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Report on beluga investigations at Churchill in 1950

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INTRODUCTION

From July 5 to September 3 Mr. B. G. Arnason and the author were at Churchill, Manitoba to continue studies of the beluga or white whale, Delphinapterus leucas, which were processed on a commercial scale by the Adanac Whale and Fish Products Company of Dauphin, Manitoba.

The work of the observers entailed:

1. Continuation of attempts to mark the beluga with a modified Greener harpoon gun, to determine the migratory range of the animal.

2. Aerial observations to determine the number of animals at and near Churchill.

3. Further biological studies concerning food, reproduction, etc., of the beluga.

4. To observe operations at the Adanac Whale and Fish Products Company plant.

5. To contact and interview persons who might have knowledge pertinent to the biology, habits and Eskimo utilization of this animal.

Thanks are due the personnel of the Adanac Whale and Fish Products Company, the R.C.M.P., Mr. O. Sigurdson, Mr. F. Martin, Mr. H. Ingebrigtson, Father Phillipe and Father Ferran of the Oblate Fathers, and many other residents of Churchill whose co-operation and assistance aided in furthering the investigation.

EQUIPMENT

A twenty-foot freighter canoe, powered by a 10 H. P. outboard motor was employed for work in the Churchill River estuary. This craft, while quite adequate in reasonably calm weather, was much too small to permit its use in the heavy surf at the river mouth (the only location found suitable for marking beluga) during much of the period of investigation.

The Greener Light Model Harpoon Gun (W. W. Greener Limited, London, England) was again used. It was equipped with the letter O, approximately 2 inches by 1½ inches, outlined with half-inch pins in place of the regular harpoon head, this symbol to represent "1950". This equipment was quite adequate whenever weather conditions permitted its application.

The services of an Anson Mk. V were secured for the aerial survey work. This craft, operated by "Arctic Wings", of the Hudson Bay Vicariate Transport Limited, having the bomb-aimers window in the nose, provided an unobstructed vantage point for the survey work. However, the speed of this craft is such that, whenever a large group of animals was concentrated in a small area an accurate count was not possible. An aerial camera is recommended to supplement further work of this nature.

MARKING OPERATIONS

As is 1949, it was found that the only productive method of marking belugas was to anchor near the river mouth and wait

until they swam within range of the marking gun. Although other locations were tried when necessitated by adverse weather conditions and the adequacy of the canoe have been discussed under "Equipment".

Dredging operations near the river mouth restricted movement of the animals into the estuary. This was believed to be the case when the party was anchored near the river mouth during marking operations. Aerial observations later confirmed this belief. Because of this dredging, animals entering or leaving the estuary dispersed across the entire river mouth instead of more or less restricting themselves to the east side of the river mouth between Merry's Rock and Cape Merry. This dispersal greatly reduced the number of animals coming within range of the marking gun, which effect could not be offset by a change in the site chosen for anchoring.

In all, seven animals were marked during the 1950 season. Of these, four were white, two were grey and one was a small blue animal. Two others were fired at but missed. No belugas marked either in 1949 or 1950 were brought to the whale processing plant. Thus, unless some marked animals have been killed in other vicinities or died of natural causes eleven marked animals are now at large. In addition to this several other animals may have been marked in 1949. In view of the large numbers of belugas frequenting this Churchill estuary a marked sample of such a size is quite inadequate to provide the hoped for results.

Since the modified harpoon gun is quite suitable for this work the solution to the problem of marking a greater number

of animals lies in providing a more worthy craft from which to conduct operations. A small power boat such as the "Peterhead" used in northern areas for coastwise travel would be quite satisfactory. With a craft of this size little attention need be given to weather conditions and marking operations could be conducted during most of the period of investigation. While the purchase price of such a craft might seem prohibitive, the fact that it would also provide living quarters during the investigation would obviate the necessity of securing expensive hotel accommodations and high priced meals. Thus such a craft could doubly justify its purchase price, much of which could be recovered by resale of the boat at completion of the investigation.

AERIAL OBSERVATIONS

In making aerial counts of belugas in the Churchill area use was made of an Anson, Mk. V aircraft chartered from Arctic Wings of the Hudson Bay Vicariate Transport Limited.

Flights were made to cover the area from the Churchill River to the Seal River. Funds were not available to cover the greater distance from Churchill to the mouth of the Nelson River from which flights, it had been hoped, the direction of migration and numbers of migrants could be determined.

Flights made, however, did provide counts of animals in the Churchill-Seal River vicinity indicating the numbers of animals subject to hunting on several occasions throughout the season.

While some estimations of numbers of animals in large groups were necessary the following numbers are believed adequately accurate.

Table 1 Aerial Counts of Belugas

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

Due to inclement weather and the fact that either pilot or aircraft was not always available on fine days no surveys were possible from August 1 to August 30. The speed of the Anson aircraft (125-150 m.p.h.) was such that estimations were necessary whenever the animals were concentrated in a small rea. This was often the case in the vicinity of the Seal River.

It is recommended that, if further aerial surveys be conducted, an aerial camera be employed. From aerial photographs it would be possible to obtain not only a very accurate count but also to calculate the length (age?) composition of a group of belugas.

It was found that for best results, the survey should be conducted as near noon as possible with the line of flight such

that the sun is behind the observer. This minimizes glare from the water. Glare, when flying toward the sun renders a count impossible, and is especially severe when the sun is not at zenith. A calm day is necessary to provide maximum vision below the surface of the water and to prevent confusion of whitecaps and belugas. The latter is a very real obstacle to an accurate count. A height of four thousand feet proved optimum. From this height a desirable wide angle of vision is had and the animals are still quite visible to the unaided eye.

