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Attempts to mark beluga in the Churchill area  
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# ATTEMPTS TO MARK BELUGA IN THE CHURCHILL AREA DURING 1949

C. W. Douglas

## INTRODUCTION

From July 20th to September 15th, 1949, Dr. K. H. Doan and C. W. Douglas of the Fisheries Research Board of Canada were present at Churchill for the purpose of studying the beluga or white whale (Delphinapterus leucas) now being exploited on a commercial scale at Churchill, Manitoba, by the Adanac Whale and Fish Products Company of Dauphin, Manitoba.

The objectives of the observers were:

1. To attempt marking of beluga which frequent Churchill waters with a view to establishing the extent of migration of these animals.
2. To determine whether commercial exploitation at Churchill might adversely affect the food supply of northern inhabitants.
3. To construct the biology of this marine mammal.
4. To observe operations at the Adanac Whale and Fish Products plant.
5. To interview persons resident in or having business in northern areas who might have knowledge pertinent to the biology, habits and commercial possibilities of beluga.

Equipment

During the month of August, 1949, attempts were made to mark beluga in the Churchill area, the purpose being to give some means of identifying animals which had been in Churchill waters should they be captured in other vicinities. When sufficient numbers are marked and data received concerning the capture of marked beluga it will be possible to plot the migration routes of the animals present at Churchill during the marking period. This period will cover the period of commercial whaling at Churchill. This knowledge is necessary in order that it may be known to what extent the Churchill beluga kill may affect the food supply of Hudson Bay natives who rely to some extent upon the beluga for food and oil for themselves and for dog food.

The marking apparatus consisted of a Greener Light Model Harpoon Gun (W. W. Greener Ltd., London, England) with a modified harpoon. The head of the harpoon was removed and in its place a small metal plate,  $1\frac{1}{2}$  inches by 2 inches, was affixed in which were placed one-half inch pins forming the figure 9, for 1949. These pins were dipped in tattoo ink (B-7 Hog shoulder tattoo ink, Ketchum Manufacturing Co., Ottawa) the intention being to strike the beluga, as it surfaced, with this device, thus leaving a permanent, obvious and identifiable tattoo on the animal.

This tattoo when tried on beluga pulled up on the beach, and on a piece of beluga hide and blubber placed under the water, made a series of holes representing the figure, and was well filled with the tattoo ink. The length of the pins was sufficient to carry the ink just through the hide and into the blubber. It is believed that the mark left on the beluga will be permanent, as the ink is the same as that used for marking live hogs.

"Tag" methods

Shooting a metal "tag" into the animal, bearing the desired data, as is done with the great whales, is 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 great likelihood that a successfully placed tag of this sort would go unnoticed when the animal is butchered by the native.

A report was heard concerning a beluga which was captured and found to bear in its flesh the point of a harpoon from which the line had broken during some previous hunt. The area about this metal object was declared to be greatly inflamed, soft, and so 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 constructed of a relatively clean, inactive metal and did not penetrate deeply enough to cause injury to the animal.

Marking operations

Only on relatively calm days do the beluga remain for more than an instant at the surface or present sufficient area for target above the water during respiration. This influence of the weather on the behavior of the beluga and the fact that wind, rain and fog render canoe travel often inadvisable, if not impossible, are major obstacles in the way of beluga marking. Thus, only on 11 of the 24 days, during which the marking equipment was on hand at Churchill was it possible to attempt marking beluga.

Beluga exhibited very little tendency to enter the

estuary on windy, cloudy days and the wind often rose hurriedly to such an extent that a hasty return to shore was necessary. These factors rendered it impossible to continue marking operations throughout the entire day, even on several of those 11 days on which marking operations were attempted.

It was thought, at first, that it would be best to pursue the animals into shallow water, and shoot the marking device at the beluga when it surfaced to breathe. It was relatively easy to approach the animals within harpoon range. However, the beluga are so erratic in their course and surface for so short a time while pursued that this method was discontinued after several trials.

Pursuit of beluga in mid-stream or on the waters of the bay was likewise found unwarranted, even in very calm weather. Here it was found difficult to approach even within harpooning distance as the animals easily eluded the pursuers owing to the depth of water into which they could dive and maneuver and the unrestricted areas of water through which they could execute their evasive movements.

Drifting with the river current in the hope of thus approaching, unnoticed, the small groups of beluga entering the estuary was also tried but discontinued. It was found that, due to the great area of water across which the animals could disperse, they seldom came close to the canoe. Furthermore, the beluga were frightened away whenever attempts were made to move the canoe, with paddle or motor, to a position from which it would drift nearer to the animals.

There is a reef, known as Merry's Rock, found 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 animals entering or leaving the estuary restricted themselves to those waters between Cape Merry and the bell buoy marking Merry's Rock.

On calm days, at high tide, when no surf is breaking on the reef a canoe can be anchored over this rock. The beluga seemed to exhibit very little fear of the canoe anchored in this spot, and at times approached within reasonably good distance before veering away or diving. The majority of the animals veered off prior to coming within effective range of the harpoon gun (the accurate range is approximately 25 yards with the marking plate attached). However, as this spot commands a relatively restricted, shallow channel much used by beluga when entering and leaving the estuary it is believed that this location will afford the maximum number of opportunities for marking beluga by the harpoon-tattooing method. The greatest drawback to this location is that the heavy surf often prevents anchoring there on windy days.

Although much time was spent to no avail in trying various locations and methods of applying the harpoon-tattoo method before the Merry's Rock vicinity was tried, four animals are known certainly to have been marked with this device and a further number may have been hit as well. These latter animals were travelling at some speed and underwater so that it could not be definitely ascertained whether or not they had been hit. The sudden rush and dive of the marked beluga leaves no doubt that an animal, at the surface, has been hit.

