BULLETIN NO. 98

Beluga of the Churchill Region of Hudson Bay

BY

K. H. DOAN AND C. W. DOUGLAS

Central Fisheries Research Station, Winnipeg, Manitoba

PUBLISHED BY THE FISHERIES RESEARCH BOARD OF CANADA UNDER THE CONTROL OF THE HON. THE MINISTER OF FISHERIES

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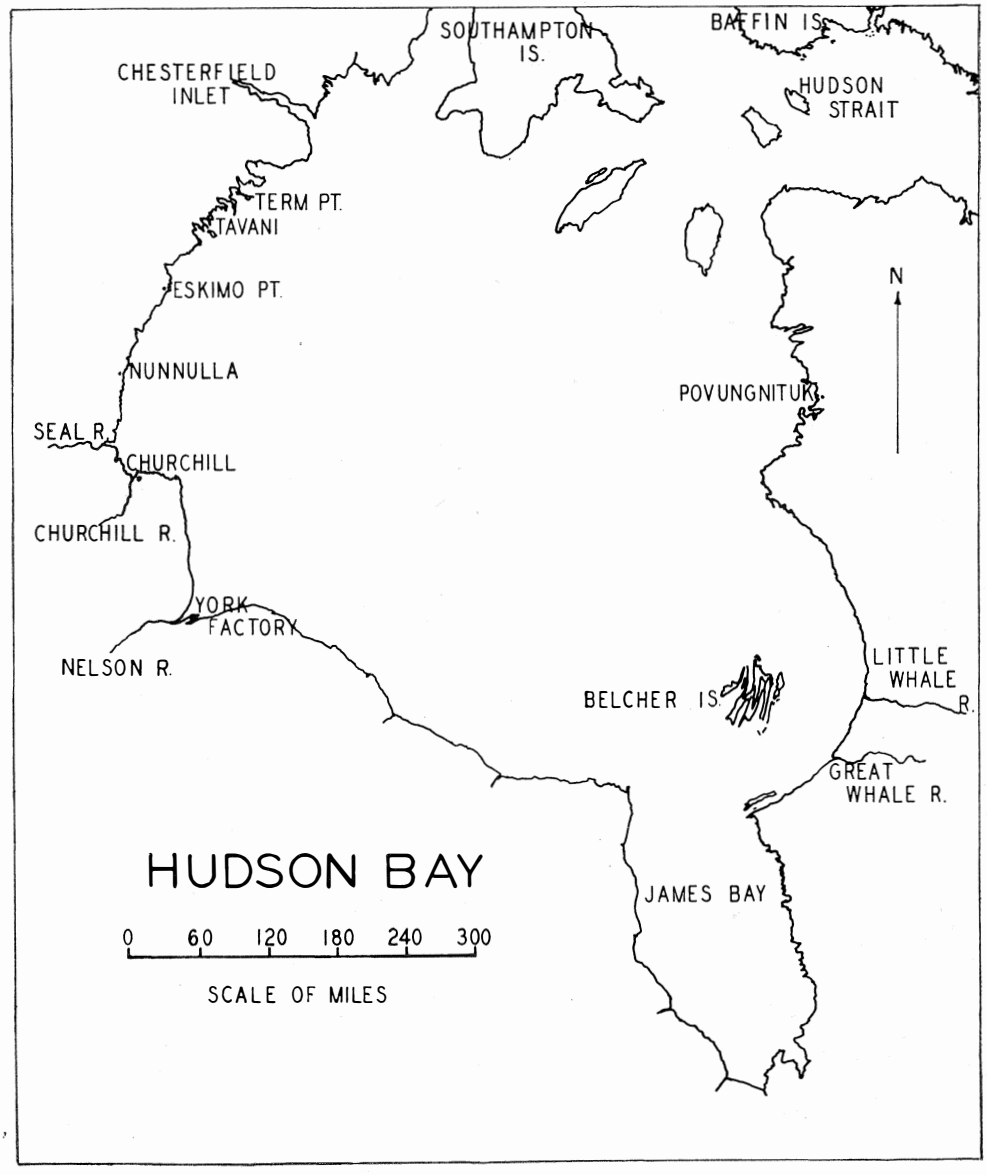
ABSTRACT

AT VARIOUS TIMES since the waters of Hudson Bay have been frequented by white men there have been attempts made to utilize, on a commercial basis, the white whale or beluga, *Delphinapterus leucas,* that inhabit those waters. All these previous attempts have been rather short-lived. Several of the operations have been conducted to afford employment to native trappers during the summer, but such philanthropic ventures have been undertaken on a rather restricted basis and without extensive equipment.

In 1947 it became apparent that a commercial operation would be attempted at Churchill on a comparatively large scale, and studies were undertaken of the life history, food habits, migratory range, utilization, etc., of the Hudson Bay beluga in order to provide facts useful in a management plan governing the Churchill beluga industry. For parts of four summers, 1947 through 1950, beluga were studied at Churchill, and data were made available to the Research Board covering the 1951 catch and production. Analyses were made of beluga products at the Pacific Fisheries Experimental Station, to determine some of their chemical and physical properties.

Printed in Canada by
University of Toronto Press
for the
Fisheries Research Board of Canada

CONTENTS


SOUTHAMPTON IS.
BAFFIN IS.
CHESTERFIELD INLET
HUDSON STRAIT
TERM PT.
TAVANI
ESKIMO PT.
N
NUNNULLA
POVUNGNITUK
SEAL R.
CHURCHILL
CHURCHILL R.
YORK FACTORY
NELSON R.
LITTLE WHALE R.
BELCHER IS.
GREAT WHALE R.
HUDSON BAY
JAMES BAY
0 60 120 180 240 300
SCALE OF MILES

INTRODUCTION

THE PRESENCE of whales in Hudson Bay attracted European whalers as early as the year 1619. The Hudson's Bay Company on February 8, 1688, resolved "that the Churchill River bee settled this yeare with a good shipp and a competent cargo for trade and materialls for white whale ffishings". Captain James Young sailed that year from Gravesend for York Factory and a harpooner was included in the crew. The fruit of his labour appears in the entry in the minutes of the Company for December 18, 1689, of 28 casks of white whale blubber oil.

In more recent times, an operation was begun at Churchill in 1929 for the purpose of capturing beluga on a commercial scale. Information has been given by Messrs. W. E. Brown and J. J. Anderson of the Hudson's Bay Company, who stated that this operation did not involve the use of elaborate machinery such as is now employed at Churchill, the blubber then being rendered in large open kettles. In 1929 animals were present in good numbers, and sufficient beluga were captured to warrant continuation in 1930. However, in 1930 very few beluga frequented the vicinity of Churchill and the operation resulted in a financial loss. No further attempts were made to commercialize beluga at Churchill by the Company. It is reported that in 1931 the animals were almost nonexistent in Churchill waters.

About the turn of the present century attempts were made to exploit the beluga frequenting the waters adjacent to the Great Whale River and the Little Whale River. It is said that here, as with the later operation at Churchill, the animals were abundant when operations first began but decreased in numbers during ensuing years, so that before long monetary returns did not warrant continuance of the venture. Whaling operations ceased in this vicinity about 1905. It is declared that, while the decrease in numbers of animals was the primary cause for discontinuance of the venture, another factor, that of the probability of severely decreasing a source of native food, bore heavily on the decision of the Hudson's Bay Company. Records of these operations are now destroyed.

In all three of the aforementioned localities the majority of beluga were taken by harpoon. It is thought that the animals were frightened away by this noisy and disturbing method in one summer and took care to avoid the localities in ensuing summers. This observation is in accord with observations of Degerboel and Freuchen (1935) who described the tendency of beluga to avoid localities where nets have been repeatedly set for their capture.

At Pangnirtung, Baffin Island, the Hudson's Bay Company for some years

organized beluga drives in order to obtain the blubber oil. After several years, however, here as in other localities, the animals failed to return in sufficient numbers to warrant commercial exploitation and the Company ceased to organize the drives. Since discontinuance of this venture, the animals have returned sporadically to the area, and the natives still continue to hunt them, keeping the meat for themselves and selling the blubber. The Company continues to purchase beluga blubber, more to give the natives a source of income during an otherwise idle season than with any thought of monetary gain. Production amounted to approximately 3,268 gallons in 1948, 4,902 gallons in 1949, 2,623 gallons in 1950, and 8,557 gallons in 1951.

Very little information on the biology and abundance of beluga or white whale, *Delphinapterus leucas,* was available for the Hudson Bay region up to 1947 when it appeared that interest was developing in the commercial exploitation of these mammals at Churchill, Manitoba. Knowledge was desired of migration routes and abundance, so that an estimate might be made of the effects of commercial hunting at Churchill upon the stock of beluga which furnish some part of the food supply of natives in the Arctic. It was anticipated that observations on the food, growth, reproduction and other habits of beluga might assist in proper management of the animals with respect to methods and seasons of hunting, sizes to be killed, protection of young and the setting of reasonable annual quotas.