If weekly flights covering a shoreline distance of two hundred miles were made, making use of an aerial camera (preferably color film), very accurate data concerning the direction of migration and numbers of migrants could be obtained. The aforesaid mileage should encompass that distance which could be traversed by migrating animals in a weekly period. Thus the animals would not have passed completely through the line of survey during the intervals between flights and successive photographs could show the distance and direction travelled by any groups of animals.

Assuming the belugas at Churchill to represent transient groups, the numbers counted, Table I, indicate a population sufficiently large to withstand the present commercial catch. However should the beluga population at Churchill prove to be a local group a prolonged whale fishery will severely deplete the number of animals in a very few years. This latter assumption is not believed to be the case and, relying on precedent, it is suspected that any great decrease in the number of animals frequenting the Churchill estuary will be due to animals avoiding an area where

they are too severely molested.

WHALING ATTEMPTS AT THE SEAL RIVER

The Adanac Company's gas boat was taken, on three occasions, to the Seal River, approximately fifty miles north of Churchill, by hunters who themselves bore all expenses incurred on the trips. These trips were made in the belief that, since according to reports the animals congregated there in a very restricted area in very shallow water, it would be profitable supplement to the Churchill hunting to capture the animals at the Seal River and transport them to the Adanac plant.

Aerial observations showed that the animals are present in about equal numbers at Churchill and at Seal River. However, they are present at the latter in only a very restricted area thus rendering them more subject to hunting efforts. During the afternoon of July 19 and the morning of July 20, 11 animals were captured by two teams of hunters. Again on July 25 and August 3, 10, and 8 belugas represented the processed catch of one Eskimo hunting team. On August 3 several others were captured but broken tow lines caused their loss in transit.

The number of animals captured per hunting crew on these trips exceeds the daily average in the Churchill vicinity. This may be due not only to their concentration at Seal River but also to the small disturbance caused by only one or two hunting crews in the area. However, there is no harbour at Seal River and if

caught there by a storm the gas boat would have to ride out the rough weather in very shallow, shoaled waters. Should bad weather be imminent a hasty return to Churchill is precluded not only by the very slow speed of the boat but also by a very strong current, which on a falling tide is strong enough to seriously impede if not halt the progress of the Adanac boat with belugas in tow.

The boat's pace, slow enough at best, is often further impeded by a bed of seaweed which must be traversed en route between the two rivers. These algae at times have so fouled the propeller as to almost and at times absolutely nullify its efforts to drive the gas boat. This seaweed resists every effort to dislodge it completely while at sea.

These factors introduce a very serious loss of hunting time when the hunting crews also man the gas boat to transport the belugas. Add to these factors the large gas consumption of the Adanac boat and the trips, the good catches being too infrequent, represent a financial loss to the hunters when compared with the productivity of their efforts, more continuous and less expensive, in the vicinity of Churchill. Loss of hunting time more than any other factor renders these trips unworthy of the effort. It is believed that a hunting team permanently stationed at the Seal River during the season, working in conjunction with a one or two-man gas- boat crew would permit an operation of profit to all concerned. Even this method would have its drawbacks. The frequent storms would interrupt travel to and from the Seal River thereby causing some spoilage of animals during a prolonged spell of rough

weather. There would doubtless also be some loss of animals, carried away during storms, as the shoreline there is absolutely devoid of even the smallest sheltered cove in which to collect the captured belugas. The ocean floor there slopes so gradually that, according to the hunters, the water recedes for "miles" at ebb tide. This prevents access to or departure from the immediate vicinity of the river except during high tide, causing further loss of time unless arrival and departure are well planned. The Seal River project is not a worthy venture, at least from the hunter's point of view. No means is seen of successfully carrying out this operation unless more power is secured for the gas boat with a non-hunting crew to man it.

The 29 animals tranported from Seal River averaged 11.1 feet in length as compared with 10.5 feet in average length of the animals captured in the Churchill area. This greater length is believed due to prey selection by a very adept team of hunters rather than any significant difference between the animals frequenting the Seal and Churchill River environs. In order to "cool" the beluga and prevent spoilage they were gutted at the Seal River thus preventing examination of stomach contents, ovaries, etc.

THE BELUGA - WALRUS QUESTION

A report was heard declaring that the walrus population is decreasing at an alarming rate in the vicinity of Chesterfield inlet. In view of this Father Ferran of the Oblate Fathers believes

that the beluga will play an ever increasing part in the food supply of the Eskimos in that area. Further enquiries concerning this brought forth very little information to confirm or refute the claim. Some who have visited Chesterfield inlet declare that beluga are seldom seen there and are thus of little importance, and others report a seasonal abundance of walrus in the district. There seems to be very little doubt that the number of walrus visiting "Walrus Island" is declining, however, a reliable report of "hundreds" seen on floe ice between Hudson Strait and Southampton Island indicates that these somewhat wandering animals are far from extinct. Furthermore, there seems to be no scarcity of walrus ivory used in the manufacture of articles for the trinket and ornament trade. It is possible that heavy hunting has driven away rather than actually killed off those animals frequenting the Chesterfield area. At any rate it is doubted that beluga can replace the walrus in that area due to deficiency both in quantity and quality.

