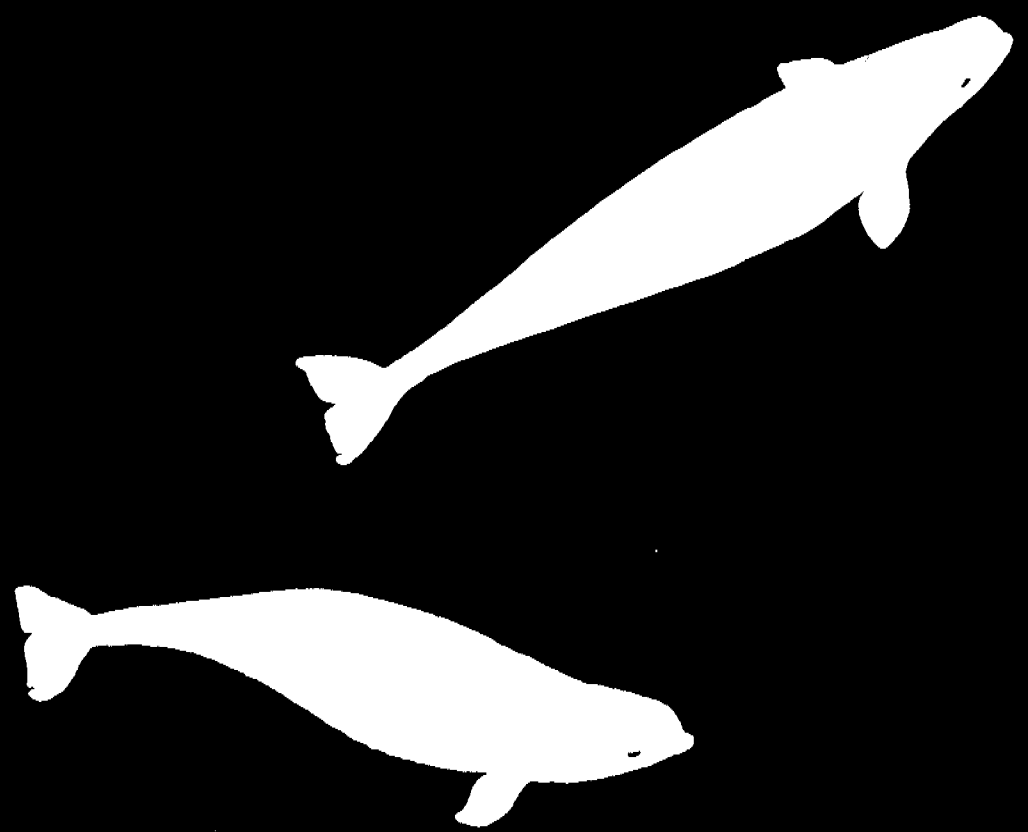
THE BELUGA IN ALASKA



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THE BELUGA WHALE IN ALASKA

by

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TABLE OF CONTENTS

THE BELUGA WHALE IN ALASKA

The beluga, or white whale, Delphinapterus leucas, is a common inhabitant in the waters of Alaska from Cook Inlet to the Arctic. There is, however, a dearth of factual biological data available on the animals. Belugas have been studied since 1954, but these investigations have dealt primarily with food habits and with methods of controlling depredations on commercially valuable salmon. Knowledge of life history and ecology in Alaska is therefore incomplete.

General Description

Belugas generally resemble cigars, with one end blunt and the other tapered. The rounded head has a thick cushion of fat and flesh over the forehead; the body continues to swell as far as the flippers, and from this point gradually diminishes to the horizontal flukes. Newborn belugas are almost six feet long; adult females may reach thirteen feet in length; adult males grow to nearly sixteen feet. Belugas are dark blue-gray at birth, becoming light gray and finally white at four to five years of age. This color change is caused by the loss of pigment in the skin.

Beneath the skin, a layer of blubber surrounds the entire body. Brooks (1954a) found the blubber posterior to the forelimb to be two and three-quarters to three inches in thickness, with a maximum of five inches being found on a large male.