In 1947 a preliminary reconnaissance was made in the vicinity of Churchill with the purpose of planning future research on beluga. Late in August, K. H. Doan and W. M. Sprules examined a small commercial catch of beluga and they also caught some in gill-nets. In 1948, Doan and D. Peterson worked on beluga at Churchill for five weeks during the summer, and Doan and C. W. Douglas studied beluga for eight weeks in 1949. The following summer Douglas and B. Arnason worked a further eight weeks on these animals at Churchill. The integrated data of these several field parties compose the bulk of this study. Weekly reports on the beluga catch in 1951 were furnished by Adanac Whale and Fish Products, Churchill, through the agency of the Royal Canadian Mounted Police and the Department of Fisheries.

In this paper information has been recorded on the habits, life history, and utilization of beluga, and it is expected that this information will be valuable in the administration of this natural resource.

Travel in the Churchill River and in Hudson Bay near the river was by 20-foot freight canoe and outboard engine. Observations were made from chartered aircraft in 1948 and 1950. Marking live beluga was attempted in 1948, and a packinghouse bacon-type tattoo shaped like a maple leaf and bearing the word "Canada" was mounted on a harpoon shaft. In subsequent seasons a Greener light-model harpoon gun was modified by replacing the normal barbed head of the harpoon with a small metal plate carrying one-half inch pins arranged to form the figure "9" in 1949 and "0" in 1950. The pins were dipped in hog-shoulder tattoo ink, the intention being to strike the beluga as it surfaced and leave a permanent mark.

DISTRIBUTION AND ABUNDANCE

Aerial Observations

In 1948 two flights were made northwards from Churchill, following the coast at 1,000 feet about one mile offshore. On August 12 about 200 beluga were in Churchill River after mid-day at high tide, and 165 more were close to shore within 50 miles north. There was a group of 125 at Nunulla, about at the Manitoba-Northwest Territories border, and a marked reduction in numbers northwards to Term Point, N.W.T. Those along the shore of Hudson Bay were commonly in groups of 2 to 10 and all were facing southward. On the return trip in the evening of the same day, flying coastwise at 2,000 feet, no beluga were seen more than 60 miles north of Churchill. At this place, 34 were counted and most lay five miles offshore, facing open water, at low tide. There was a sudden increase in abundance when 116 were seen off the Churchill River and 15 entering its mouth. Beluga dive at the close approach of an aircraft overhead. On a flight to Term Point on September 13, no beluga were observed at Churchill but 28 were sighted 100 miles north and 3 at Tavani, N.W.T. It was assumed that most of the animals had been disturbed by stormy weather and had gone south along the coast.

Four flights were made in 1950 and considerably more beluga were encountered than two years previously, so that some estimation of numbers in large groups had to be made. Counts were as follows:

Date, 1950	*Churchill area*	*Seal River area*
July 19	600 +	600-700
July 26	700	700
Aug. 1	988	650 +
Aug. 31	33	not surveyed

Surveys were not made between the 1st and 31st of August because of bad weather or the unavailability of aircraft. Photographs would have assisted in making better counts and perhaps measurements. Best results were obtained when the survey flight was conducted about noon with the sun behind the observer. This minimized glare from the water which was especially severe when the sun was not at zenith. A calm day was necessary for maximum vision below the surface of the water, and to prevent confusion of beluga with whitecaps, a very real obstacle to accurate counting from an elevation of 4,000 feet. This height, however, provided a desirable wide angle of vision and the animals were quite visible to the unaided eye.

During a flight along the coast from Churchill to Eskimo Point, N.W.T., and return on the morning of August 31, 1951, Fishery Officer O. B. Rutherford counted 631 beluga, and a flight on the afternoon of the same day from Churchill south to the Nelson River and return showed 76 animals.

Seasonal Abundance

It was reported that beluga entered Churchill River in good numbers on the day when the ice left the river mouth, June 15, 1949. This was said to be

customary every spring. This would indicate that the animals had been lying off the mouth of the river prior to break-up, but how long they were in the vicinity before the middle of June no one seemed able to say, other than "quite a while".

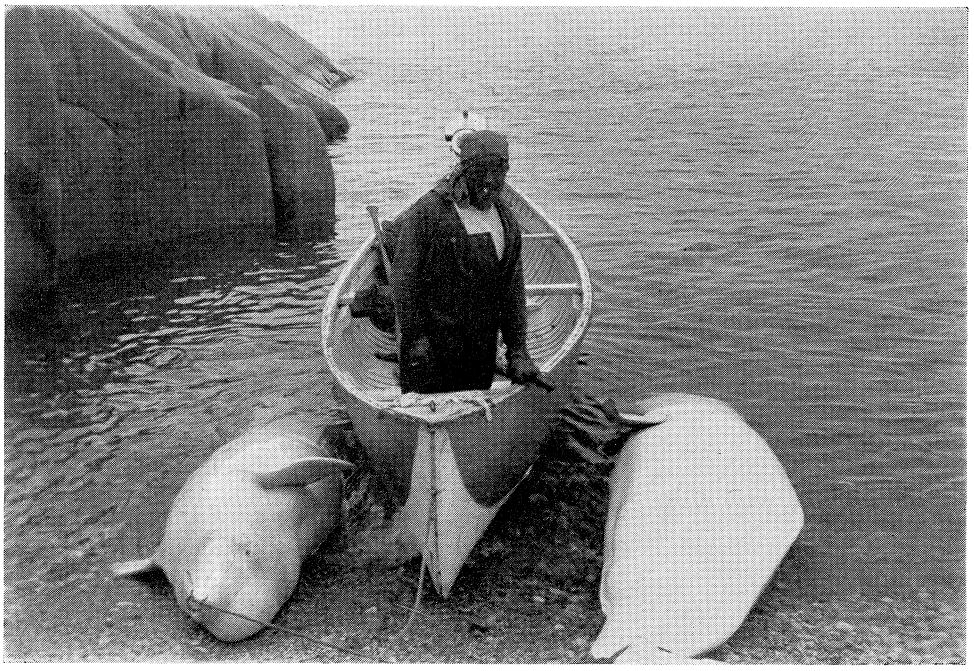


FIGURE 1. Eskimo hunter and two beluga at Churchill, Manitoba.

Beluga are more common at Churchill early in the summer than later on. On the evening of July 20, 1949, after an unusually calm day, 162 "spouts" of beluga ascending the river were counted. This count was made with binoculars and covered about one mile of river length in a slow sweep. Further observations indicated that a "spout-count" showed about three-quarters of the animals actually present on a calm day. The above count, therefore, represented about 200 beluga moving upstream along one mile of river. This is an incomplete indication of the number present in the vicinity, unless it could be related to data from aerial counts or photographs. It is only on exceedingly calm days that the "spout" can be observed readily, and even a slight wind quickly disperses the spray and vapour.

Drastic reduction in the abundance of beluga was usually associated with stormy weather in late August and early September. In 1949 only 20 animals could be seen in the river and off its mouth on September 7, when viewed from the top of the Churchill grain elevator. The ground was snow-covered on September 9, and no beluga were sighted for five days. Aerial observations

the following year revealed only 33 beluga on Aug. 31, about 3 per cent of the number seen a month earlier.

Much comment and speculation has been heard concerning the locality frequented by beluga in winter. It has been suggested that they leave Hudson Bay with the onset of winter, moving to Davis Strait which remains comparatively free of ice during that period when most of Hudson Bay is icebound. This would necessitate a round trip of at least 2,500 miles each winter. Several reports have been heard of vast migrations of beluga late in the fall moving eastward through Hudson Strait.

Further information indicates that beluga may live throughout the winter along the western coast of Hudson Bay in the open strip of water off the shelf of solid shore ice, the floe edge. Mr. John Voisey of Tavani, N.W.T., declared he had seen beluga off the floe edge during every winter month, though never in great numbers. Mr. Norman Ford, special R.C.M.P. constable of Chesterfield Inlet, N.W.T., reported seeing two animals off the floe edge at Chesterfield in April, 1950. On the other hand, a Mr. Brown, formerly a trapper in the Tavani vicinity, and Mr. Eric Carlson, former master of a Hudson's Bay Company supply vessel, both of whom have spent many years in the Hudson Bay area, said that they have never seen beluga in the Bay during the winter months.