COMMERCIAL PRODUCTS OF THE BELUGA FISHERY

For a part of the season, due to failure of the refrigeration plant, it was necessary to render entire animals rather than utilize the carcass for both oil and meat products. Furthermore, the entire head of the animal was rendered with the blubber during the 1950 season. Thus, figures on average oil and meat product per animal are not comparable for the 1949 and 1950 seasons. How-

ever, from data available on weekly produce returns and knowledge of the methods used in utilizing the carcasses, figures roughly comparable to the 1949 produce-per-animal data have been computed. These data are as follows, based on 273 animals:

Table 11 Produce per beluga

Average oil (July 9-Sept. 9).....	316.08 lbs. or 35.13 gals.
Average meat product (July 9-Sept. 9).....	294.32 lbs.
Average total products per animal.....	610.25 lbs.

Attempts are being made by the Adanac Company to introduce "Beluga Steaks" to the domestic market. While this product found some acceptance in several localities, conversation with those who have partaken of such meat indicates that its chief sales attraction lies in its novelty rather than any particularly delectable quality of the flesh.

Only minor changes in methods of handling and processing animals were made in the 1950 season so that discussion in the 1949 report will prove an adequate description of these activities.

CONTRAVENTION OF THE REGULATION CONCERNING THE MOLESTATION OF FEMALE BELUGAS ACCOMPANIED BY CALVES

This regulation, it is known both from personal experience and discussion with many whaler, may be unintentionally contravened, the calf having been comcealed or at any rate unnoticed until after

the female is harpooned. In other cases, however, it is believed that a practice is made of pursuing nursing females. It is well known that a pursued female accompanied by a calf swims more slowly and follows a less erratic course than a calfless female in order, apparently, that she will not become spearated from her offspring. This habit renders such a beluga easy prey to the indiscriminate hunter. With at least a few hunters the author firmly believes that use is made of this characteristic when securing animals in large quantity. This was exhibited when the comparatively large catches of some more successful hunters were found to consist chiefly and consistently of lactating females. On several occasions calves have been seen to follow a canoe to shore which had brought in a lactating female.

No means of obtaining evidence of wilful contravention of this regulation can be obtained. It would not be possible to follow closely enough a suspected hunter without eliciting suspicion and caution on his part. Possession of a lactating female could not be taken, in a court, as the absolute indication of guilt. The accused could always declare that the calf was not seen until too late. This, if it be true, should be excuse enough as the calf is sometimes easily overlooked even in calm weather. No satisfactory method can be seen of adequately enforcing this regulation and it is recommended that it be deleted.

Since there is no apparent method of preventing nursing females from being killed, it seems wise to use some method of capture whereby the calf will also be taken rather than left to die

of starvation contributing nothing, either to the commercial fishery or to the native food supply. It has been demonstrated that a calf as small as seven feet in length is easily retained in the 24 inch mesh employed for whaling in the Churchill area. A calf of this length was found so thoroughly entangled that it is believed that even smaller animals would be held in such a net. The calf follows the mother so closely that, in the majority of cases, if a female is captured in a net the young one will also become entangled. The calf will not represent any great addition to the oil or meat stock of a commercial enterprise but would at least not be a total waste as it is under the present system.

The Adanac Company obtained a large stock of nets in 1949 and a forty-foot boat with which to tend them. It is recommended that the use of nets for the capture of beluga be declared legal. This recommendation is not meant to condone the killing of small and relatively worthless animals but is advocated as an attempt to minimize the waste which is incurred under the present system whereby the female is killed and her young left to fend, presumably unsuccessfully, for themselves. Use of nets will also be advantageous in the Churchill area where prolonged storms often prevent the pursuit of belugas by canoes. Thus for days a commercial plant must remain idle, which could operate if nets were to be used. Such a processing plant which must operate at maximum efficiency during the entire period of the short whaling season cannot afford to sit idle during any of that period during which belugas can be captured. Nets should eliminate, except during

very extreme weather, the necessity for the plant to remain idle. The net catch, in addition to the harpoon catch, should bring the total of animals utilized by the plant to a point where the company can show an operating profit.

AVERAGE LENGTH OF BELUGAS

Fluctuations in weekly average length of beluga were noted in the commercial catch and are as follows.

Table 111 Fluctuations in mean length of male beluga at Churchill.

Date	Total of lengths (feet)	Number of beluga	Mean length (feet)
June 30	96	8	12.0
July 1-7	380.5	34	11.19
July 8-14	290.0	29	10.0
July 15-21	35.5	4	8.9
July 22-28	179.0	15	11.9
July 29-Aug. 4	394.5	37	10.66
Aug. 5-11	367.5	33	11.13
Aug. 12-18	148.5	14	10.6
Aug. 19-25	----------	no whaling	----------
Aug. 26-Sept.2	53.5	5	10.7
TOTALS	1,944.0	179.0	10.86

Table IV. Fluctuations in the mean length of female beluga at Churchill.

Date	Total of lengths (feet)	Number of beluga	Mean length (feet)
June 30	0	0	0
July 1-7	113	11	10.27
July 8-14	178.5	18	9.91
July 15-21	29.5	3	9.8
July 22-28	294.0	28	10.5
July 29-Aug. 4	234.5	24	9.77
Aug. 5-11	203.5	21	9.69
Aug. 12-18	40.5	4	10.1
Aug. 19-25	----------no whaling----------		
Aug. 26-Sept. 2	28.5	3	9.5
TOTALS	1,122	112	10.02

Fluctuations both in average length and in sex distribution (Table VII) may support the belief that the 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. Females entering the catch ranged in length from 7'6" to 12'6", the range of males was from 6' to 14'8".

COLOUR PHASE VS. LENGTH OF BELUGA - 1950

Table V. Average lengths of male and female beluga, by colour groups. Based on 320 animals.