There are many contradictory accounts on the total number of teeth. Jardine (1837) remarked that belugas have no teeth in the upper jaw and 16 in the lower. Walker, et. al. (1964) states that there are usually ten teeth in the upper jaw and eight on each side of the lower. Doan and Douglas (1953) give a maximum number of 40 teeth. Brooks (1954a) examined 68 belugas and concluded: "Dentition is homodont; the teeth resemble simple pegs and have persistent pulp chambers. Nine or ten occur in the upper jaw and nine teeth in the lower jaw on each side for a usual complement of 36 to 38 teeth."

Belugas have sharply defined laminations in both the cementum and dentine portions of their teeth. By comparing the number of tooth layers deposited annually with size, color, and behavior of the animals, Lensink (1961) concluded that four complete laminations are deposited each year and counts of laminations will provide a precise index to age. Kleinenberg and Klevizal (1962) compared the scars of corpora lutea in the ovaries with the numbers of layers of dentine in the teeth and concluded that four layers are laid down in the course of a year, two clear and two dark layers alternating.

Although determination of sex should be confirmed by examination of the genital slit and/or internal dissection, Sergeant (1962) remarked that the flippers in adult males become rolled upwards, a characteristic that will separate old males at a glance. Brooks (1954a) noted that with increasing age, the front flippers develop a more pronounced curl and lose their dark border.

Range and Movements

Belugas are distributed throughout the arctic and subarctic regions of North America and Europe. Vladykov (1944) prepared a worldwide distribution chart which shows that nearly all major concentrations occur in shallow bays or estuaries of large rivers north of 40° north latitude. Sightings have been made, however, of these animals far from their native haunts. For example, Townsend (1929) sighted belugas at Ipswich, Massachusetts, near latitude 42° and Scheffer and Slipp (1948) mention sightings of belugas off the Washington coast.

In Alaska, belugas commonly occur from Cook Inlet westward to Bristol Bay, northward along the Alaskan coast, and eastward in arctic Canada. The Bristol Bay population appears to be resident throughout the year. Movements of the Cook Inlet population in winter are not known. In the waters of the northern Bering Sea and the Arctic Ocean, belugas move with free ice or leads in pack ice. It is believed that the Bering Sea is the wintering area of belugas frequenting the Western Canadian arctic and the Eastern Siberian arctic, as well as for those remaining in Alaskan waters (Brooks, 1954a).

Over much of their Alaskan range, belugas enter estuaries in summer as soon as ice moves offshore. The entering of estuaries may be the result of concentrations of smelt or other fish which are ascending rivers from the sea.

In shallow rivers, upstream movements are influenced by tidal flow; belugas move upstream on the flood tide and return to the bays on the ebb. Daily upstream movement of 20 to 30 miles has been observed in the Kvichak River in Bristol Bay. In the Yukon River, which is little influenced by tidal action, belugas have occasionally been seen 60 miles upstream from the mouth.

In an attempt to trace the possible movement of Bristol Bay belugas to other areas, Lensink (op. cit.) marked 46 animals with homemade dart tags. His tags were approximately nine inches long and when inserted in a beluga, about seven inches hung free. The tags were applied by means of a ten-inch stainless steel needle inserted into the end of a harpoon pole for all but two to three inches of the needle's length. The end of the harpoon served as a stop and insured that the tag would not be inserted too deeply. Only one tag was returned, which had been placed on an animal about one month earlier. He also saw an animal in September that had been tagged in June. He concluded that these two observations were not sufficient to definitely establish the success of the tagging method and that at least 500 belugas should be marked to insure recoveries and trace movements.

Abundance

There is little basis for establishment of total numbers of belugas in Alaska. Brooks (1955) and Lensink (op. cit.) used surface observations, aerial observations, and interviews with fishermen to obtain a population estimate in the Bristol Bay region of between 1,000 and 1,500 animals. Aerial surveys of Cook Inlet which I made in 1963 and 1964 indicated a summer population of 300 to 400 animals.