Possibility of air observation

As a supplement to or probably in lieu of marking, observations from aircraft could be made along the bay coast throughout the summer. These flights, in order to give a fair amount of data should be made along the coast for considerable distance, say, 100 miles north and south of Churchill. During these flights the abundance of beluga and their locations would be noted.

As the data from a series of flights accumulated, any differences in abundance at any one or all points along the coast would become apparent. In this way migration of the beluga and the direction of their movement would be obvious.

These data in conjunction with coincident aerial counts of the beluga in the Churchill area should at once show whether or not the Churchill herd is a local population or a series of transient groups. The number of animals which are annually subjected to commercial operations at Churchill, and the scope of their migration is the knowledge upon which should be based the regulations governing the size of the commercial catch at Churchill.

If the Churchill herd represents a local population, even though it is over-exploited, little hardship will be felt by residents of the area as very few beluga are taken for human or dog food in that immediate vicinity. However, if these animals which are present at Churchill in the summer are a series of transient groups which also frequent more northerly areas, then over-exploitation of this sort of population may result in some inconvenience to the more northerly natives who to some extent make use of the beluga.

While marking will doubtlessly give the desired data over a period of years, it is thought that observations from their aircraft would give reasonably sound data, at a relatively early date, upon which to base regulations governing the size of the commercial beluga kill at Churchill. This would then enable an adequate system of beluga control to be instituted before possible serious depletion is made of the numbers of beluga inhabiting or passing through the Churchill waters.

#### PERIOD OF BELUGA ABUNDANCE IN THE CHURCHILL AREA

Churchill residents and those who were at the whale plant when the ice left the river mouth on June 15, 1949, reported that beluga entered the river in good numbers on that day. This would seem to indicate that the animals had been lying off the mouth of the river prior to breakup. How long they were in the vicinity of the river mouth prior to June 15 no one seemed able to say. It was stated, however, that the beluga were in the vicinity of the river mouth for "quite a while" prior to breakup (no dates were obtainable). Upon the party's arrival in Churchill it was stated that the beluga had been "quite abundant" in the river ever since breakup.

On July 20, in the evening of a very calm day, at 7:45 P.M. when the tide was at half-ebb, 162 "spouts" of beluga ascending the river were counted. This count was made with the use of binoculars and consisted of a single sweep of approximately one mile of river length. Further observations indicated that a "spout count" shows approximately three-quarters of the actual number of animals present on a calm day. In view of this there

would have been over two hundred beluga ascending the river, in one mile of its distance. This, of course, is an incomplete indication of the number of animals present in the vicinity, unless it could be correlated with data such as that obtainable from aerial photographs or counts giving total numbers of beluga in the area. It is only on exceedingly calm days that the "spout" of the beluga can be readily observed. Even a slight wind disperses the vapour very quickly.

Throughout the summer until the latter part of August the animals were present in good numbers. From August 30 to September 5, inclusive, bad weather with high winds, rain and fog occurred in the Churchill area. Although it was still very windy on September 6 the sky cleared somewhat and a few (6-12) beluga were seen lying in the bay off the river mouth while the tide was low. This observation was made from the top of the grain elevator. From this position both the estuary and the bay area off the river mouth may be viewed. On September 7, a clear but windy day, approximately 20 beluga were seen going upstream in the estuary, and off the river mouth. This observation was again made from the top of the elevator and at ebb tide. By this time the animals were exceedingly scarce as compared with July and most of August. A period of bad weather occurred again September 8-13 inclusive, with much rain and fog. The ground was covered with snow on the night of September 9. No beluga were seen from September 8 to 14, either in the river or the bay.

Five 100 yard whale nets were set on the west side of the river on September 9. Weather prevented tending these nets sooner, and they were pulled in September 14. Three beluga had

been captured in the period. Although no nets had been used prior to this from which catch figures could be obtained, it is believed that earlier in the season the nets would have been more successful.

It is seen then that the beluga enter the river as soon as it is free of ice in the spring and leave the area again in the fall with the onset of bad weather. This fact is declared by residents of Churchill to be characteristic of the beluga in that area.

It was one of the objects of the party at Churchill to attempt to mark beluga in order to check their movements after they leave the area in the fall. (See "Marking"). It was not possible to make any observations in 1949 to determine whether or not the Churchill beluga represent a local population or a series of transient groups. There is some movement of the animals along the coast during the summer which is indicated by their sporadic appearance at various points. Action such as this has been reported from Tavani, and rumours of similar cases at other points were heard.

As nets will be used to a much greater extent during 1950, it is thought that records from these will give some indication of the relative abundance of beluga in the area as the season progresses.

#### METHODS OF CAPTURE OF BELUGA IN THE CHURCHILL AREA

Two methods of "whaling" are employed by natives of the Churchill area. These methods are (1) the use of large nets, (2) pursuit and capture employing harpoons and rifles.

##### Nets

The nets in general use are made of heavy cord

(approximately No. 96 sideline) sided with one-half inch manilla rope. Nets are about 24 inches stretched mesh, 15 to 20 meshes deep, and corked along the upper edge. The nets are set in shallow water along the edges of the estuary and near the shore in the bay off the river mouth.

Due to 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 renders the use of nets rather difficult unless a boat of fair size is used to tend them.

As both the Adanac Company's net-tending boat and the nets themselves did not arrive in Churchill until very late in the summer, almost no opportunity for whaling in this manner was afforded during the 1949 season.