Sex \ Colour	Blue			Grey			White		
	Min.	Max.	No.	Min.	Max.	No.	Min.	Max.	No.
M	6'	9'6"	19	7'	11'6"	31	9'9"	14'6"	149
F	8'	9'6"	3	7'6"	10'6"	28	8'6"	12'6"	90

Figure 1. The degree of overlapping in colour phase.

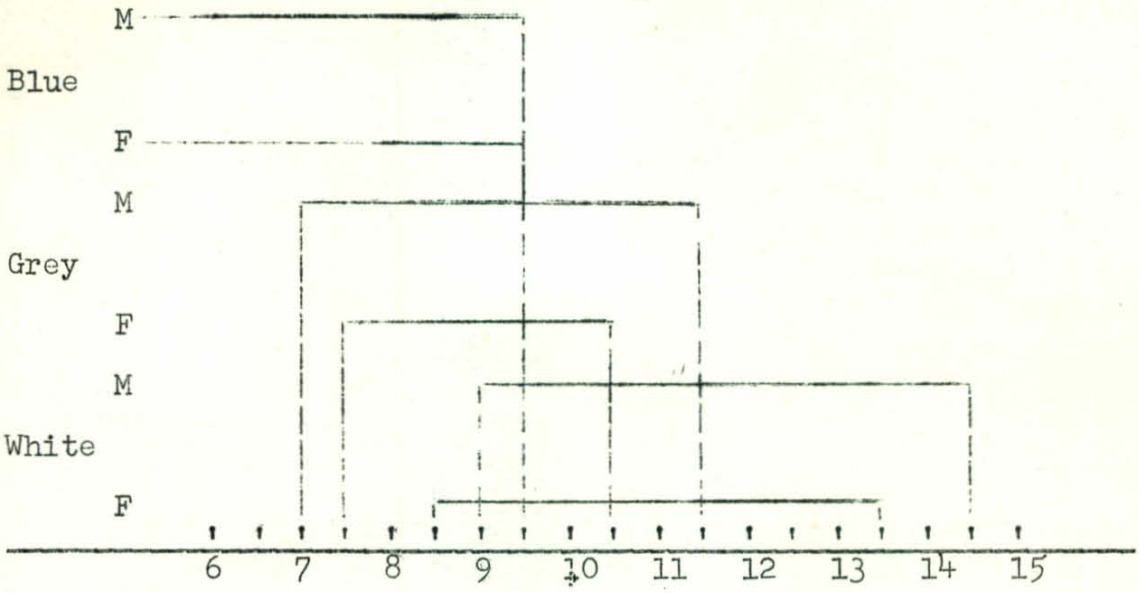

Table VI. Details of length versus colour per sex

Length	Colour	Blue		Grey		White	
	Sex	M	F	M	F	M	F
6'		2					
6'6"		2					
7'		3		1			
7'6"		4			1		
8'		4	1	3			
8'6"			1	2	2		1
9'		2	1	3	6	2	5
9'6"		2		2	12	3	15
10'				11	4	8	18
10'6"				4	3	8	28
11'						26	16
11'6"				5		38	5
12'						35	1
12'6"						21	1
13'						6	
13'6"						1	
14'						0	
14'6"						1	

As was stated in the 1949 report, the degree of gradation between colour phases is such as to prevent definite assignation of some animals to a definite class. It should be borne in mind, then, that with extreme members of any intergrading group it is much a matter of opinion as to which class an animal should belong.

Again no animal bearing brown pigment was found such as is reported by Vladykov from St. Lawrence River animals.

SEX DISTRIBUTION IN THE COMMERCIAL CATCH

Permission to employ nets in the beluga fishery was not granted until too late (Sept. 7) to be of any use to the beluga fishery. By this date all whaling had ceased. Thus the only data available on sex distribution of beluga are those obtainable from the returns of harpooned animals. It is believed that hunter selection renders these data somewhat inadequate.

Table V11. Returns for animals captured in the Churchill area.

Date	No. Male	No. Female	Total male & female	% Male	% Female
July 1-7	34	11	45	75.5	24.5
July 8-14	29	18	47	61.7	38.3
July 15-21	11	7	18	61.1	38.9
July 22-28	10	28	38	26.3	73.7
July 29-Aug. 4	40	25	65	61.5	38.5
Aug. 5-11	33	21	54	61.1	38.9
Aug. 12-18	14	4	18	77.7	22.3
Aug. 19-25	----------	----------	no whaling	----------	----------
Aug. 26-Sept. 2	5	3	8	62.5	37.5
TOTALS	176	117	293	60.1	39.9

BREEDING PERIOD AND FREQUENCY OF PREGNANT FEMALES

Sixteen embryos examined were according to length, conceived between April 18 and May 26, eight being conceived between May 1 and 7, four between May 8 and 14 and the remaining three spread over the remainder of the month. On July 10 a 4'6" female embryo was examined. This length, being almost full time, would indicate conception during late July or early August 1949. (Table V111).

As in 1949, the breeding season was completed prior to the time that the ice cleared from the Churchill River estuary (last week of June in 1950) and consequently before the commencement of hunting in the Churchill area. Thus hunting at Churchill should have no effect upon the breeding habits of the beluga.

Table V111. Breeding period of beluga per embryo length.