Population Dynamics

Little is known about the population dynamics of belugas in Alaska. There is little reason to believe that the basic life history of the species may differ from belugas found in the Hudson Bay area of Canada. Therefore, the following information is based largely on findings by Canadian scientists.

Based on a study of mammary glands, ovaries, uteri, and the presence of embryos, Doan and Douglas (op. cit.) concluded that females in their third year, or nine feet or more in length, are sexually mature. Sexual maturity in the male beluga does not occur until the animal reaches a length of eleven feet and not before four years in age, according to Vladykov (1944).

Doan and Douglas (op. cit.) found from measurements of 49 embryos that three-quarters of conceptions occurred in May, with the balance occurring from March to September. Vladykov (1944) based his conclusions on a modification of methods used for large whales and determined that belugas breed from April to June, with a peak in May. Findings by Lensink (op. cit.) agree with Canadian researchers in that all adult males taken in Bristol Bay between May and September had epididymes filled with sperm and were capable of reproduction. He concluded that a short peak in calving suggests that most reproductive activity is confined to a relatively short period -- perhaps May or June.

Doan and Douglas (op. cit.) concluded that since a high percentage of females they examined contained no embryos, it would seem that female belugas customarily do not bear young every year. Lensink (op. cit.), agrees that mating does not occur in the year of parturition and subsequent calves are born at intervals of two years. However, Slijper (1962) states that belugas have a gestation period of 12 months and bear young each year with a resting period of one year after every four to five pregnancies. Further studies are needed to settle this question.

In common with other marine mammals, and unlike most terrestrial species, the young of belugas are almost always born tail first. Since birth takes place underwater and the process is slow, it may become a matter of life and death whether the young emerge head or tail first. Slijper (op. cit.) relates that after the calf has emerged, the female devotes all her attention to guiding her young to the surface at the earliest possible moment.

Lactation lasts about eight months, but the calf may remain with its mother for several years (Slijper, op. cit.). Maternal ties are particularly close in belugas, and even though the calf has stopped suckling, it will rarely leave its mother's side and often swims just behind her dorsal fin or beneath one of her pectoral fins.

Food Habits

The diet of belugas during the spring and summer months is probably the best known aspect of beluga biology in Alaska. In 1954, the then Alaska Department of Fisheries initiated a program to determine if the beluga was a competitor with man for commercially valuable salmon in the Bristol Bay area.

The belugas examined by Brooks (1954a, 1955, 1956, 1957) contained five species of salmon as well as smelt, flounder, sole, sculpin, blenny, lamprey, two types of shrimp, and mussels. Since this study was conducted during the summer months (May to August), it is possible that a greater number of food species enter the beluga's diet at other times of the year (Brooks, 1954a).

According to Brooks (1955) a dietary shift from smelt to fingerling salmon occurs in late May when the downstream migration of the latter begins. Characteristically, this migration is composed of dense schools of salmon moving near the surface. This behavior of the salmon appears to make them more readily available to belugas than are smelt which, though perhaps equally abundant, favor the bottom of the river and may be less densely schooled.

By the first of July, Brooks (1955) found the diet had shifted from downstream salmon migrants, which had nearly all passed to the sea, to adult salmon heading for their upstream spawning grounds. These mature fish then made up the bulk of the beluga's food from July through August.

In the Saint Lawrence River of Canada, Vladykov (1946) found that belugas feed principally on capelin, sand lance, cod, clamworms, and squid. To a lesser degree at least 50 other species are taken. Sergeant (1962) reports that in mid-winter, in Canada, belugas eat a variety of food which consists largely of crustaceans, fish, and squid. In the Churchill area of Manitoba, Canada, when summer movement to river estuaries occurs, their diet changes almost entirely to capelin. He also states that polar cod have been found in beluga stomachs. This species may be an important food in the Canadian arctic.

