1. A total of 9 surveys were flown throughout the period. Each survey covered the same general area of upper Cook Inlet shoreline, including all areas north of a line between the north Foreland and moose point. On the June 18th and June 22nd surveys the survey area was extended to the East and West Forelands. No neonates were positively identified on any of these surveys due to their turbid water conditions. However, on both the May 17 and the June 4 surveys very dark, small belukhas were sighted. These could have been newborn calves although this was not determined because newborn calves and yearlings only differ in length by approximately 30 cm (John Burns pers. comm.). Determining 30 cm difference between animals from an aircraft at 100 to 200 m altitude and moving at an airspeed of approximately 80 kts with the belukhas in highly turbid water proved to be an impossible task.

Table 1. Belukha sureys of upper Cook Inlet May 17, 1982 through Aug 27, 1982.

Date	Number Sighted	Location Sighted
May 17	15	South of Little Susitna R.
	10	North of Beluga R.
	15	W. pt. Fire Island
June 4	150-200	Between Susitna R. and Lewis R.
	100	Lewis R. to Beluga R.
	15	SW side Chickaloon Bay
	20	Chickaloon R. Mouth
June 11	200-300	Lewis R. to Beluga R.
June 18	108	Susitna R. Mouth
	39	Ivan R. to Beluga R.
	50-75	Beluga R. and Mouth
	78	Beluga R. to Tyonek village
	30	Chickaloon Bay
June 22	15	Boulder pt. (N. of Kenai)
	4	Mouth of Susitna R.
	50-75	Lewis to Theodore R.
	40	Beluga R. and Mouth
	25	McArthur R. and Mouth
July 2	46	Susitna R. to Beluga R.
	7	
July 8	7	Beluga R. area
Aug. 5	63	Susitna R. Mouth to Beluga R.
	62	McArthur R. area
	30	Chickaloon Bay
	21	Potter Marsh
Aug. 27	15	Mouth of Beluga R.

Early in the surveys one area was identified as a concentration area. This area was just offshore from the water line and extended from the mouth of the Little Susitna River to just south of the mouth of the Beluga River. The exact timing of use of this area has not been determined. A large number of belukhas could have arrived and remained in this area prior to the beginning of surveys on May 17th. The pilot of the aircraft for the first survey reported seeing "large numbers of belugas" near the mouth of the Susitna River in early May. This concentration lasted through the third week in June as indicated by the June 18th survey shown in Table 1. However, by the June 22nd survey we began to see belukhas at other locations in Cook Inlet and on June 24th, several hundred belukhas were reported in Turnagain Arm near McHugh Creek and across to Gull Point.

There are several possible explanations which are immediately apparent for belukhas concentrating in the area near the mouths of the rivers in the northwest part of Cook Inlet. concentrations in areas of river mouths in the spring is common to many belukha whale populations. Seargent and Brodie (1975) considered the primary reason for whales gathering at this time of year was calving and breeding while Fraker et. al. 1978 felt that taking advantage of warmer estuarine temperatures in the spring was important to all segments of a belukha population, not just the reproductive age classes. They hypothesized that the thermal advantage to all classes was the primary reason for spring estuarine aggregations of belukhas, and secondarily, the concentration areas may afford some shelter from storms. Fraker et. al (1978) felt

that availability of an important food source was not a major factor for belukhas concentrating in the Mackenzie estuary because most whales examined from the native whale harvest had empty stomachs. However this may be a significant difference from the Cook Inlet stock of belukhas as well as the Bristol Bay stock. We know from Brooks (1954) and Lensink (1961) that belukhas do feed in the estuaries in the spring in Bristol bay and may be primarily attracted to the area by both downstream migrating smolts and returning adults of several species of salmonas well as an early run of smelt.

Belukhas feeding in estuaries in Cook Inlet in the spring has not been positively determined. However, the presence and timing of several species of anadramous fish, similar to the conditions in Bristol Bay, suggest this to be the case. Probably the single most important fish species to the belukhas in Cook Inlet in the concentration area in the spring is the eulachon (*Thaleicthys pacificus*) which arrives in the Susitna estuary and enters the river for spawning in two major runs. The first was detected in the river when sampling began on May 16 and lasted until approximately May 30 (ADF&G 1982 Adult Anadramous Fish Investigations). The second run of eulachon entered the river and covered a nine day period lasting until June 9. The second was considered to be 4.5 times greater than the first (ADF&G 1982 Adult Anadramous Fish Investigations). Although no detailed abundance information was obtained, the total number of fish was estimated in the several millions. Brooks (1954) found that smelt (*Osmerus dentax*) were important in the diet of belukhas in Bristol Bay very early in

the spring, shortly, after breakup. Smelt are similar in size and habits to eulachon and probably eulachon are comparable in the diet of Cook Inlet belukhas.