No.	Date of Capture	Length (inches)	Gestation (days)	Assumed date of conception	Length of mother
125	July 22	4¼	52	May 23	11'
191	July 30	4 7/8	65	May 26	10'6"
76	July 11	5	65	May 7	10'
128	July 22	6	70	May 13	10'6"
123	July 22	6 5/16	72	May 11	11'
84	July 12	6½	73	May 1	9'6"
228	Aug. 3	7¼	80	May 15	9'6"
264	Aug. 6	9	87	May 11	10'6"
208	Aug. 2	9¼	89	May 5	10'
300	Aug. 13	9 7/8	91	May 14	10'6"
211	Aug. 2	10	93	May 1	9'6"
288	Aug. 7	10½	96	May 3	10'6"
256	Aug. 6	10½	96	May 2	9'6"
287	Aug. 7	10½	96	May 3	11'
132	July 25	11	98	April 18	10'6"
303	Aug. 16	12	104	May 4	9'
67	July 10	54	Approx. 11¼ mos.	Late July 1949	9' 6"

Place of breeding

No evidence of "breeding-display" was noted during the investigation and it is obvious from the foregoing table that such activities would be exceedingly rare during that period when the Churchill estuary is inhabited by beluga. From what is known of ice conditions in Hudson Bay it is apparent that breeding activities, are almost entirely restricted to that time when the beluga would be found off the floe edge in the waters of the Bay proper.

Frequency of pregnant females

From a study of mammary glands, ovaries, uteri and the discovery of embryos it has been determined that females nine feet in length or more may be considered sexually mature, (Table VIII).

Eighteen females of a total of 115 animals of or exceeding the nine-foot length were found to be pregnant. This figure of 15.65 per cent is quite comparable with last year's figure of 16.46 per cent. However, due to hunter selection of prey both with regards to sex and nursing females, it is deemed wise not to place too much stress on these figures in a determination of breeding potential. Use of nets should reduce or eliminate the decided possibility of a biased sample.

Five pregnant females (#50-123, #50-125, #50-191, #50-208, and #50-228, 11', 11', 10', 9'6" respectively were found to have greenish fluid contained in the mammary glands. This fluid was of the same colour and consistency as that found in nursing females. From this it would seem wise to take with some doubt an oft-reported statement that beluga bear young only every third year. The pre-

sence of milk in the mammae of a pregnant beluga might be taken as evidence of a much-protracted period of nursing, 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. The small amount of data presently at hand does not justify a conclusive statement and further studies regarding this condition is necessary.

Some studies were attempted with regards to the number of lactating females in the beluga catch. However, due to suspected direct contravention of the rule stating that female belugas accompanied by calves shall not be molested, the figures obtained are deemed worthless for consideration under this heading and have been mentioned only in that section concerned with the aforementioned regulation. The author firmly believes that adequate unbiased data with regards to frequency of pregnant and/or lactating females will be obtained only by diligent perusal of data obtainable from net-caught animals.

Again, only single embryos were discovered and interviews with residents in the Churchill area failed to produce any known instance of twinning.

Table IX. Studies of Corpora Lutea and frequency of pregnancy.

Catch No.	Length	Colour	Corpora lutea			Mammae presence & colour of milk	Uterus presence of foetus
			R. ovary	L. ovary	Total		
50-154	9'	G	0	1	1	C-G	0
50-222	9'6"	W	1	3	4	C-G	0
50-228	9'6"	G	1	3	4	G	1-7¼"
50-231	9'6"	G	0	1	1	nil	1-3 5/8"
50-242	9'6"	G almost white	2	1	3	C-G	0
50-276	9'6"	G	1	0	1	C	0
50-190	9'9"	G	1	2	3	C	0
50-135	10'	G	1	4	5	C	0
50-159	10'	W	3	1	4	C	0
50-208	10'	G almost white	4	0	4	G	1-9¼"
50-SR-214	10'	W	3	4	7	C-G	0
50-239	10'	W	1	1	2	G	0
50-280	10'	W	8	3	11	G	0
50-136	10'6"	W	3	3	6	C	0
50-152	10'6"	G	2	1	3	G	0
50-191	10'6"	G	4	3	7	G	1-4 7/8
50-205	10'6"	G	5	3	8	C	0
50-281	10'6"	W	5	1	6	G	0
50-155	10'7½"	W	2	4	6	G	0
50-153	10'8"	W	3	6	9	C-G	0
50-134	11'6"	W	5	0	5	G	0

Code:

1. Per colour of animal G=grey
   W=white

2. Per colour of mammary fluid C-G=cream-green
   C=cream
   G=green

It had been hoped that there would be found a better correlation between length and numbers of corpora lutea. The foregoing data indicate either a very inconsistent growth rate or very irregular ovulation.

A comparison of length, numbers of corpora lutea and the degree of ankylosis of vertebral epiphyses with their centra would permit estimations of age at maturity, and ovulations per year, however, neither time nor assistance rendered it possible to carry out the lengthy and detailed study which would be necessary in order to gather adequate data concerning the vertebrae.

From the data available it is obvious that a nine-foot female is sexually mature. No data concerning the ovaries of a female less than nine feet in length is available.

That females #50-228, #50-208 and #50-191 were in the early stages of pregnancy and also lactating seems to indicate that a calf may follow its mother throughout a successive breeding season. It has been claimed that pregnancy does not occur on successive years. It is not believed, however, due to previous studies of teeth and stomach contents of young, that the calf nurses for so great a period (12-18 mos.) as would be necessary, to substantiate the belief, in these three cases, that a period of at least a year

has elapsed since the previous birth. This would indicate that, in some cases at least, pregnancy can, and does occur on successive years. When data on the age of beluga are available, a study of ovaries will readily show whether or not ovulation occurs every year and how often throughout the year.