Parasites and Predators

Belugas appear to be relatively free of parasites. Ectoparsistic infestations are apparently uncommon, although Slijper (op. cit.) mentions the occurrence of the whale louse, Cyamus sp., and Acorn Barnacles, Coronula reginae, on the beluga.

Endoparasites appear to be more common. An acanthocephale, Corynosoma, has been identified by Neiland (1962), and Babero and Thomas (1961) found a Pharurus oserkaiae in Alaskan belugas. Vladykov (1944) found Corynosoma and the nematode Anisakis simplex in belugas from the waters of Eastern Canada. Doan and Douglas (op. cit.) mention parasites of the genus Stenurus as infecting Canadian belugas.

Other than man, the only known predator of belugas is the killer whale, Orcinus orca (Fitzinger). Slijper (op. cit.) mentions a report of killer whales causing "a veritable carnage among the relatively slow moving arctic belugas." He cites an example of the ravenous appetite of the killer whale and the possible havoc it could cause in a herd of whale or porpoise: the stomach of a 24-foot killer whale contained 13 porpoises and 14 seals!

Underwater Sound

Man has known for many years that belugas produce underwater sounds. These sounds are of such volume that they can be heard above the surface of the water and are said to resemble the call of a song bird. Because of this sound, the beluga is known among British whalers as the Sea Canary. Fish and Mowbray (1962) listed categories of sound as clicks and creaks, whistles, modulated whistles, yelps, blares, rasps and taps, bangs, and trills. Tomilin (1955) describes the call as a woman's shrill cry. In Russia, a noisy man is said to squeal like a beluga.

Tomilin (op. cit.) believes that sounds are emitted underwater by passing air through the nasal canal. Lilly and Miller (1961) substantiate this theory by explaining that sounds are produced by sacs in the head which change size and shape through movements of muscles in their walls. It is considered probable that belugas produce sounds above 100 kc and they may respond to sounds up to 80 kc. However, the greatest energy in most sounds is concentrated in the spectrum of 20 to 20,000 cps. (Fish and Mowbray, op. cit.).

Using the same basic principle as that of sonar and of the marine fathometer or echo sounder, whales are apparently able to communicate, navigate, and find food (Slijper, op. cit.). Kellogg (1958) conducted an experiment to investigate the evidence that Cetaceans possess and use this echo-location. Using captive Bottlenose Dolphins, Tursiops truncatus, he found the animals were able to perceive, avoid, and find objects after vision had been experimentally eliminated.

Like fishermen, whalers have employed underwater sound transmissions to locate their catch. Ships equipped with sonar (Asdic) use this equipment as an aid in finding and pursuing whales by bouncing echoes off their bodies.

Several other methods of using underwater sound to find whales have been proposed. One method is to listen for the sounds whales produce and thus locate the animals. Another method might consist of attracting whales by broadcasting their own recorded noises back into the water.

A contrasting, although related method, would be to frighten the animals into shallow water by loud or disturbing noises. Gulf fishermen in the New Orleans area have investigated the possibility of using fear-inducing sounds to keep porpoises from taking fish from their nets. (Kellogg, 1961).

Observations of Cetaceans, including belugas, have revealed a strong fear of killer whales. Slijper (op. cit.) mentioned that some animals may become so panic-stricken, when approached by killer whales, that they become paralized with fear.

In 1965 the Department of Fish and Game began a series of experiments utilizing the underwater sounds produced by killer whales to repel belugas from the river systems of Bristol Bay. The sounds were projected into the water when belugas were within 200 yards of the transmitter. An immediate reaction occurred -- the belugas turned and left the area.

Sound-producing equipment consisted of an Amplicorp portable tape recorder, a Bogen Model RP-2 preamplifier, a McIntosh Model MC-40 amplifier, and a Hydro Products Model DEA-7 hydrophone/projector. Also included in the equipment array was a Heathkit audio-generator Model IG-72 which will be used in future experiments involving sound above the audible spectrum.