One local institution employed a single net from time to time throughout the season to obtain beluga for dog food and, although this operation was not carried on continuously throughout the season, they were successful in capturing 9 animals in this fashion.

In spite of the large size of the meshes some small animals are captured by this method which is borne out by the fact that a 7 foot animal (No. 186) was taken in a 24 inch net. Thus it is believed that regulations with regards to minimum length of beluga taken by nets are of doubtful practicability. It is thought, too, that since the animals are often entangled by the flukes of the tail and their "flippers", any net, regardless of mesh size, would be indiscriminate with regards to length of beluga caught.

Weirs

The author was told of another use to which nets have been put in the capture of beluga in this area. A shallow bay with a narrow entrance is sought, and across the mouth of this bay a heavy net is placed and allowed to lie slack on the bottom. At high tide, when the bay is filled with water, the beluga enter over the slackened net. As the tide begins to recede or when the person tending the net believes that no further animals will enter on that tide, the net is drawn tight across the entrance precluding the animals' exit. At ebb tide the animals are left either stranded completely out of water or in water so shallow that they are readily killed.

It might be noted here that the author has been told that at the mouth of the Seal River where many tide-pools and pockets exist the beluga have been seen stranded almost out of water in these pockets at low tide. It was declared by those who reported this that, as long as the beluga was able to keep himself wet by splashing and rolling in the pools, no harmful effects were noted and the animals swam away with ease at the return of the tide.

Another well authenticated report of members of the family Delphinidae surviving on a beach between tides is contained in the "Natural History" Magazine (Vol. LVIII No. 7, Sept. 1949). This report is concerned with pilot whales which came ashore on the Florida coast. This report declares that the animals suffer no ill effects providing heat stroke does not ensue, although evidence is brought to show that symptoms of this state are not always immediately obvious.

The bay at Churchill where the weir method was employed

for capturing beluga has now been dredged and built around so it is no longer of any use for this purpose. It is obvious that if another readily accessible bay of this type can be found in the Churchill area it will provide an excellent method of making beluga available for marking.

There would be, of course, the danger that some of the animals might be permanently injured or eventually die due to the long period spent outside their natural environment, and exposed to the heat of the sun.

### Harpoons

The pursuit and harpoon method of capture was that most used at Churchill during 1949. As insufficient data are available on the effectiveness of nets, and as there is great variation in the ability of hunters, no comparison can be drawn between the two methods of capture.

Two men working as a team are necessary in the hunting of beluga. These men must be equipped with a canoe of fair size (a 20-foot freighter model is quite adequate) in order to stand the rough water and to be stable when towing a beluga lashed to its side. An outboard motor of about 10 h.p. is necessary to provide adequate speed when in pursuit of the animals and power to tow the animal back against the force of the river current and receding tide. Any high-powered rifle is adequate to kill the animals once they have been harpooned.

The harpoon employed in this vicinity is a copy of that seen amongst collections of primitive Eskimo ivory instruments. Into the end of a pole whose length may vary to suit the user,

but which is generally about 8 feet, is firmly driven a piece of soft round iron until about 6 inches of it project from the tip of the pole. Over the tip of this spike the hollow harpoon tip's shaft is slid. This tip is made from a metal tube, usually copper, about 5 inches in length which is shaped and flattened at one end to give a barbed point. The other end of this tube is flattened and somewhat curved as shown in Figure 1. The tube is kept open at this end, to be slid over the spike affixed to the pole. At the mid-point of the length of this harpoon tip a hole is drilled and through it a loop of strong, stiff wire is passed, for the attachment of the harpoon line.

When the harpoon is thrust into the animal the tip disengages from the spike as the pole is withdrawn. Due to the shape of the tip and the location of the point of attachment of the line the harpoon head, as it pulls back, tends to move sideways and take up a position in the blubber, at right angles to the line of pull giving a very firm anchor beneath the hide of the animal. Very few reports were heard of this device pulling free of the animal, once 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 (a 5 gallon can serves well) which acts as a marker buoy.

The line generally consists of 30 or more feet, according to individual preference, of one-quarter inch manilla rope or some other cord capable of withstanding a strain of several hundred pounds.



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Method of capture with harpoons

A relatively calm, sunny day when the canoe can make good speed without undue concern for the size or direction of the waves is ideal for beluga hunting. The two men set out and attempt to find beluga in a shallow portion of the estuary. Once the animals are sighted in water shallow enough that escape by diving is minimized, it is necessary only to choose the quarry and pursue it in the shallow 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 is embedded in the animal the buoy can with line attached is thrown over. The motor is stopped and tipped out of the water to prevent fouling with the harpoon line. The act of being harpooned causes the beluga to begin a series of rather aimless rushes in an attempt to dislodge the instrument. This series of rushes is of short duration and the beluga soon either comes to rest, or continues a relatively straight course.

The animals' position is now obvious from the location of the buoy. The buoy is retrieved and held by one member of the party. The beluga now attempts to escape from its captors and will tow the canoe along at considerable speed.

During the intervals when the animal surfaces to breathe it is shot at with the rifle by the second member of the party 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 the beluga. However, in the excitement, and with the unsteady nature of the moving canoe and the movements of the beluga,

several shots are usually required.

The dead animal is pulled to the surface with the harpoon line. A rope is now secured above the flukes and fastened to a front thwart of the canoe in such a fashion that the greatest possible amount of the beluga's body is out of the water. In this fashion the beluga may be towed to the desired location, offering a minimum of resistance to the progress and handling of the canoe.

Some hunters have also tried drifting until an animal is close to the canoe, after which the procedure is the same as that used in pursuing the beluga. This method leaves too much to the whim and fancy of the animal 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 beluga, as against the use of nets, is that the sounds of motors and rifle shots have a decided tendency to frighten off the remaining animals. (See "Reaction to hunting activity".)