It may be argued that the calf for which the milk was being supplied, in these three cases, was born late in 1949. However, evidence of birth due to occur or occurring in late summer or early fall has been encountered only twice during the 1949 and 1950 investigations. A 5'3" male still bearing 6" of umbilical cordd (#49-69) was taken on August 12, 1949 and a 4'6" female foetus was found in a beluga (#50-67) taken on July 10, 1950. These data would deem it unlikely three cases of late birth in such a small sample as that now under discussion.

It seems likely then that the three females being considered were feeding calves which had been born in the spring of 1950 and the females were preparing to give birth again in the spring of 1951. Should this be true, the breeding potential of the beluga is a bit higher than was previously supposed.

No explanation of the variations in colour of the milk can be given. It may be concerned with diet or the length of the period over which lactation has occurred. However, data are quite inadequate to consider either of these possibilities.

Placental Scars

No placental scars have been found in the uterine mucosa of any beluga. This may be due to a small and easily overlooked scar or of complete absence of such a condition. Absence of placen-

tal scars would be in accord with great whales which are believed to have an indeciduate placenta. 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 amniotic 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.

The sheet entitled "Beluga Catch Statistics" bears a column in which is to be inserted "Evidence of previous births". In view of the absence of placental scars no means is seen whereby this data could be supplied by a person engaged in whaling and the may well be deleted from the sheet. In its place might be inserted a clause covering the presence or absence of milk in the mammary glands as this is the only condition apparent to a lay observer.

Method of Birth

Evidence of head-presentation was found. In #50-67, a 9'6" female a 4'6" foetus was found. The calf was lying in the uterus with its dorsal surface directed toward the ventral surface 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 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. Only one example does not permit a conclusive statement but is at least worthy of note.

TEETH OF BELUGA

As was noted in the 1949 report, the maximum number of teeth and apparently the complete set, is forty. It is also believed that numbers of teeth can not be taken as a criterion of age due to poor correlation between length of animal and tooth number. The largest animal does not necessarily possess the greatest number of teeth. The largest animal taken thus far (#50-246, a 14'8" white male) had only 30 teeth $(\frac{7|7}{8|8})$.

The lower teeth which had not yet perforated the gums of a 4'6" female embryo (taken from #50-67, a 9'6" white female) were removed and examined. These teeth were of a tritubercular nature, bearing a very small auxiliary cusp on each of the anterior and posterior proximal faces of the tooth. This tritubercular condition, although it disappears due to wear at a very early age represents an advance over the haplodont condition apparent from a dental examination of an older animal.

FOOD OF THE BELUGA

Nereis jaws and beaks of a small squid were again found frequently in the stomachs of beluga. Although the shoreline was searched at low tide for signs of Nereis none was found. A resident of Churchill, however, reports that on the sand stretches left exposed at low tide in the vicinity of Cape Churchill are found "worms" which, according to his description, must be Nereis. Complete digestion of the soft parts again precluded specific identification of these animals. Several years ago, Churchill residents report,

that in an experiment with lobster pots set in the bay small squids were taken. Thus it seems that the beaks and jaws do not represent remnants brought from great distances in the beluga's stomach but are remains of organisms present in the vicinity of Churchill. The pike (Esox lucius) amd a sculpin (probably Myoxocephalus) were also found in the stomachs of beluga.

During the 1950 investigation there was a very heavy run of Capelin (Mallotus villosus) at Churchill. Throughout the period of investigation this small fish, seldom exceeding seven inches in length comprised the main item in the diet of the beluga. The beluga were seen to enter exceedingly shallow water in pursuit of these fishes, apparently quite oblivious to shallow water, receding tides and the shouts of watchers on the beach.

Sand and small stones gave evidence of a bottom-feeding tendency of the animals. Seaweed was occasionally found in the stomach of the animals though in such small quantity and with such irregularity that it is believed to be only accidental entrant into the beluga diet.

PARASITES

Nematodes, Anisakis simplex (Dujardin, 1845) and Stenurus arcticus (Cobb 1888), both tentatively identified, were again found in the stomach and eustachian canal, respectively. While A. simplex was never found in great numbers, S. arcticus was present in abundance in every adult animal examined to the point, at times, where it should nearly have completely occluded the eustachian canal. A

thorough search of the small and large intestines failed to produce evidence of parasitism by cestodes or nematodes. Trematodes were not found in the liver or any other organ of the beluga.

Presence of or evidence of Cirripedia or Argulidae, ectoparasites often reported from great whales, was not detected nor reported during the investigation nor has reference to these organisms parasitizing beluga been found in the literature. The temperature of the water inhabited by the beluga may have a deterrent effect on these ectoparasites.

WHEREABOUTS OF BELUGA DURING THE WINTER MONTHS

Much comment and speculation has been heard concerning the locality frequented by beluga in winter. It has been suggested by many that the beluga leave the environs of 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 about 2,500 miles each winter if the animals travelled directly to and from the Churchill vicinity and much more if they were to follow the shoreline as they seem, generally, to do. Several reports have been heard of vast migrations of beluga late in the fall through Hudson Strait, moving eastward. There is no reason to doubt the veracity of these reports.

Further information, however, indicates that beluga are present, throughout the winter in that open strip of water off the shelf of solid shore ice, the floe edge. Mr. John Voisey of Tavani, N.W.T.

declares that he has seen belugas, though never in great numbers, off the floe edge during every winter month. Norman Ford, special R.C.M.P. constable, of Chesterfield Inlet, N.W.T., reported seeing two animals off the floe edge at Chesterfield Inlet in April of 1950.