Beluga may not inhabit all areas off the floe edge, and an almost perpetual veil of mist along the edge was reported to hinder winter observations there. It may be concluded that the oft-heard declaration that all beluga leave Hudson Bay in the winter must be modified to state that, while many beluga may leave the Bay prior to the onset of winter, in some localities at least a few animals remain throughout the entire winter. It is a matter of speculation whether the latter remain voluntarily or become trapped there by ice and are forced to stay.

DESCRIPTION

Lengths

Measurements of total length of beluga taken at Churchill were made in 1947, 1949, 1950 and 1951. During this period the extreme range of lengths has been from 5.0 to 14.7 feet, based on measurements of 1,077 animals, as may be seen from Table I. Female beluga were, on the average, about 10 inches shorter than males. About 64 per cent of the kill in 1951 was of beluga that were 10 feet or more in length.

Weekly average lengths fluctuated as much as 1.5 feet (see Table II), and these fluctuations are interpreted as support of the belief that animals frequenting the Churchill area are a series of transient groups. The majority of these animals were caught by the same hunters, using the same equipment in the same localities throughout the entire season.

Weights

Individual weights of 16 beluga taken at Churchill in August, 1947, were

TABLE I. Average total lengths, in feet, of beluga taken at Churchill, Manitoba.

	1947[a]	1949[b]	1950[b]	1951[c]
Both sexes:				
No. specimens	21	181	291	584
Average length	10.8	10.4	10.5	10.1
Length range	7.8–13.0	5.3–13.7	6.0–14.7	5.0–14.0
Females:				
No. specimens	12	89	112	199
Average length	10.5	10.0	10.0	9.6
Length range	7.8–12.8	—	7.5–12.5	5.0–12.5
Males:				
No. specimens	9	92	179	385
Average length	11.4	10.8	10.9	10.4
Length range	9.5–13.0	—	6.0–14.7	5.0–14.0

[a] Measurements made at Churchill on 5 fresh beluga in round, and in Winnipeg on 16 beluga shipped gutted.
[b] All measurements made at Churchill on fresh, round beluga.
[c] Data taken from weekly license reports.

obtained upon their arrival in Winnipeg. The animals were gutted before shipment in the fresh state in a refrigerator car, and there was probably some loss in weight during the period of about one week from capture at Churchill to weighing at Winnipeg. The weights and lengths are listed in Table III.

TABLE II. Average length of beluga taken at Churchill, by weekly periods. Number of specimens in parentheses.

Week ending	Average lengths in feet			
	Males		Females	
	1950	1951	1950	1951
June 16	—	8.9 (4)	—	8.0 (1)
June 23	—	11.8 (14)	—	9.6 (6)
June 30	12.0 (8)	11.1 (25)	—	9.6 (9)
July 7	11.2 (34)	9.6 (40)	10.3 (11)	9.7 (24)
July 14	10.0 (29)	10.1 (16)	9.9 (18)	10.0 (7)
July 21	8.9 (4)	9.5 (35)	9.8 (3)	9.1 (18)
July 28	11.9 (15)	9.9 (56)	10.5 (28)	9.8 (35)
Aug. 4	10.7 (37)	10.5 (45)	9.8 (24)	10.0 (29)
Aug. 11	11.1 (33)	10.5 (34)	9.7 (21)	9.2 (15)
Aug. 18	10.6 (14)	10.4 (60)	10.1 (4)	9.8 (33)
Aug. 25	—	11.3 (45)	—	9.1 (9)
Sept. 1	10.7 (5)	9.6 (8)	9.5 (3)	9.8 (11)
Sept. 8	—	12.0 (3)	—	9.5 (2)

No equipment was available at Churchill for weighing individual beluga taken in more recent years. The reports of licensees in 1951 showed individual weights, but they were only approximate and were entered upon a rough

rule-of-thumb basis. This basis appeared to be the allowance of slightly less than 100 pounds for each foot of total length.

Colour

In general, the colour of beluga is related to length, and presumably to age. The smallest and youngest animals are slate blue in colour, those of intermediate size are grey, and white beluga are usually of large size. The degree of

Table III. Lengths, weights, sexes and colours of beluga shipped from Churchill in 1947. The observations and weights were of gutted animals, and were made in Winnipeg about one week after capture at Churchill.

Length	Weight	Sex	Colour
feet inches	*lb.*		
7–10	380	F	blue
9– 1	555	F	blue
9– 6	570	M	grey
10– 0	810	F	white
10– 1	705	M	grey
10– 6	665	M	grey
10– 8	683	F	white
10–11	620	F	white
10–11	725	M	white
11– 0	776	M	grey
11– 1	695	F	white
11– 1	724	F	grey
11– 9	1,015	M	white
12–10	1,210	F	white
13– 0	1,130	M	white
13– 0	1,110	M	white

gradation between colour phases sometimes makes it difficult to assign an animal to a definite colour class, so that in some instances the colour designation is more or less arbitrary. No brown beluga have been observed, as reported by Vladykov (1944) for the St. Lawrence.

In 1950 and 1951, observations were made on the length, colour and sex of 902 beluga taken at Churchill. As may be seen from Table IV, blue beluga averaged slightly more than 7.5 feet in length, and grey beluga about 9.4 feet; white males were 11.5 feet on the average, but white females averaged only 10.2 feet in length. Average lengths of blue, grey and white beluga were significantly different statistically, but the slight reduction in average lengths of 1951 animals compared to those taken in 1950 was not significant except for the grey males.

Teeth

As with the other toothed Cetaceans, the dentition of the beluga is of the usual homodont type, the teeth being a series of slender, conical pegs. The lower teeth which had not yet perforated the gums of a 4.5-foot female embryo were removed and examined. These teeth were of a tritubercular nature, bearing a very small auxilliary cusp on each of the anterior and posterior proximal faces of the tooth. This tritubercular condition, although it disappears with wear at

an early age, represents an advance over the apparent haplodont condition discernible in a dental examination of an older animal.

The teeth of young beluga are quite conical, each apex is directed slightly

FIGURE 2. The gill-net has been lifted and piled in the boat and the beluga have been secured on the beach preparatory to cutting them up. Domestic use, Churchill, Manitoba, 1947.

forward, and the teeth come to a rather sharp point. However, a progressive wearing down ensues owing to the action of the teeth of one jaw against the opposing teeth of the other. Wear continues until the crowns of the teeth in

TABLE IV. Average length, in feet, of beluga taken at Churchill in 1950 and 1951, arranged by colour and sex groups.

Year	Colour	Sex	No. of specimens	Length			SE mean
				Minimum	Maximum	Mean	
1950	Blue	M	19	6.0	9.5	7.6	.245
1951	Blue	M	72	5.0	9.0	7.4	.099
1950	Blue	F	3	8.0	9.0	—	—
1951	Blue	F	21	5.0	9.5	7.8	.225
1950	Grey	M	31	7.0	11.5	9.8	.207
1951	Grey	M	56	7.0	11.5	9.2	.113
1950	Grey	F	28	7.5	10.5	9.4	.123
1951	Grey	F	74	7.0	11.0	9.3	.089
1950	White	M	149	9.0	14.5	11.6	.072
1951	White	M	255	8.0	14.0	11.5	.061
1950	White	F	90	8.5	12.5	10.3	.076
1951	White	F	104	7.5	12.5	10.2	.064

older animals are worn away so that the opposing teeth fit into the ground surfaces of each other. This results in semi-flattened surfaces, but because of their small width it is doubtful if the teeth can grind food in a pseudomolar fashion.

Much variation between length of beluga and numbers of teeth was shown in both sexes, a smaller individual often revealing more teeth than a larger one. Very generally, though, the greater the length the greater was the number of teeth, but the relationship was not precise enough to be useful in age deter-