#### Other methods of beluga capture

Other methods of beluga capture, not used in the Churchill area, have been reported to the author.

In some of the more northern localities it is said a herd of beluga are approached by a fleet of canoes, arranged in an arc, and frightened toward shore with much shouting, paddle slapping and shooting by the canoeemen. This method is practised in a shallow area as the tide is receding. As a consequence some of the animals become entrapped in shallow water and are left stranded on the shore at ebb tide.

Although the author has seen no killer whales (Grampus orca) in the area, 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, frightening them into very shallow water where they are at the mercy of hunters or left on the beach by the ebbing tide. This has been reported from the Tavani area (62° N, 92° 30' W) by a person whose reports are declared well founded. Killer whales were also reported to be present in the Churchill area in 1949 although this could not be confirmed.

In the vicinity of Povungnituk there is very little shallow water adequate 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, the dead animals are readily seen lying on the bottom. The dead beluga are raised to the surface with the assistance of a grappling apparatus. The grapple consists of three large hooks, such as god hooks, affixed back to back and attached to the end of a long, heavy line.

In view of the deep water it is obvious that harpooning in that area would not be pre-eminently successful. However, it is the author's opinion, although he has not witnessed the Povungnituk method, that it would result in the escape of many wounded animals with the consequence that some would be permanently crippled or later, lost to the hunters, die of the wounds received. Nets might be a satisfactory answer to this but their high cost is somewhat prohibitive.

## REACTION OF BELUGA TO HUNTING ACTIVITIES

It was noticed that the beluga became more easily frightened as the season progressed.

On July 22 it was fairly easy to approach the animals with the outboard motor 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 their course.

By August 15 the animals would sense the approach of a motor and dive while the hunters were still a good distance away. 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 due to 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 said, did not seem in haste to leave the estuary at the sound of distant gunfire and outboard motors. This might indicate that these animals had not been in the area for the same length of time as the more wary ones.

Assumptions drawn from the foregoing indicate that the

beluga of the Churchill estuary vicinity represent a more or less local population supplemented by transient groups of animals. It should be said that no characteristic difference in the groups of wary and unwary beluga were noted as regards maturity (based upon colours in the group) or sex composition (based upon females accompanied by calves).

#### FORMER ATTEMPTS TO EXPLOIT THE HUDSON BAY BELUGA

Messrs., W. E. Brown and J. J. Anderson have given the following information concerning attempts of the Hudson's Bay Company to exploit the beluga of Hudson Bay and adjacent waters.

In 1929 an operation was begun at Churchill for the purpose of capturing the beluga on a commercial scale. The operation did not involve the elaborate machinery now in use at the Adanac Company, the blubber being rendered in large open kettles. In 1929 the animals were present in good numbers, sufficient beluga having been captured to warrant continuation of the operation in 1930. In 1930, however, very few animals were found frequenting the Churchill vicinity and in this year the operation was undertaken at a financial loss. No further attempts were made to commercialize the beluga at Churchill by this Company. In 1931 it is reported that the animals were almost non-existent in Churchill waters.

About the turn of the century attempts were made to exploit the beluga frequenting the waters adjacent to the Great Whale River and the Little Whale River. It is reported 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 now destroyed).

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

At Pangnirtung, on Baffin Island, the Hudson's Bay Company for some years organized beluga drives in order to obtain the blubber oil of the animals. After several years, however, here as in the aforementioned 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 the animals, keeping the meat for themselves and selling the blubber to the Hudson's Bay Company. It is declared that in 1948, seventy-six 45-gallon drums (3,420 gallons) of blubber oil were obtained at the Pangnirtung post. The Company continued to purchase the beluga blubber, more to give

the natives a source of income during an otherwise idle season, rather than with any thought of monetary gain.

While it may not be safe to predict that an analogous condition will develop in the Churchill area, judging from the foregoing cases, indications are that the animals are sufficiently wary that no fear need be held for their extinction due to hunting pressure in a restricted area. It will be noted that the aforementioned operations were conducted on a low overhead basis. The fate of a high-overhead company such as Adanac, should the beluga fail to return to Churchill waters in adequate numbers, is quite obvious.

#### LENGTH AND SEX COMPOSITION OF CATCH

Table 1. Average length of Churchill beluga.

Sex	Number of specimens	Total length (inches)	Mean length (inches)	Mean length (feet and inches)
Male	92	11,898	129.33	10' 9"
Female	89	10,626	119.39	9' 11"
Male and female	181	22,524	124.44	10' 5"

(The range in length was from 5'3" to 13'8")

Table II. Average length of Churchill beluga, by sex and colour.

Sex	Number of specimens	Total length (inches)	Mean length (inches)	Mean length (feet and inches)
<u>Blue</u>				
Male	18	1,635	90.83	7'7"
Female	9	761	84.55	7'
Male and female	27	2,396	88.74	7'5"
<u>Grey</u>				
Male	15	1,736	115.75	9'7"
Female	31	3,580	115.48	9'7"
Male and female	46	5,316	115.56	9'7"
<u>White</u>				
Male	58	8,413	145.05	12'
Female	47	6,037	128.44	10'8"
Male and Female	105	14,450	137.61	11'6"

Table III. Catch composition by sex and colour.