On the other hand, a Mr. Brown, formerly a trapper in the Tavani vicinity, N.W.T., and Eric Carlson, former master of a Hudson Bay Co. supply vessel, both of whom have spent many years in the Hudson Bay area declare that they have never seen belugas in the Bay during the winter months. These four statements are based on many years of observation by competent men. Belugas may not inhabit all areas off the floe-edge and an almost perpetual veil of mist along the floe edge is reported to hinder winter observations there.

It is believed that the oft-heard declaration that all belugas leave Hudson Bay for the winter must be modified to state that while many belugas do leave the Bay for more clement areas prior to the onset of winter, in some localities at least a few animals remain throughout the entire year. One can only speculate concerning whether the latter remain of their own volition or are trapped there by ice and forced to stay.

THE BELUGA AS A SOURCE OF DOG FOOD

For some residents in coastal sections the beluga is the chief source of dog food, especially during the summer months. The animals are cut into meal-sized pieces and placed in barrels. No attempt is made to refrigerate or otherwise preserve this meat so that often it is fed in a somewhat decomposed state. The Adanac Company's

ground-meat product has found some favour with dog-owner's in or adjacent to Churchill. Animals staked out during the summer months and kept on such a diet do not exhibit any apparent dietary deficiency from this food. However, some who have kept dogs on a diet entirely of whale meat declare that this causes a very severe scouring. This scouring may be due either to the very high oil content of the food, its relatively high Vitamin A content, or both.

During the winter when animals must undergo considerable exertion it is reported that a dog fed solely on the flesh and blubber of a beluga does not have the endurance exhibited by one whose diet is supplemented by or consists entirely of caribou and fish. Further north, in the coastal sections, where walrus and seal are available the same objection is offered to the use of whale meat. Apparently meat of the beluga will not produce the stamina exhibited by dogs fed on any other of the available forms of dog food; caribou, seal, walrus and fish.

During the summer of 1950 some ground whale meat was mixed with commercial dog meal in an attempt to reduce or eliminate the ill effects of beluga meat alone. This experiment was instituted rather late in the season and the results have not yet been learned.

It has been suggested that, in an effort to conserve caribou, trappers along the Hudson Bay Railway be urged to substitute whale meat for caribou as a dog food. This, if it could be effected, would be at least a small contribution to the conservation of caribou It is anticipated, however, that such an attempt would meet with considerable opposition from the dog owners. The trapper will have

to purchase, at a fair price, the beluga meat with its aforementioned ill effects after having been long accustomed to using caribou, apparently a more adequate food, and which he may obtain seasonally for little more than the cost of his labour. However, the conservation attempt being very worthy, it is hoped that the meal-reinforced beluga meat will have the desired effect and thus prove an adequate, even though relatively expensive, caribou substitute. The difficulty of transportation of a winter's supply of ground whale meat to a point at any distance inland from Churchill or at any distance from the Hudson Bay Railway cannot be overrated.

USE OF THE NAME BELUGA

As suggested by Vladykov (Chasse et Biologie du Marsouin Blanc) the vernacular name "beluga" to designate Delphinapterus leucas can only lead to confusion with the sturgeon, Acipenser huso found in Russia. Thus, while the name "white whale" may also have its faults especially with regards to the International Whaling Agreement this name is believed to be more suitable. "White whale" is the name used most commonly in popular literature as well as in many scientific and semi-scientific works. It is, therefore, suggested that the term "beluga" not be stressed and that the animal be designated "white whale" in its place; certainly a better known, more euphonious name which will not lead to confusion of this mammal with a fish. If the name "beluga" must be used it should be so conditioned as to eliminate confusion in the mind of any

reader. The term "white whale" will require no such treatment. Perhaps "white dolphin" would adequately circumvent all objections cited.

RECOMMENDATIONS

1. Use of Nets. To avoid an undue and unavoidable waste of animals it is suggested that use of nets be declared legal. In this way the calves, which now die when deprived of their source of food, will be brought into the catch. The calves, although small and of little value will count against the district quota. No doubt, then, those at the plant will make an effort to place their nets in the localities in which the least number of claves are taken. Use of nets will add considerably to the catch by being operative when weather prevents use of other methods of beluga capture. This method will also represent a very economical method of capture as compared with the present method of purchasing harpooned animals.

2. Aerial Surveys. Use of aircraft for counts has proven ideal. An extension of this program to encompass a greater length of coastline should provide data concerning direction of migration and numbers of migrants. Further data concerning composition of groups of animals could be gained by use of an aerial camera. This would also provide an unquestionable count of animals. The more regular and often (weekly if possible) the flights may be made the more valuable will be the data.

3. Regulations. Because it may often be innocently contravened by even the best-intentioned hunter, and its unenforceability the regulation concerning molestation of "female belugas accompanied by calves" should be deleted. Deletion of this clause will be necessary in any case if nets are declared legal.

4. Beluga Catch Statistics. As there is no method by which a layman may determine previous births of belugas the clause concerning "evidence of previous births" should be deleted from the sheet entitled "Beluga Catch Statistics". In its place should be inserted a clause covering the presence or absence of milk in the mammary glands. This information should be obtained on all females. Knowledge of the colour of milk is also desirable.

5. Purchase or Rental of a Larger Boat. In view of adverse weather conditions prevalent at Churchill it is recommended that those engaged in marine investigations in this area be provided with a craft more seaworthy than a canoe. A boat of "Peterhead" design would be adequate. Such a craft would not only provide a method whereby more tenable results could be produced but would provide living quarters thus offsetting the need of renting expensive accommodations. Resale of the boat would recover much of the initial investment, minimizing the cost.