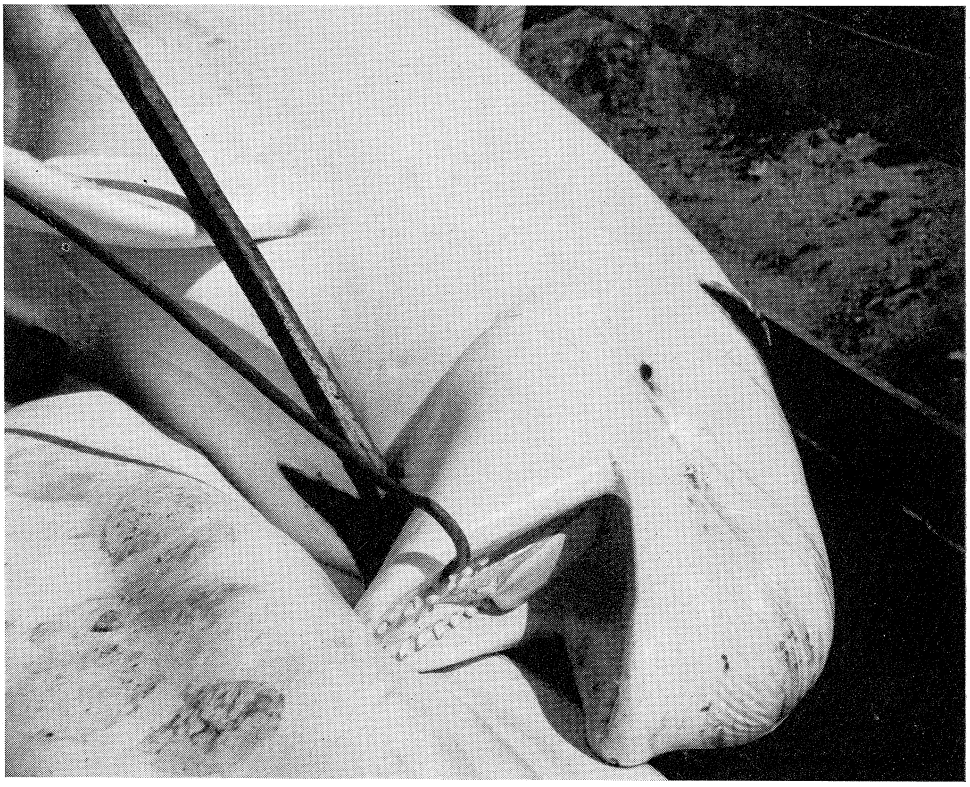


FIGURE 3. Close-up of beluga's head, showing teeth.

minations. The upper teeth tended to be the first to appear and usually were more numerous until the full set of 40 had been attained. Examination of 28 male and 27 female beluga showed no more than 10 teeth in each side of each jaw. Only one animal had the full 40, and it was a 13-foot male taken on August 17, 1949. In four other specimens of equal or greater length examined the same summer the dental formulae were $\frac{10|10}{9|10}, \frac{9|9}{9|9}, \frac{9|9}{8|8}$, and $\frac{10|10}{8|\ 8}$. The largest beluga, a 14.7-foot male killed in 1950, had only 30 teeth, $\frac{7|7}{8|8}$.

LIFE HISTORY AND REPRODUCTION

Breeding

From a study of mammary glands, ovaries, uteri and the presence of embryos it has been determined that females 9 feet or more may be considered sexually mature. The youngest of these were probably in their third summer, based upon length frequencies. In 1949, 13 (16.5 per cent) of 79 females examined were pregnant, 18 (15.7 per cent) of 115 were pregnant in 1950, and 19 (11.5 per cent) of 165 females were reported to contain embryos in 1951. Measurements of the size of 49 embryos indicated that more than three-quarters of the conceptions occurred in May, and the balance in March, April, and June to September (Table V). Approximate dates of conception have been calculated according to the growth rates of beluga embryos established by Vladykov (1944).

Table V. The frequency of approximate dates of conception in female beluga examined at Churchill. All pregnant beluga were nine feet or more in length.

Period	Year			
	1949	1950	1951	Total
Mar. 16–31	1	—	—	1
Apr. 16–30	2	1	2	5
May 1–15	4	13	8	25
May 16–31	5	2	6	13
June 1–15	1	—	—	1
July 16–31	—	—	1	1
Aug. 1–15	—	1	—	1
Aug. 16–31	—	—	1	1
Sept. 1–15	—	—	1	1
Totals	13	17	19	49

Twin embryos have been found only once in the examination of 49 pregnant female beluga at Churchill. During the week ending August 11, 1951, a 10-foot white female was reported to have contained two embryos, both males, whose lengths were 8.5 and 6.5 inches. It has been recorded elsewhere that twins sometimes occur (Degerboel and Freuchen, 1935).

In view of the fact that such high percentages of females contained no embryos, it would seem that a female beluga customarily does not bear young every year. It might be argued that breeding occurs late in the year, and therefore embryos would not be seen in the summer. If this were so, and the gestation period was 12 months, well-advanced embryos would commonly be in evidence in the summer. Very few are to be observed, so it seems logical to conclude that there would be little likelihood of the majority of females that were barren in the summer becoming pregnant later in the year.

Degerboel and Freuchen *(ibid.)* believed that beluga breed every third year. In 1950, five pregnant females were found to have greenish fluid in the mammary glands. This milk was of the same colour and consistency as that found in nursing

females. It therefore seems unwise to accept the unqualified statement that beluga bear only every third year. The presence of milk in the mammae of the pregnant beluga might be taken as evidence of a protracted period of nursing, the formation of pre-parturition fluid in the mammae excited by the state of pregnancy, the possibility that pregnancy may occur more frequently than previously supposed, or a gestation period of less than 12 months. A conclusive statement does not seem possible at this time.

The presence of large embryos in female beluga late in the summer is rare. On August 12, 1949, a 63-inch male calf was killed which still bore several inches of umbilical cord, and was presumably newly born. The latest date of finding a large unborn embryo in 1951 was the week ending July 14, when an 11-foot female contained a 58-inch female embryo estimated to weigh 125 pounds. During the week ending June 30, 1951, a 51-inch embryo weighing 95 pounds and a 48-inch embryo weighing 75 pounds were found.

Of the 20 embryos reported in 1951, 13 were males and seven were females. This is in about the same ratio of 2:1 that was reported for the whole summer's catch. Of the 12 embryos whose sex was recorded in 1949, nine were males and three were females.

The Churchill River is usually icebound until about June 15, so that breeding must take place elsewhere than in the river before that date. It is unlikely that open-water hunting operations there would disturb the breeding and indirectly decrease the stock.

No placental scars have been found in the uterine mucosa of beluga. This may be because the scar is small and easily overlooked, or because there is a complete absence of such a condition. Absence of placental scars would be in accord with the great whales which are believed to have indeciduate placentae. Where this condition exists the villi of the amniotic sac are readily detached from the point of uterine attachment or are retained within the uterine mucosa and resorbed. Whichever way the villi are disposed of, there is no tearing scar left on the lining of the uterus. Because of this absence of placental scars no evidence of previous births may be had from uterine examination.

Evidence of head presentation was observed. In one 9.5-foot female a 4.5-foot foetus was lying in the uterus with its dorsal surface directed toward the ventral side of the mother. The head was directed posteriorly and lay near the cervical portion of the uterus. The caudal portion of the foetus was curled to lie along the ventral surface of the calf's abdomen. Should head presentation be the normal method of delivery, it is in direct contrast with accounts read of birth of young to porpoises kept in aquaria, where tail presentation has been noted (Kritzler, 1949).

Consideration was given to the degree of correlation between numbers of corpora lutea and length of female beluga. Such data as were gathered might indicate either that ovulation in beluga is very irregular or that there may be great variation in rate of growth of females. Generally speaking, the greater the length of the animal the greater the number of corpora lutea. A better criterion of age than the length of the animal is necessary before any conclusion

is drawn with respect to frequency of ovulation. It should be stated, however, that no corpora lutea were found in the ovaries of any beluga of less than nine feet in length. Extensive work with reference to numbers of corpora lutea was abandoned until such time as conditions permit the accurate determination of the ages of individuals. Time did not permit the undertaking of histological studies of a series of ovaries with reference to their corpora lutea so that an estimate of the degree of persistence of these bodies cannot presently be made. It is, however, believed that, considering the large numbers of corpora lutea occurring in some ovaries, an inspection of the ovaries for these bodies can indicate whether or not pregnancy has occurred previously.

Sex Ratios

Observations made in 1949 on 180 beluga taken at Churchill showed that 93 were males and 87 were females, a ratio of about 1:1. In 1950, sex determinations were made on 326 beluga, and there were 176 males and 117 females, a ratio of 3:2. Reports were received in 1951 showing that the catch included 383 males and 198 females, a ratio of 2:1. In three years the catch has progressively contained more males, these composing 50, 60 and 67 per cent of the total in 1949, 1950 and 1951, respectively.

A statistical examination of the weekly sex ratios in 1951 (Table VI), using the chi-square method (Fisher, 1948), indicated that during the period June 17

Table VI. Number of male and female beluga taken at Churchill in 1951.

Week ending	Males		Females	
	No.	%	No.	%
June 9	4	80	1	20
June 23	14	70	6	30
June 30	25	74	9	26
July 7	40	63	24	37
July 14	16	70	7	30
July 21	35	66	18	34
July 28	56	62	35	38
Aug. 4	46	62	28	38
Aug. 11	33	69	15	31
Aug. 18	60	65	33	35
Aug. 25	44	83	9	17
Sept. 1	8	42	11	58
Sept. 8	2	50	2	50
Total	383	66	198	34

to August 18 the weekly catches did not vary significantly from the 2:1 sex ratio, and that therefore the animals that were being hunted at Churchill were not heterogeneous for sex ratio, and could have been the same population on this basis. Application of the same statistical tests indicated that the meagre catches during the first week and the last three weeks of the season differed significantly

from the 2:1 sex ratio, and therefore there was a probability that a different group of beluga was being exploited, or at least they were being exploited differently.