Sex	Colour	Number of specimens
Male	Blue	21
Female	Blue	12
Male and female	Blue	33
Male	Grey	14
Female	Grey	31
Male and female	Grey	45
Male	White	58
Female	White	45
Male and female	White	103

## WEIGHT AND LENGTH OF CHURCHILL BELUGA

No equipment was available during the 1949 season to obtain weights of the animals taken at Churchill. The following table gives data on 16 beluga taken at Churchill in August, 1947, and shipped to Winnipeg in fresh state, dressed. As the time necessary to capture and transfer these animals from Churchill would have been approximately one week, there was undoubtedly some shrinkage in weight by the time these figures were obtained in Winnipeg.

Table IV. Lengths, weights (gutted), sexes and colours of beluga shipped from Churchill in 1947.

Number	Length	Weight (pounds)	Sex	Colour
1	9'6"	570	Male	Grey
2	13'	1,110	Male	White
3	10'11"	725	Male	White
4	11'1"	724	Female	Grey
5	11'	776	Male	Grey
6	10'8"	683	Female	White
7	13'	1,130	Male	White
8	12'10"	1,210	Female	White
9	10'1"	705	Male	Grey
10	11'1"	695	Female	White
11	10'6"	665	Male	Grey
12	10'11"	620	Female	White
13	11'9"	1,015	Male	White
14	9'1"	555	Female	Blue
15	10'	810	Female	White
16	7'10"	380	Female	Blue

## SEASONAL CHANGE IN SEX RATIO

Figures, based upon the sex of the beluga brought to the processing plant, show no significant change in the sex ratio at Churchill throughout the summer.

Table V. Proportion of sexes in beluga processed at Churchill, 1949.

Period	Number of beluga	Per cent male	Per cent female
July 22-July 29	20	55	45
July 30-Aug. 8	41	44	56
Aug. 9-Aug. 18	61	54	46
Aug. 19-Aug. 29	58	53	47

Many females were seen accompanied by calves and some gravid females were taken, thus it is likely that these figures represent the true sex ratio owing to the fact that females with calves and pregnant females do not remain apart from the rest of the herd for a part or all of the summer for the purpose of bearing and rearing their young.

Taking the overall total of 180 animals we find the sex ratio to be about 52 per cent male and 48 per cent female. A factor which might cause these figures to deviate from the true case might be easier capture of one sex than the other, due to greater wariness or speed of one sex, with the consequent less frequent appearance of this sex in the catch. Whether or not this is the case should be obvious during the 1950 season when nets will be employed to a much greater extent. This should eliminate the possibility of varying degrees of wariness or elusive ability between the sexes.

## PRODUCE PER BELUGA

Approximately 85,000 pounds of meat product and 45,000 pounds of oil (5,000 gallons) were obtained from 203 beluga.

This represents:

- (1) 221.6 pounds or 24.62 gallons of oil per animal.
- (2) 418.7 pounds meat produce per animal.
- (3) Total of 640.3 pounds of produce per animal.

No attempt was made to keep the head and jaw oil separate from the other oils obtained, the quantity obtainable being too small to warrant the extra work and equipment necessary for such procedure.

No knowledge of the analysis of the oil is at hand. However, it may be said that the equipment employed produced an oil which was almost entirely free of sediment, a light brown or amber colour, and quite free of odour.

The meat and bone, with some blood, were ground together and frozen in 50-pound boxes. This produce was sold as animal food for use on fur farms or for dog food. The liver was kept separate, packed in 25-pound boxes, and sold also for use as fur-animal food.

Some of the meat, fried as steaks, was eaten at Churchill. The author found it to be of exceedingly fine texture, quite rich, and somewhat comparable with liver in flavour. When fried the meat is dark, almost black, which might reduce its table qualities. Although the flesh is hardly on a level with beef it is considered quite palatable and an excellent substitute for the standard meats should the occasion arise.

No attempt was made to take the hides to be tanned and

made into leather. The time necessary to skin the animal and clean the hide was too great to warrant it worthwhile in an operation such as that conducted by the Adanac Company.

#### Thickness of blubber

No data were collected concerning the decrease in thickness of blubber and weight of blubber per whale during the 1949 investigation. However, as the season progressed a gradual decrease in thickness of blubber was noted. No figures being at hand, it can only be stated that by September 14 the scanty condition of the blubber was noted to such a degree that the opinion was expressed by members of the whaling plant staff that "the oil obtainable from the late-season beluga hardly justified their capture".

#### COMMERCIAL PROCESSING OF BELUGA AT CHURCHILL

##### Flensing and butchering

The processing of beluga at the Adanac plant was as follows:

1. The animals were pulled to the second floor of the processing plant, along an inclined ramp, with the aid of a steam winch.
2. The blubber was removed from the beluga in longitudinal strips with the aid of a steam winch and flensing knives.
3. These long strips of blubber were cut into smaller pieces approximately two feet square.
4. The pieces of blubber were placed in a "cooker" preparatory to rendering.

5. The remainder of the carcass, free of blubber, was broken into longitudinal sections, 2-3 feet in length.

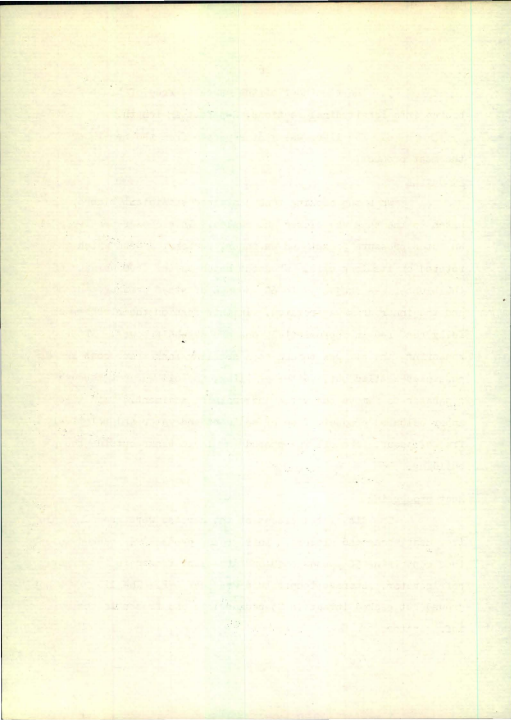
6. The liver was kept separate from the remainder of the meat product.