6. Assistance. In order to pursue an intensive study of the taxonomic relationships of beluga and attempt to determine age from an adequate series of data concerning fusion of vertebral epiphyses with their centra it would be desirable to have at least one if not two additional members on a beluga investigation party. Additional members would, furthermore, permit a member of the party

to be present at the whale processing plant at all times. As it now stands, with a party of two much time is spent away from the plant, usually when whaling is at its best. Thus many data concerning length and colour are available only from whale plant records and that concerning corpora lutea, state of uterus, stomach contents, parasites, etc., goes entirely unrecorded. A party, preferably of four members would be necessary to carry on adequate taxonomic and age studies in conjunction with aerial surveys, marking operations, and other biological studies.

6. Tourist Hunting. It is again recommended that tourist hunting be permitted in the Churchill area on a license obtainable in that vicinity from the R.C.M.P. or other government representative. Many tourists have expressed severe displeasure at not being able to hunt this animal, declaring that, as it now stands, the Adanac Company exercises a veritable monopoly over the beluga population. The author can find very little fault, apparent to tourists, in this declaration. The author sees no tangible reason for excuse why tourists should not be permitted to engage in this sport provided the slain animal is disposed of by sale to the plant or gift or sale to the guide or other worthy local persons. Permission for tourists to engage in such activities would represent a method of increasing the off-season income of residents qualifying as guides and might draw to Churchill some persons, coming specifically to hunt, who would require accomodations and food while in the area. This could do something toward enlivening a district which can now offer a visitor very little in the way of recreation. It should

also be borne in mind that many of those now able to procure a license are only transient person, little more than long-staying tourists and certainly not residents of the vicinity in the true sense of the word.

7. Quota. No need is seen to alter the present district quota. The population seems adequate to withstand the legal kill of 600, however, until much more data are at hand, so that the breeding potential of the total number of animals subjected to hunting can be computed, no binding statement concerning the adequacy of the quota as it now stands can be made.

BIBLIOGRAPHY

1. Anderson, R. M. - 1946 Catalogue of Canadian Recent Mammals. Dept. of Mines and Resources, Mines and Geology Branch, National Museum of Canada, Biological series 31, Bulletin No. 102, Ottawa.

2. Barabash, I. I. - 1937 Taxonomic observations on white whales. Journal of Mammalogy, Vol. 18, No. 4.

3. Bonin, W., et V. D. Vladykov - 1940 La Peau du Marsouin Blanc ou Beluga. Contributions de l'Institute de Zoologie de l'Universite de Montreal - No. 7. (Extrait, avec changement de pagination, du Naturaliste Canadien, Vol. 67, Nos. 10 et 11, 1940).

4. Brocklesby, H. N. 1941 - The Chemistry and Technology of Marine Animal Oils with Particular Reference to Those of Canada. Fisheries Research Board of Canada, Bulletin No. LIX.

5. Degerboel, M. and P. Freuchen. 1935 - Report on the Fifth Thule Expedition, 1921-24, The Danish Expedition to Arctic North America in charge of Knud Rasmussen, Ph. D., Vol. II, No. 4-5, Mammals.

6. Doan, K. H. 1948 - Report on white whale investigations, Churchill, Manitoba, August - September, 1948, Fisheries Research Board of Canada, Central Fisheries Research Station, Winnipeg, M. S.

7. Douglas, C. W. 1949 - Attempts to mark the beluga in the Churchill area. Fisheries Research Board of Canada, Central Fisheries Research Station, Winnipeg, M. S.

8. Dunbar, M. J. 1949 - The Pinnipedia of the Arctic and Subarctic. Fisheries Research Board of Canada, Bulletin No. LXXXV.

9. Halkett, A. 1913 - Check list of the fishes of Canada and Newfoundland, King's Printer, Ottawa.

10. Hare, K. F. and M. R. Montgomery. 1949 - Ice, open water and winter climate in the Eastern Arctic of North America, Journal of the Arctic Institute of North America, Vol. 2, No. 2, and Vol. 2, No. 3.

11. Kritzler, H. 1949 - The pilot whale at Marineland. Natural History, Vol. LVIII, No. 7.

12. Lyster, L. L. 1940 - Parasites of some Canadian sea mammals, Canadian Journal of Research, Vol. 18. Section D, December, 1940, No. 12.

13. Mackintosh, N. A. and J. F. G. Wheeler. 1929 - Southern Blue and Fin Whales. Discovery Reports, Vol. 1, pp. 257-540.

14. Vladykov, V. D. 1944 - Chasse, biologie et valeur economique du Marsouin Blanc ou Beluga (Delphinapterus leucas) du fleuve et du golfe Saint-Laurent. Departement des Pecheries, Province de Quebec.

1946 - Nourriture du Marsouin Blanc ou Beluga (Delphinapterus leucas) du fleuve Saint-Laurent. Departement des Pecheries, Province de Quebec.

15. Whiteaves, J. F. 1901 - Catalogue of the marine invertebrata of Eastern Canada, Geological Survey of Canada, Ottawa.

16. Yamaguti, Saytu. 1941 - Mammalian Nematodes, Japanese Journal of Zoology, Vol. IX, No. 3, Part 35, National Research Council of Japan.

17. Yorke, W. and P. A. Maplestone. 1926 - The Nematode parasites of vertebrates, J. and A. Churchill, London.