FOOD HABITS

In June, vast schools of capelin, *Mallotus villosus,* customarily run to the shores of Hudson Bay at Churchill, presumably in connection with spawning. The run was heavy in 1950, and during the summer this small fish, seldom exceeding a length of seven inches, was the beluga's chief food. They chased capelin into shallow water, with little regard for receding tides and the shouts of watchers on the beach. Capelin were infrequently seen in beluga stomachs in 1949, and in 1951 they were occasionally reported as having been consumed in amounts from one pint to one gallon. The hard parts of some invertebrates, jaws of *Nereis* and beaks of squid, have been found in beluga stomachs, and the former is probably a food item of considerable importance. Squid were a staple food, because their beaks were to be observed in beluga stomachs all summer. Remains of Arctic char, *Salvelinus alpinus,* were found by Dr. W. M. Sprules in the stomachs of two beluga taken at Term Point, N.W.T., in 1948. Shrimp remains were found in one beluga stomach. The beluga's habit of feeding near the bottom was indicated not only by the bottom organisms eaten but also by the frequent presence of sand and small stones in the animals' stomachs.

Nearly all identification of food was made from the hard parts of the ingested animals, the digestive juices being of such strength as to have destroyed all soft parts of the food prior to inspection. This was true even though several stomachs were checked less than two hours after the time of capture. The digestive juices may destroy all evidence of other articles of food in the beluga diet, thus rendering this account of beluga foods somewhat inadequate. It has been suggested that the beluga, when pursued, regurgitates the contents of the stomach. Such action was not observed, but if it be so it would account for the paucity of material in the examined stomachs.

PARASITES

Nematode parasites of the Super-families Strongyloidea and Ascaroidea were found to infect the Hudson Bay beluga. Since the classification of nematodes is covered by widely scattered and often inaccessible literature, the following identifications are somewhat tentative. A small strongyloid was found very frequently in the eustachian canal and tympanic cavity, and at times these roundworms were present in such numbers as to almost completely occlude the canal.

These parasites have been referred to the genus *Stenurus* Dujardin, 1845 (Syn. *Pharurus* Leuckart, 1848, and *Prosthecosacter* Diesing, 1851). On the basis of host these strongyloids are tentatively identified as *Stenurus arcticus* (Cobb, 1888), Syn. *Strongylus palasii* Benedin, 1870 (Nomen nudum). The frequency

with which *S. arcticus* occurred was not determined, but this parasite was present in the eustachian canals of the majority of beluga examined.

An anisakid was found frequently, though never in great numbers, in the stomachs of beluga. This ascarid has been identified as *Anisakis simplex* Dujardin, 1845. Lyster (1940) declares *A. simplex* Dujardin, 1845 to have as synonyms *A. kukenthali* (Cobb, 1888), *A. typica* (Diesing, 1861) and A. *dussumierii* (van Beneden, 1870). *A. simplex,* antedating all others, is taken as the proper name for this ascarid.

The age at which beluga become infected with these parasites has not yet been determined though *A. simplex* were collected from the stomach of a seven-foot-four-inch individual. Although this animal was just cutting teeth $\begin{matrix}0|2\\0|2\end{matrix}$ the presence of *Nereis* jaws in its stomach indicated that it was not entirely dependent upon milk for sustenance and could become infected from other foods.

Thanks are due to Dr. J. A. McLeod of the University of Manitoba for assistance in identifying the parasites.

HUNTING METHODS

The nets in general use are made of heavy cord, about No. 96 sideline, sided top and bottom with half-inch manilla rope. Local nets are usually hand-tied, 24-inch stretched mesh, 15 to 20 meshes deep, and corked along the upper edge. They are set in shallow water along the edges of the estuary and near shore in the Bay off the river mouth. Because of exceedingly strong tides and river currents, very heavy anchors are employed to prevent the nets from drifting and fouling. The excessive weight of the anchors and the great weight of the net itself render the use of nets rather difficult unless a boat of fair size is used to tend them.

In spite of the large size of the meshes, nets catch small beluga as well as large, and 28.7 per cent of the 171 animals taken by net in 1951 were under nine feet in length (Table VII). It is believed that, since the animals are often entangled by their tail flukes and their flippers, any net, regardless of size, would take a proportion of small beluga. Beluga soon drown in a net because they cannot reach the surface for air.

Another use of nets was formerly made in the Churchill area. A heavy net was placed across the narrow mouth of a shallow bay and allowed to lie slack upon the bottom. As the bay filled with a rising tide, beluga entered over the nets. When the tide began to recede or there was no likelihood of more beluga entering the bay, the net was drawn tight across the entrance and prevented the animals' exit. At low tide the beluga were left either stranded completely out of the water or in water so shallow that they were readily killed and recovered. The bay at Churchill, where the weir net was employed, has now been dredged and built around so it is no longer of any use for this purpose.

It was reported that at the mouth of the Seal River, about 30 miles north

FIGURE 4. The tail flukes are usually cut off in order to clear the beluga from the gill-net.

TABLE VII. Length distribution (in feet) of beluga taken by nets at Churchill in 1951.

Week ending	Number of beluga, by lengths									Totals
	5	6	7	8	9	10	11	12	13	
June 16	—	—	—	—	—	—	—	—	—	0
June 23	—	—	1	—	—	2	1	1	—	5
June 30	—	—	1	2	2	3	2	1	—	11
July 7	—	1	3	5	10	3	1	1	1	25
July 14	—	—	1	1	2	2	—	—	—	6
July 21	—	—	—	—	2	2	—	—	—	4
July 28	—	1	3	2	4	2	2	1	—	15
Aug. 4	—	—	1	—	4	4	3	2	—	14
Aug. 11	1	—	1	1	1	8	2	3	1	18
Aug. 18	1	1	6	3	12	8	3	3	—	37
Aug. 25	—	—	3	5	4	4	2	1	—	19
Sept. 1	—	—	3	1	4	4	1	—	—	13
Sept. 8	—	—	—	1	—	1	—	2	—	4
Totals	2	3	23	21	45	43	17	15	2	171
Per cent of total	1.2	1.8	13.5	12.3	26.3	25.1	9.9	8.8	1.2	—

of Churchill, there are many tide-pools and pockets where beluga occasionally become stranded at low tide. It was declared that as long as the beluga could keep themselves wet by splashing and rolling in the pools no harmful effects were noted and they swam away with ease at the return of the next tide. An account is contained in Norman and Fraser's *Giant Fishes, Whales, and Dolphins,* of how a beluga was transported, out of water, in a packing case filled with seaweed, from Newfoundland to the British Isles. Five weeks elapsed between the animal's capture and its return to its natural element in a tank at the Westminster aquarium. Apparently the beluga suffered no ill effects attributable to its long stay out of water.

Another well-authenticated report of members of the family Delphinadae surviving on a beach between tides is contained in *Natural History* (1949), and concerns pilot whales which came ashore on the Florida coast. It was said that the animals suffered no ill effects providing heat stroke did not ensue, although evidence was brought to show that symptoms of this state were not always immediately obvious.

Harpooning is the commonest method of capturing beluga at Churchill, and about 70 per cent of the 1951 catch were taken this way. Two men working as a team are necessary, and they must be equipped with a canoe of good size, such as a 20-foot freight model, in order to combat the rough water and to be stable when towing a beluga lashed to its side. A 10-h.p. outboard engine provides adequate speed when in pursuit of animals, and has power enough to tow a dead beluga against the river current or receding tide. Any high-powered rifle will kill beluga once they have been harpooned.

The common style of harpoon is a copy of the instrument seen in collections of primitive Eskimo ivory tools, only nowadays it is made of metal. Into the end of a pole whose length may vary to suit the user, but which is generally about eight feet, is firmly driven a piece of three-eighths-inch soft round iron until about six inches of it project from the end of the pole. Over the end of this spike is slid the shaft of the hollow harpoon tip. This tip is made from a metal tube, usually copper, about five inches in length which is shaped and flattened at one end to make a barbed point. The other end of this tube is flattened and somewhat curved as shown in Figure 5. The tube is kept open at this end, to be slid over the spike in the pole. A hole is drilled at the mid-point of the length of the harpoon tip and through it is passed a loop of strong, stiff wire for the attachment of the harpoon line.