#### Rendering

When the cooking tank contained sufficient blubber the hatch to the tank was closed and sealed. This cooker consisted of an outer pressure jacket and an inner, perforated drum which was rotated on its long axis. When the hatch to the drum was sealed the blubber was subjected to 60 pounds of steam pressure and heat and the inner drum was rotated. In this fashion the blubber was fully rendered in approximately one and one-half hours. After rendering, the oil was forced to a settling tank where most solid particles settled out. After settling, the oil was put through a separator to remove the water and 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 plant building.

#### Meat processing

The disjointed pieces of the carcass were ground complete, i.e. meat, bone and viscera. This ground product was packed in cartons containing 50 pounds each and air-blast frozen in the plant refrigerator. Storage temperature was near 0°F. The liver was not ground but packed intact in 25 pounds lots and frozen in the refrigerator.



## BREEDING SEASON

The breeding season and the approximate date of conception of embryos was calculated from the length of embryos at the date of capture of the gravid female, according to the rate of growth of beluga embryos established by Vladykov (1944) after the method devised by Barret-Hamilton and Hinton (1925) and Risting (1928). At birth young beluga, both in the St. Lawrence River and the Churchill River, were approximately 5 feet in length (see Table VII, No. 69) and it is believed that lengths at various ages of the embryos would also be the same in both rivers.

It may be seen from Table VI that breeding occurs from March 29 to May 31, according to the observed embryos. That these dates do not encompass the entire breeding season is shown by the fact that No. 69 (5 feet 3 inches, male), captured on August 12, still retained approximately 6 inches of umbilical cord. The 12 month gestation period thus indicates that this animal has been conceived during August, 1948.

Table VI. Breeding period of beluga per embryo length.

No.	Date of capture	Length mm.	inches	Sex	Days Gestation	Assumed date of conception	Length of mother
49e	Aug. 5	118	4 5/8	Male	63	June 1	9'3" G
12e	July 25	172	6 3/4	Male	74	May 12	10' W
48e	Aug. 5	178	7	Male	77	May 20	10' G
90e	Aug. 14	228	9	Male	87	May 19	9'6" G
6e	July 22	228	9	Male	87	Apr. 26	10' BG
28ae	July 29	235	9 1/4	Male	89	May 2	10'5" G
160e	Aug. 29	241	9 1/2	Male	90	May 31	10' G
104e	Aug. 15	267	10 1/2	Male	96	May 11	10' W
181e	Aug. 29	279	11	Female	98	May 23	10' G
124e	Aug. 18	305	12	Female	104	May 6	11' W
156e	Aug. 29	305	12	Female	104	May 17	10' W
155e	Aug. 29	382	15	Male	122	Apr. 29	10'6" W
79e	Aug. 14	458	18	-	138	Mar. 29	11' W

#### Place of breeding

In 1949 the mouth of the Churchill River was icebound until June 15. This is said to be the approximate date of breakup each year. Officials of the Hudson Bay Company assert that the Seal River opens at about the same time as the Churchill River. G. W. Malaher states that the Nelson River is icebound until early June. Because these estuaries are icebound until after the breeding season is completed, according to embryoage calculations, breeding must occur in open water off the floe-edge in the bay proper.

That some breeding does take place during the summer is indicated by No. 69 mentioned above; however, it is probable that the beluga do not enter the river for the express purpose of breeding nor, since the gestation period is 12 months, of having their young. If then, the beluga does not enter the Churchill River to breed little fear need be expressed that the beluga hunting operations in the aforesaid river will disturb the breeding and decrease the herd indirectly as well as directly.

#### COLOUR PHASES OF THE BELUGA OF THE CHURCHILL AREA

During July, August and September of 1940 data were collected on length and colour of the beluga taken in the Churchill region. Details of this are to be found in Tables VIII and IX. Only three stages of colour were observed, blue, grey and white. The brown of the very young ("veau") which Vladykov reports as occurring in the St. Lawrence River was totally absent from the 10 beluga observed in the Churchill area whose lengths would have placed them in Vladykov's class "Veau" (155 cm.-211 cm.). Details of these animals are shown in Table VII.

A young male (No. 69 - 5 feet 3 inches) still bearing approximately 6 inches of umbilical cord was a deep blue colour. The extremities of the tail and the areas about the eyes were somewhat darker than the surrounding tissue but no trace of brown was present. It may be stated further that no brown individuals were noticed among those young animals seen swimming with the adults, although many young were seen in the river and bay, often at a range which permitted definite determination of the animal's colour.

Table VII. Length and colour of young beluga at Churchill.

Number	Length	Colour	Sex
9	6'	Blue	Male
31	6'	Grey-blue	Female
41	6'7"	Blue	Female
60	4'6" (approx.)	Blue	--
69	5'3"	Blue	Male
84	7'	Blue	Female
88	6'6"	Grey-blue	Female
107	6'6"	Blue	Male
126	6'4"	Blue	Female
169	5'6"	Blue	Male

Blue, grey and white was the order of colour with increased size in Churchill beluga. No definite point of demarcation with regards to colour and length was found. Instead, there was a considerable degree of overlapping as follows:

Female	Colour	Lengths	) See Table VIII
	Blue	5'6" - 8'6"	
	Grey	7'6" - 11'	
	White	10' - 13'5"	)
Male	Colour	Lengths	) See Table IX
	Blue	5'3" - 9'6"	
	Grey	8' - 10'11"	
	White	10' - 13'8"	)

In some instances the gradation of colour between one phase and the next was such as to render difficult the assigning of an individual to one class or the other.