After the smelt run decreased by the end of May, belukhas in Bristol Bay switched to downstream migrating salmon smolt (Brooks 1954). Lensink (1961) felt that as the smolt moved out of the estuary and into Bristol Bay, they apparently scattered and became much less vulnerable to predation. Thus of six belukhas taken between June 6 and June 15, none had eaten smolt. If this is also the case in Cook Inlet, then it is possible that salmon smolt from the Susitna River may not be an important food source. However, Cook Inlet is somewhat different from Bristol Bay and particularly at low tide extensive sand bars are exposed with the majority of the Inlets water confined to channels and waterways, considerably smaller then Kvichak or Nushagak Bays in Bristol Bay. Although the belukhas apparently seldom enter the Susitna River, the salmon smolt may be concentrated enough at low tide outside the river mouth to allow the belukhas to feed on them. Certainly, no realistic estimate of belukha use of salmon smolt in Cook Inlet can be made without examining stomach contents of the belukhas.

Adult king salmon (*Oncorhynchus tshawytscha*) are available in the area of the Susitna River (ADF&G, unpub. data), from mid April through August with a peak in June. However their value to belukhas as a food source is questionable. Brooks (1954) did not find adult king salmon

to be a significant component of the diet of belukhas in Bristol Bay and speculated that only the smaller adult king salmon were taken by the largest adult male belukhas. If this is the case in Cook Inlet also, probably adult king salmon are taken only in small numbers.

All four of the other species of North American salmon enter the Susitna River to spawn but probably only the sockeye (*Oncorhynchus nerka*) would likely be present in numbers sufficient to provide a significant food source during the time period when the belukhas are concentrated near the mouth of the Susitna River. However even sockeyes do not become abundant in upper Cook Inlet until after July 1, after the concentration of belukhas has dispersed.

Potential Impacts

Quantification of impacts of the Susitna hydroelectric project on belukhas at the present time is not possible. This type of project has the potential for reducing the numbers concentrating near the mouth of the river by reducing the available food or by altering the heat budget of the river. However the overall effect on the availability of anadromous fish to belukhas is predicted to be small. There may be no alteration of the heat budget of the river realized by the belukhas at the mouth of the river although very little data are available to prove this.

Approximately 5 to 8% of the total adult salmon returning to the Susitna River system spawn in the area from Talkeetna to Devil Canyon; the area which is predicted to be the most heavily impacted by dam construction. The slough habitat in this area is predicted to be completely lost, thereby eliminating approximately 5% of the chum salmon from the system as well as a small number of sockeye. This means that a small amount of food in the form of adult chum and sockeye will no longer be available to the belukhas after dam construction. Since we have no quantitative measure of the importance of these species to the belukhas, no estimate of impact can be made except to guess that it will probably be slight.

Impacts on the eulachon runs which enter the Susitna River are assumed to be slight as they remain in the lower reaches of the river (Bruce Barrett ADF&G pers. comm.). This species may be extremely important to the belukhas and it is possible that any reduction of eulachon could severly impact the belukhas.

Although most impacts from either heat budget alteration or food reduction are likely to be slight, we cannot accurately predict the overall effect on the belukhas. If any environmental perterbations effect the belukhas in upper Cook Inlet, it is likely these effects will take the form of a reduction in the population in Cook Inlet. Given our present state of knowledge, a reduction in the belukha population of upper Cook Inlet would not be detectable unless it were greater than a 50% to 75% reduction in the entire population. Even a reduction of this magnitude could go unnoticed for several years as no systematic monitoring of the population is planned.

Recommendations for future studies

The most immediate information needs for the Cook Inlet belukha population with respect to the Susitna hydroelectric project is a realistic population estimate. Generation of such an estimate would require development of a systematic aerial census of the belukhas in the entire Inlet from which a statistically sound estimate could then be made. Beyond that, future studies should involve, collections of skulls in order to make an absolute determination on the taxonomic status of this population; food habits studies to positively identify and quantify the importance of food species; and movement studies to define the geographical range and seasonal movements of the population.