When the harpoon is thrust into the animal the tip disengages from the iron spike as the pole is withdrawn. Because of the curve of the tail of the harpoon tip, and the location of the point of attachment of the line, the harpoon head moves sideways as it pulls back and takes up a position in the blubber at right angles to the line of pull, thus giving a very firm anchor within the beluga. Very few reports were heard of this device pulling free, once it was firmly implanted. The wire loop of the harpoon tip is attached to the line which is fastened to the pole to prevent the loss of the pole itself. To the other end of the line is secured an airtight container, usually a five-gallon can, which marks

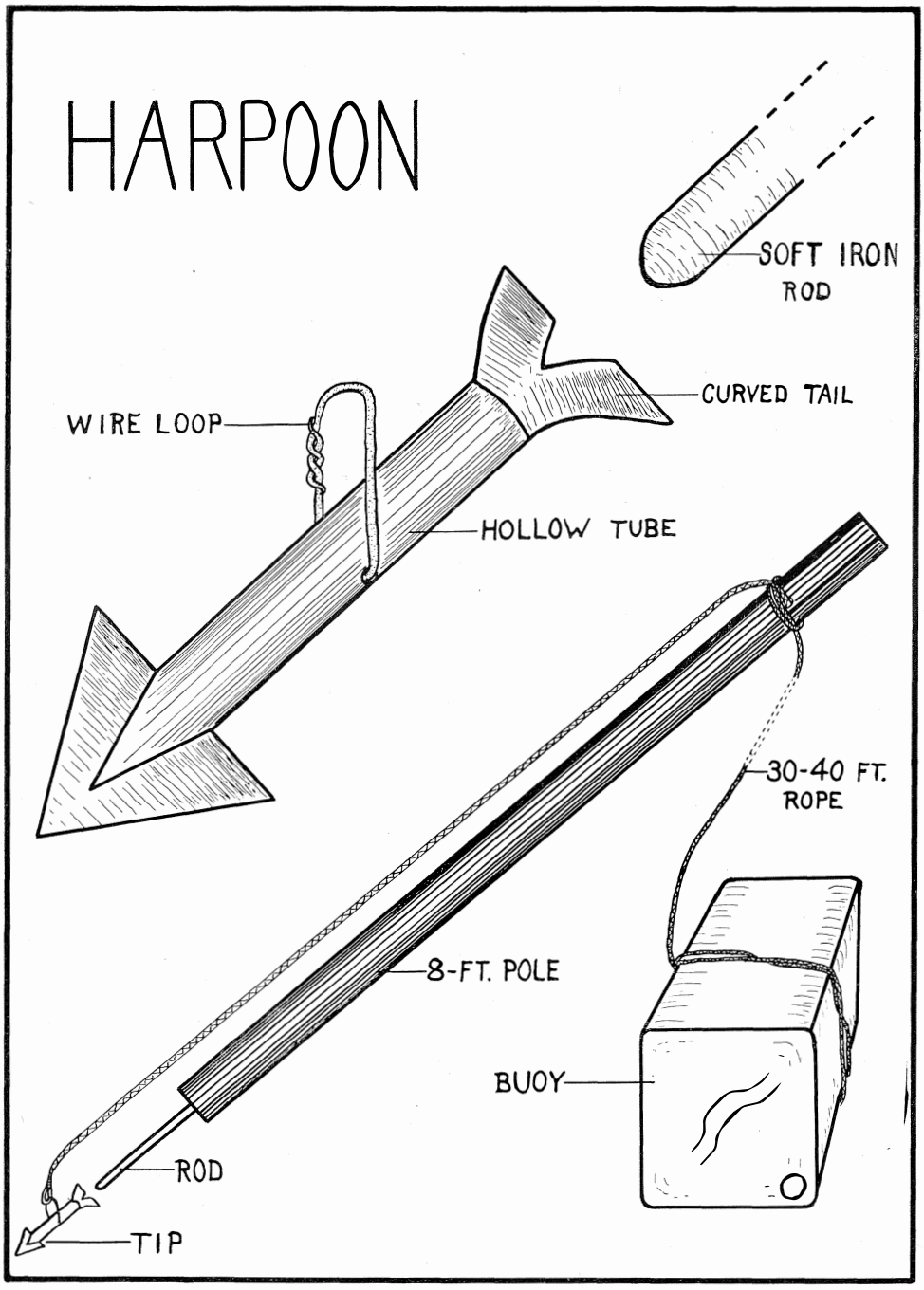


FIGURE 5. Details of Eskimo-type harpoon.

the progress of a pursued animal. The line generally consists of 40 feet or so of quarter-inch manilla rope capable of withstanding a strain of several hundred pounds.

Hunting conditions are usually ideal at high tide on a calm, sunny day when the canoe can make good speed without undue concern for the size or direction of the waves. The two men cruise about until they locate a beluga, both by sight of the animals and their brief spouts, in a shallow portion of the estuary. Once the animals are sighted in water that is too shallow for them to escape by diving, it is only necessary to choose the quarry and pursue it so that it cannot

FIGURE 6. The blubber layer is stripped off in chunks before placing in barrels for natural rendering, and the carcasses will be chopped up for dog food. Domestic use, Churchill, Manitoba, 1947.

escape into deep water, until close enough to drive home the harpoon. This is generally done by reaching down into the water and pushing the point into the beluga, or, as in some instances by those more adept at the art, the harpoon is thrown.

Once the harpoon head has been embedded in the animal and the shaft has been pulled out, the buoy with line wrapped around it is thrown out. The motor is stopped and tipped out of the water to prevent fouling with the harpoon line. The impact of the harpoon causes the beluga to begin a series of rather aimless rushes in an attempt to dislodge the instrument. These rushes are usually of short duration, and the beluga soon either comes to rest or continues a

relatively straight course. The animal's position is now apparent from the location of the buoy. The engine is started, the buoy is retrieved and held by one member of the party, and the beluga in its attempts to escape capture will tow the canoe along at considerable speed.

During the brief intervals when the animal surfaces to breathe, the other member of the party shoots at it with the rifle until a vital spot is hit. As the bones of the skull are quite thin and brittle, one well-placed shot is usually sufficient to kill. However, in the excitement, and with the unsteady nature of the moving canoe and the strenuous movements of the beluga, several shots are usually required. The dead animal is pulled to the surface with the harpoon line, since otherwise it would sink and be lost, and a rope is secured above

TABLE VIII. Length distribution (in feet) of beluga taken by harpoon at Churchill in 1951.

Week ending	Number of beluga, by lengths										Totals
	5	6	7	8	9	10	11	12	13	14	
June 16	—	1	—	2	—	1	1	—	—	—	5
June 23	—	—	—	—	2	2	4	7	—	—	15
June 30	—	—	—	1	1	3	11	7	—	—	23
July 7	—	1	1	2	7	21	4	3	—	—	39
July 14	—	—	1	1	1	8	4	2	—	—	17
July 21	2	—	5	7	12	15	7	1	—	—	49
July 28	—	2	10	7	10	24	6	15	2	—	76
Aug. 4	—	2	4	5	5	20	11	8	4	1	60
Aug. 11	1	—	1	6	3	10	5	5	—	—	31
Aug. 18	—	1	1	4	6	15	12	15	2	—	56
Aug. 25	—	—	—	—	1	4	7	19	4	—	35
Sept. 1	—	—	—	—	—	3	3	—	—	—	6
Sept. 8	—	—	—	—	—	—	—	1	—	—	1
Totals	3	7	23	35	48	126	75	83	12	1	413
Per cent of total	0.7	1.7	5.6	8.5	11.6	30.5	18.2	20.1	2.9	0.2	—

the flukes and fastened to the front thwart of the canoe in such a fashion that a large amount of the beluga's body is out of water. In this manner the beluga may be towed to a desired spot, offering a minimum of resistance to the progress and handling of the canoe.

Some hunters have also tried anchoring or drifting until a beluga comes close to the canoe, after which the procedure is the same as when pursuing it. This method leaves too much to chance and is seldom resorted to unless beluga do not venture inshore or there are too many dangerous rocks near the shore. The greatest drawback incurred with harpooning is that sounds of engines and rifle shots have a tendency to frighten off the remaining animals.

Inspection of the length frequencies of beluga taken by harpooning at Churchill in 1951, Table VIII, reveals that 16.5 per cent of the 413 that were

taken this way were less than nine feet in length. This is a smaller proportion of young animals than was taken in nets.

Two other methods of capturing beluga have been reported, but they are not used in the Churchill region. It is said that in some of the more northern localities a group of beluga are approached by a fleet of canoes or kayaks arranged in an arc, and frightened towards shore with much shouting, shooting and slapping of paddles. This method is practised in shallow water as the tide is receding, usually near the head of a bay. As a consequence some of the animals become entrapped in shallow water and are left stranded on the shore as the tide goes out.