It has been noted that the beluga of the St. Lawrence (Vladykov, 1944) exhibit four colour phases - brown, blue, grey and white, and that those of the North Pacific (Arsenyev from Vladykov, 1944) pass through three stages - grey, blue and white, in that order. The beluga of the Churchill area have been observed to pass through only three stages of colour - blue, grey and white. If colour phases may be taken as a critereon, it may be that the Churchill beluga represent a different taxonomic group from those in the aforesaid areas. The existence of several species of beluga is in accord with the work of Barabash (Barabash, I.I., 1937) and is suggested by Anderson (Anderson, R.M., Catalogue of Canadian Recent Mammals, 1946).

#### FREQUENCY OF PREGNANT FEMALES

As a female (No. 19) 9 feet in length was found to be lactating, and two females of lengths 9 feet 3 inches (No. 49) and 9 feet 6 inches (No. 90) contained embryos, it is assumed for this discussion that any female which reaches the length of 9 feet is sexually mature and capable of bearing young. A study of the ovaries of female belugas will be undertaken during the 1950 season in an attempt to ascertain positively the length and age at which sexual maturity occurs.

Of 79 females whose lengths were 9 feet or over, examined during the period July 22 to September 14, only 13 were found to

contain embryos. All embryos examined were conceived between the approximate dates of March 29 and May 31. (See Table VI.) It may be noted (Table VI) that the gravid females occur between the lengths of 9 and 11 feet and that no gravid female was less than 9 feet in length. Plotting length against frequency in the catch, though data are still quite inadequate, the above group seems to occur on and after the third mode (Table VIII), thus placing the youngest pregnant females in their third summer. Further observations will be made to determine whether or not females are ever pregnant at a shorter length (younger) than those already observed. In all cases only single embryos were found. Freuchen, however, reports that twins do occur at times (Freuchen, Thule Expedition Report, Vol. II, p. 267).

In view of the fact that such a high percentage of mature females contained no embryos, it would seem that a female beluga does not bear young every year. It might be argued that breeding might have occurred after observations in 1949 had ceased. However, if this were the case, this late breeding would occur each year. Should breeding have occurred late in the fall of 1948, and the gestation period was 12 months, well advanced embryos would have been in evidence during the period of investigation in 1949. This was not so. Thus it seems logical to conclude that there was little likelihood of conception occurring in the 66 mature females which were without embryos in late July, August and the first half of September, 1949 and that the females do not bear young each year after maturity. This is in accord with the observations of Freuchen (Thule Expedition Report) who believes that they breed every third year.

That some breeding does occur at least until August is borne out by the fact that a calf, still bearing the umbilical cord, was taken on August 12. This, however, appears to be an exception when one considers the lengths of the other embryos observed.

The beluga is among those animals lowest in breeding potential. That is to say, the beluga, which may not bear young until at least its third summer, does not bear every year, and bears only single young, may not stand prolonged and heavy hunting without severe depletion. This will be noticeable true if the Churchill herd turns out to be a local population.

#### TEETH OF BELUGA

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. Whether or not the beluga is diphodont has not yet been determined from our observations, but if so it might account for the fact that occasionally a young animal of fair length is found to have a lesser number of teeth than a smaller (younger) animal.

The teeth of the younger animals are quite conical, with the apex directed slightly anteriorly, and come to a comparatively sharp point. However, a progressive wear ensues due to the action of the teeth of one jaw against the opposing teeth of the other. This wear continues until the crowns of the teeth in older animals are worn away so that the opposing teeth fit into the ground surfaces of each other. This wear gives the crowns of the teeth a semi-flattened surface, but owing to the small width of the flattened area it is doubted that this enables the teeth to grind the prey in a pseudomolar fashion.

No indication could be had from stomach contents that the food is swallowed entire, the only traces of food being the hard parts of ingested animals. However, the very strong action of the digestive juices in the stomach of animals which swallow their prey whole was very noticeable in beluga. The extreme powers of digestion were deduced not only from the fact that only hard parts of prey were found, but also from the fact that in animals which had been dead for only a few hours digestion had continued so that the lining of the stomach was caused to come loose from the basement membranes.

Thus, although direct observation was not at hand, it seems safe to assume that the beluga does not completely masticate its prey but swallows it entire, or partially chopped, and the process of breaking up the food is left to the muscular compartment of the stomach and the digestive juices.

#### Teeth of beluga versus length

Little is yet apparent from a study of the number of teeth of the beluga with regard to its state of maturity. Much variation was shown between length of beluga and numbers of teeth in both sexes, a smaller individual often showing more teeth than a large one. Very generally, though, the greater the length the greater the number of teeth.