Preliminary results of these experiments have revealed that belugas do react to the sounds produced by killer whales. However, since the experiments are in their preliminary stages, no conclusions can be drawn at this writing as to whether the sound transmissions will keep belugas from entering river systems.

Utilization

Belugas are exploited in Alaska by Eskimos of coastal villages from the Kuskokwim River to Point Barrow. They are utilized both for human and dog food, either as meat or as "muktuk", which consists of the skin and outer layer of fat, fresh or sun dried. The oil is used for cooking and for mixing with dog food. Brooks (1954b) estimated that Alaskan Eskimos utilize at least 200,000 pounds of beluga flesh annually.

It is uncertain whether belugas were ever harvested commercially in Alaska. Whaling stations operated at Port Armstrong, Port Hobron, and at Akutan Island, prior to 1940, but the Alaskan Fishery and Fur Seal Industries Reports make no mention of belugas being a part of the whale harvest.

Personal conversation with a long-time Anchorage resident revealed that an attempt to harvest Cook Inlet belugas was made in the 1930's. About 100 belugas were netted in the Beluga River for meat and oil. After the initial catch, no animals returned to the river and the venture was abandoned.

Recently, sport hunting for belugas has developed in the Cook Inlet area. Several Alaskan guides have said, "hunting the beluga whale is by far the most exciting big game hunting ever done." (Anonymous, 1965).

Hunters, equipped with an open dory, harpoons, and high powered rifles, herd the whales into shallow water where the animals are harpooned and shot.

Several aquariums have successfully captured, transported, and held live belugas (Ray, 1962). The animals have proved to be a unique attraction, but the difficulties and expense involved in obtaining them have made the beluga an infrequent resident at zoos and aquariums.

A commercial beluga fishery once flourished in the Saint Lawrence and Hudson Bay regions of Canada. Vlaydkov (1944) estimated the net value of hide and oil from an average beluga to be $30, with meat and meal bringing an additional $15. Due to low oil prices, lack of capital to install modern machinery, and a short catching season, the commercial take of belugas in Canada was abandoned in 1960 (Sergeant, 1962).

A search for a product to take the place of fast-disappearing horse meat to feed ranch mink prompted a recent reopening of a commercial beluga fishery in the Churchill area of Canada. The plant processes over 500 belugas annually, primarily for red meat which is frozen and shipped via refrigerated railroad cars to southern mink ranches. The hides are utilized for leather which makes a superior grade of shoe laces. The average beluga will yield from 25 to 35 gallons of oil that is suitable for industrial or edible use. An interesting by-product is buttons which are made from beluga teeth.

Control

From his studies, Brooks (1955) concluded that belugas are potentially a serious predator on salmon, and control measures were warranted during years when seaward migrations of salmon are small. As a result, the Department of Fish and Game initiated a program to chase belugas from the Kvichak River and the upper portion of Kvichak Bay.

Beginning in May of 1960, belugas were harassed by dropping charges of dynamite from a skiff near herds of animals that had ascended the river. Lensink (op. cit.) observed that no belugas were seen in the Kvichak River by mid-June. He also observed no fatal injuries attributable to the explosives. He believed that instead of harming the animals, the explosives disturbed their orientation mechanism.

Since belugas occur in more than one river system of Bristol Bay, a large scale harassment program would not be feasible. Therefore, experiments utilizing underwater sound, as discussed earlier in this report, were inaugurated.

Future Research and Management

A lack of information on the biology of belugas in Alaska points out the need for extensive research to better understand this unique animal. Future

investigations should include the development of techniques to obtain information on numbers and movements; the relationship to salmon and the extent of possible predation; and breeding biology and reproduction.

Accurate information on the location and extent of utilization by coastal Eskimos should be obtained before any management program of the beluga is implemented.

If commerical utilization of belugas is proposed, or occurs, we must be prepared to answer biological questions on belugas before such ventures are attempted. Attention should also be given to the aspect of sport hunting, primarily in the populated areas of Cook Inlet. Sport hunting for belugas could evolve into a recreational outlet for a large segment of the sporting public.

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