Although killer whales, *Grampus orca,* were not observed, reports were often heard of their sporadic occurrence in Hudson Bay waters. It seems that their presence at times aids in the capture of beluga. These killer whales apparently pursue the beluga and frighten them into very shallow water where they are at the mercy of hunters or left stranded by the ebbing tide. This has been reported from the Tavani area, N.W.T. Killer whales were also reported to be present near Churchill in 1949, although this could not be confirmed.

In the vicinity of Povungnituk there is very little shallow water for harpoon hunting. Here another apparently successful method is employed. This consists essentially of pursuing the animals and shooting them from canoes without first harpooning them. As the water in this area is very clear, contrasted with the Churchill estuary, the dead animals are readily seen lying on the bottom. The dead beluga are raised to the surface with a grapple of three large hooks, such as cod hooks, affixed back to back and attached to the end of a long, heavy line. This method is also used at the Belcher Islands. It is obvious that, in view of the deep water, harpooning would not be generally practical. However, it is believed that indiscriminate shooting would result in the escape of many wounded animals with the consequence that some would be permanently crippled or later, lost to hunters, die of the wounds received. Nets might be a satisfactory answer to this but their high cost is somewhat prohibitive.

REACTION TO HUNTING

In 1949 a series of observations was recorded which showed that beluga became frightened more easily as the summer progressed. On July 22 it was fairly easy to approach them with the engine running. They seemed to take no particular notice and did not veer from their course until the canoe was within 100 to 150 feet, whereupon they dived and sometimes altered course. By August 15 the animals would react to the approach of a motor and dive while the hunters were still at a distance. This made their capture more difficult, unless they could be driven into shallow water where their diving was limited. On August 20 it was noted that the sound of gunfire or numerous outboard motors, even in the upper part of the estuary, would cause most of the beluga to return to the Bay, even though they may have just come into the river. This progressive wariness, unless characteristic of some seasonal change in the nature of the animal, seems to be a result of hunting activities. This would indicate that, for the most part, the animals had been present at Churchill throughout the period

of beluga hunting. Thus it seems that the majority of the herd represents a local population rather than a series of transient groups. Some of the animals, as has been remarked, did not seem in haste to leave the estuary at the sound of distant noises. This might indicate that these individuals had not been in the area for the same length of time as the more wary ones.

Assumptions drawn from the foregoing indicate that beluga in the vicinity of Churchill represent a more or less local population supplemented by transients. No characteristic differences in the groups of wary and unwary beluga were noted, as regards maturity, based upon colours in the group, or sex composition as based upon the numbers of females accompanied by calves.

MARKING

Shooting a marked metal "tag" into the beluga, as is done with the great whales, was considered inadvisable. The tag, to be of a size which could be fired as a bullet or shotgun slug might cause fatal injury to so small a member of the Cetacea. There is also a likelihood that a successfully placed marker of this sort would go unnoticed when the animal is butchered by the native. A report was heard concerning a beluga which when killed was found to bear in its flesh the point of a harpoon from which the line had broken during some previous hunt. It was declared that the area about this metal object was so greatly inflamed, soft and decomposed that it seemed the area soon would have fallen away carrying the point with it. This might well be the fate of any metal tag shot into the blubber of a beluga even though the tag was made of a relatively clean, inactive material and did not penetrate deeply enough to cause mortal injury to the animal.

The tattoo was tested on dead beluga pulled up on the beach and on a piece of beluga hide and blubber placed under water. It made a series of small holes representing the figure on the tattoo head, and they were well filled with ink. The length of the pins was sufficient to carry the ink just through the hide and into the blubber. The accurate range of the harpoon gun with the marking plate attached was approximately 25 yards.

Marking operations led to observations on the beluga's reaction to weather and tides. Only on relatively calm days do beluga remain for more than an instant at the surface or present sufficient above-water target area during respiration. This influence of the weather, and the fact that wind, rain and fog are commonplace and often render canoe travel inadvisable or impossible, are major obstacles in the way of beluga marking. Beluga exhibited very little tendency to enter the Churchill River estuary on windy, cloudy days. They came into the river on the rising tide, went up as far as the head of tide, and most beluga went out of the estuary with the falling tide. The combination of river current and falling tidewater passed the beluga out of the constricted river mouth at great speed and with little effort on their part.

It was thought, at first, that it would be best to pursue the animals into shallow water, and shoot the marking device when they surfaced to breathe. It was relatively easy to approach within harpoon range, but under the stress of pursuit

they were so erratic in course and surfaced so briefly that this method was discontinued after several trials. Chasing beluga in mid-stream or on the waters of the Bay was likewise found unproductive, even in calm weather, because they easily eluded pursuers by diving and manoeuvring in deep water.

Drifting with the river current in the hope of approaching unnoticed close to small groups of beluga entering the river was also tried but discontinued. It was found that they seldom came close to the canoe, owing to the wide expanse of water across which they could disperse. Use of paddle or motor to move the canoe to a better position for drifting also frightened them away.

Merry's Rock is a reef off Cape Merry at the entrance to the Churchill estuary. This rock is submerged to a depth of several feet at high tide. It was noticed that many of the beluga, when entering or leaving the estuary, passed between the cape and the bell buoy marking the rock. At high tide on calm days when no surf was breaking over the reef a canoe could be anchored over the rock. Beluga seemed to show little fear of the canoe anchored in this spot, and at times some approached reasonably close before veering away or diving. The majority, however, veered off beyond effective range of the harpoon gun. Most of the hits and probable hits with the tattoo were made here, but these numbered only four hits and four probables in 1949, and seven hits in 1950. The probable hits were on animals travelling underwater at some speed so that it could not be observed for certain if they had been hit. The sound of the impact of the tattoo and the sudden rush and dive of a beluga left no doubt of a hit upon a surfacing animal. It is believed that the activities of a dredge in 1950 restricted movement of beluga into the river, otherwise the number marked might have been greater.

A total of 11 markings in two summers was hardly a large enough sample to produce returns, and it was not unexpected that no marked beluga were observed at the processing plant nor were such captures reported elsewhere.

UTILIZATION

Processing

At the plant of the Adanac Whale and Fish Products at Churchill, beluga were pulled to the second floor up an inclined ramp or trough, with the aid of a steam winch. This winch was also used to help pull off longitudinal strips of blubber which were cut into two-foot pieces and dropped into the top of the cooker whose opening was at second-floor level. When the cooking tank was full enough the hatch was closed and sealed. This cooker consisted of an outer pressure jacket and an inner perforated drum which was rotated on its long axis. After sealing, 60 pounds of steam pressure was let into the cooker and the inner drum was set in motion. The blubber was rendered in about 1.5 hours, and the oil was forced into a settling tank where most solid particles settled out. Then the oil was put through a separator to remove water and the remaining sediment. This gave an amber-coloured product, free of sediment and water and relatively free of odour. The oil was stored in large tanks outside the building.

The remainder of the carcass, liver removed, was broken into sections and fed into a meat grinder. This ground meat, bones and viscera was packed in 50-pound

cartons and air-blast frozen. The storage temperature in the refrigerator was near 0°F. The liver was not ground but packed intact in 25-pound lots and frozen. Small quantities of selected meat were steaked and individually wrapped and frozen.

PRODUCTION

Total production has increased each year since the plant commenced operation in 1949, and in 1951 amounted to about 314,000 pounds (see Table IX). The oil

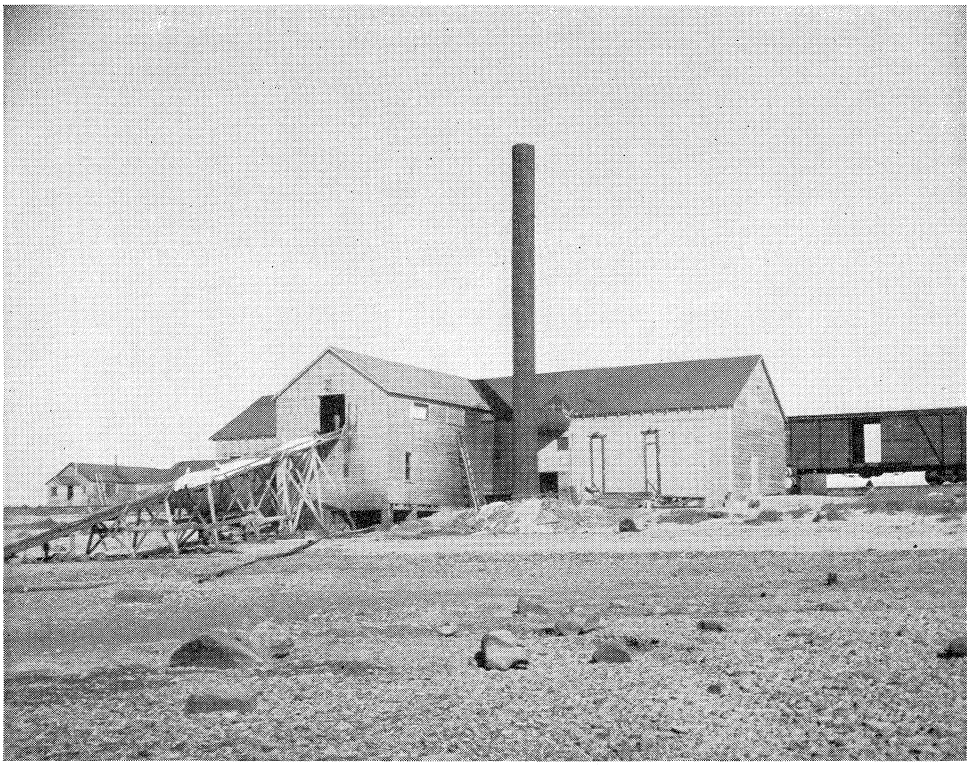


FIGURE 7. Rendering plant of the Adanac Whale and Fish Co., at Churchill, Mantoba, showing three beluga being pulled up the ramp.

is suitable for industrial and edible use, the ground meat is disposed of as feed for dogs and fur-farm animals, the liver is for animal food, and the steak has been sold for human food.

The average yield per animal of all products was lower in 1951 than in preceding years, but, from the figures in Table X, it would appear that greater emphasis had been placed on oil production than on meat, as compared with preceding years.

PROPERTIES

A few observations are available on the properties of beluga oil, liver and

meal. Characteristics of oils of the common dolphin and of the beluga have been reviewed by Bailey *et al.* (1952), and the blubber oil is not unlike that of the Pacific porpoise. Analyses reported by Schmidt (MS-2) showed that a sample of Hudson Bay beluga head oil had a saponification value of 297, iodine no. 32.6, free fatty acids 2.54 per cent, unsaponifiable matter 3.12 per cent, and a vitamin A content of 500 U.S.P. units/g., and that body oil had values of 218.4, 93.8, 1.23 per cent, 1.57 per cent and 226, respectively. A more extensive range of values is to be found in Bailey *et al.* (1952). The lubricating abilities of these oils

TABLE IX. Approximate total production, 1949-51, at the beluga processing plant at Churchill.

	1949	1950	1951
No. beluga processed	206	326	584
Oil (lb.)	45,000	101,935	172,735
Ground meat (lb.)	85,000	78,300	133,100
Liver (lb.)	—	2,050	4,750
Steak (lb).	—	—	3,200
Total products (lb.)	130,000	182,285	313,785

are related to the fatty acids and high saponification values, and oils rich in these values are to be found in the jaws. Jaw oils of this group of mammals have been used for the lubrication of watches, scientific instruments, etc. Blubber oil can be used to lubricate high-speed spindles, as a rust preventer on guns, knives and tools, and to a limited degree in leather dressing, the tanning of certain kinds of leathers and the preparation of chamois (Brocklesby, 1941).

TABLE X. Average yield of commercial products from beluga at Churchill. The weight of oil is taken as 9.25 lb. per gallon.

	1949	1950	1951
No. of beluga on which averages were calculated	203	273	584
Average yield:			
Oil (gallons)	25	35	32
Oil (lb.)	228	325	296
Animal food (lb.); meat	419	294	228
liver	—	—	8
Steak (lb.)	—	—	6
Total yield, all products (lb.) per beluga	647	619	538

Measurements of viscosities of beluga oil have been reported (Bailey, 1951) at several temperatures in comparison with those of the engine lubricating oil BA 5-W. The head oil was similar to, and the blubber oil was slightly more viscous than, this lubricating oil.

Schmidt (MS-1) removed the odour from beluga oil by steam distillation, and tested the effects of several decolorizing agents. Expressed in Lovibond units, the yellow colour was reduced from 5.0 in the untreated sample to 4.0 by using filtrol, to 3.2 by diatomite, and to 2.0 by bentonite; the same agents reduced the red colour from 0.9 to 0.6, 0.3, and 0.1, respectively.

A piece of beluga liver was shipped from Churchill to the Pacific Fisheries Experimental Station in Vancouver, B.C., in 1947 for analysis. Although it did not arrive in very good condition, it was reported (Swain, 1947) to contain 3.86 per cent oil and 702,200 U.S.P. units of vitamin A per pound, by absorption at 328 mu. using 2,000 as conversion factor. This may be expressed as a vitamin A potency of the oil of 41,450 U.S.P. units per gram. This vitamin content is less than that of the livers of the great whales, and considerably less than that of lingcod, red snapper, halibut, swordfish and blue-fin tuna.

The protein content of meal made from a trial shipment of 16 beluga sent from Churchill to St. Boniface, Manitoba, in 1947 was reported by Canada Packers Limited to be 61.3 per cent. The hides have customarily been rendered with the blubber at Churchill, and although various other commercial uses, such as the manufacture of bootlaces (Vladykov, 1944) are possible, no such additional uses of these hides have been made at Churchill. The beluga is caught to some extent by coast-dwelling residents who make use of the hide as dog harness, the blubber both as a food and an illuminant, and the flesh as food for both themselves and their dogs. Where walrus can be obtained it is preferred both for food and for leather. Neither are as important to the Eskimo as the caribou and the seal.

ACKNOWLEDGMENTS

We wish to express our sincere thanks and appreciation of the co-operation and assistance that was so willingly given to us by the Adanac Whale and Fish Products Company, the Royal Canadian Mounted Police, Mr. O. Sigurdson, Mr. F. Martin, Mr. H. Ingebrigtson, Fr. Ferran, Fr. Phillipe, and by numerous other residents of Churchill and vicinity who contributed the benefit of their knowledge and experience.

SUMMARY

Information on the Hudson Bay beluga was gathered from 1947 to 1950 by personnel of the Central Fisheries Research Station of the Fisheries Research Board of Canada, and for the 1951 season, was kindly supplied to the Station for analysis by the Adanac Company and the Royal Canadian Mounted Police at Churchill, Manitoba.

One of the objectives was to establish the migratory routes of beluga in order to assess the effect of the kill at Churchill upon the food supply of more northerly dwellers. In two seasons, at least 11 animals were marked and four more probably marked, by tattoo, but no recoveries were obtained.

Beluga increase in abundance in the Churchill vicinity until mid-summer, but rapidly disappear from the area with the onset of fall storms. Over 1,600 were counted on August 1, 1950, in the mouths of the Churchill and Seal Rivers and along the intervening coast. Some may be present off the edge of the shore

ice during the winter. Most of the breeding is completed before the Churchill estuary becomes free of ice in the spring, although some mating occurs later in the summer.

Beluga in the commercial catch have ranged from 5 to 14.7 feet in length, with the average male measuring about 10 inches longer than females. Blue, grey and white phases are exhibited progressively with age by the Churchill beluga. No brownish phase was found, even in the smallest animals. This variance in color phases as compared with the St. Lawrence beluga may be part of a taxonomic difference between the two groups.

In recent years a progressive dominance in numbers of males over females in the catch has been recorded: 1949, 1:1; 1950, 3:2; 1951, 2:1; or a catch composed of 50, 60 and 67 per cent male beluga. Uterine and ovarian examinations indicated that a female of nine feet may be considered sexually mature, at a probable age of three years. The percentages of females that were pregnant was 16.5 in 1949, 15.7 in 1950 and 11.5 in 1951, which might indicate some disturbance during breeding season. Twins were noted once in the examination of 49 pregnant beluga. Evidence of head presentation at birth was observed.

Although the teeth are tritubercular in the very young, this condition is soon eliminated by wear, so that a "haplodont" state is observed in older animals. The complete set of 20 upper and 20 lower teeth was seldom seen, and there was little correlation between tooth count and length (age). Food of calves is a thick, greenish milk, but this is later supplanted by fish, squids, sand worms and some shrimp, much of it captured near the bottom. Powerful digestive action quickly breaks down the ingested foods. A nematode tentatively identified as *Stenurus arcticus* was often noted in great abundance in the eustachian canal. *Anisakis simplex* was not uncommon in the stomach. An extensive search failed to reveal cestodes in the alimentary tract.

Both nets and harpoons were employed for the capture of beluga at Churchill, but even large-meshed nets failed to exclude small beluga from the fishery. A wariness which increased through the summer was noted in the animals' reactions to hunting activities. Blubber oil, ground meat, liver and some "whale steaks" represent the products of the Churchill industry. In 1951 over 300,000 pounds of products were obtained, averaging 538 pounds per animal.

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