The upper teeth tended to be the first to appear and usually were more numerous until the full set of 40 (see below) had been attained. No greater number of teeth than 10 was found in either side of either jaw in 55 beluga. These 55 individual

consisted of 28 males and 27 females. One specimen had 10 teeth in each side of each jaw and it was concluded that 40 must be the full complement. The specimen (No. 122) which had the 40 teeth was a 13-foot male taken on August 17. Of 4 other specimens of equal or greater length the dental formula was  $\frac{10}{9}/\frac{10}{10}$  39,  $\frac{9}{9}/\frac{9}{9}$  36,  $\frac{9}{8}/\frac{9}{8}$  34,  $\frac{10}{8}/\frac{10}{8}$  36. Whether or not No. 122 was a fully mature animal or whether, in light of data from other animals, it had merely attained its full set of teeth at an earlier age than the others, remains a point in question. It was reported by local residents that "much larger" beluga than the 1949 maximum of 13 feet 8 inches have been taken in the area. Comparing the tooth data of No. 122 and other beluga, it is felt that it may have matured dentally at an earlier age than normal, and still larger individuals may inhabit the Churchill area. It may be assumed that these "much larger" individuals, perhaps being faster swimmers or more wary individuals, have so far eluded the hunters. It is hoped that when nets are used during the 1950 season these larger beluga will be made available for investigation.

A fact which has come to light is that the young are born without teeth. Two calves examined had no teeth, and the stomachs showed no trace of food other than milk. While this is not sufficient data upon which to base a conclusion, indications are that if a female accompanied by a nursing calf should be killed the young one must also die from want of food.

#### FOOD OF BELUGA

Although residents reported fish to be the major item of the food of the beluga, only in one (No. 73) out of 33 stomachs

examined and recorded were fish remains found. These remains consisted only of the vertebrae of two small fishes, probably Mallotus villosus, or capelin. Both Vladykov and Freuchen, however, report fish to be the major item of food in the beluga diet.

It was reported that during June, shortly after the ice had left the Churchill estuary, vast schools of capelin ran to the shores of the bay preparatory to spawning. It was said that at this time beluga gathered in the areas where these fish were most abundant, and came into very shallow water, apparently feeding upon them.

An eyewitness report of an Arctic char (Salvelinus alpinus) being taken from the stomach of a beluga was received during the investigation. Dr. W. M. Sprules found Arctic char remains in two beluga stomachs at Term Point, N.W.T., in 1948.

Nereis jaws were often found in the stomachs of beluga. These were occasionally so abundant and occurred with such frequency throughout the investigation that this invertebrate, in point of numbers, seemed to constitute one of the chief articles of food of the beluga.

Beaks of a small squid were frequently found. Although never present in great numbers, squid remains were found with such frequency as to indicate their position as a staple food rather than a chance entrant into the diet of beluga. (See also Freuchen, Thule Expedition Report.)

Shrimp remains, carapace and appendages, were found in one specimen (No. 8.) These remains constituted remnants from at least three specimens and were inadvertently discarded before identification as to species could be made. 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.

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 totally destroy all evidence of other articles of food in the beluga diet, thus rendering this account of beluga foods somewhat inadequate and misleading. 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 infest the Hudson Bay beluga. A small strongyloid was found very frequently in the eustachian canal and tympanic cavity. 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 pallasii Beneden, 1870. (Nomen nudum). The frequency with which Stenurus 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 (Can. Jour. Res., Dec., 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 fact that the stomach did not in any observed instance contain more than a few A. simplex may be due to the fact that the beluga is reported to regurgitate its food when pursued (Vladykov, 1946, p. 121).

A third nematode, an ascarid, was collected. However, only one individual was taken and as the majority of characteristics used in classification of the Ascaroidea are based solely upon male features this nematode was not identified.

The age (size) at which beluga become infested with these parasites has not yet been determined though A. simplex were collected from the stomach of a 7 foot 4 inch individual. Although this animal was just cutting teeth ( $\frac{0}{2}$ / $\frac{0}{2}$ ) the presence of Nereis jaws in its stomach indicated that it was not entirely dependant upon milk for sustenance and could become infected from other foods.

Thanks are due Dr. J. A. McLeod, Associate Professor of Zoology, University of Manitoba, for assistance in identifying the parasites.

#### RECOMMENDATIONS

##### 1. Licenses

###### (a) Procurement of licenses

Much discontent was expressed by hunters and personnel

at the whaling plant with regards to the length of time necessary to procure a license to hunt beluga. It is recommended that these licenses be made obtainable at Churchill either from the R. C. M. P., the Post Office or some other authorized government agent. If this is not possible it is then suggested that an interim receipt be issued by an agent in Churchill upon application by a hunter for a license, such a receipt to serve as a license until the proper form is received from the Department of Fisheries.

(b) Tourist hunting

It is also suggested that these licenses be made available in Churchill in order that tourists may be permitted to engage in the sport of whaling during their short stay there. If tourists were permitted to take beluga it would represent a considerable supplement to the earnings of local residents in the form of guiding fees. So far only a relatively small number of tourists have come whaling, and the tourist catch has not appreciably reduced the number of beluga still available to local hunters under the district quota. Furthermore, the earnings of residents from tourist whaling will more than compensate them for time off from commercial hunting.

Another point in favour of tourist whaling lies in the fact that the Adanac Company did not demonstrate its ability to obtain the quota during the 1949 season, thus leaving many animals available to tourists under the district quota.

Should tourists be allowed to take beluga in the Churchill area it is thought that some stipulation should be included in the beluga regulations making it an infringement of the law if the carcass of the animal is not disposed of in a useful manner. This

would include sale or gift of the animal, as the tourist sees fit, to the Adanac Company, the guide, or some other resident who can utilize the animal for human consumption or dog food. In this manner, unwarranted waste of beluga can be prevented.

## 2. Quota

No need is seen to raise the district quota until the Adanac Company exhibits ability to capture more than the 600 beluga. It is hoped that should the Adanac Company reach the district quota in 1950, sufficient data will be had by that time regarding the number of animals to allow intelligent revision of the quota.

## 3. Terms of license

If the Adanac Company is permitted to use nets for beluga capture, and this is their plan for 1950, it will not be possible to escape contravening item No. 2 as stated on the beluga license. ("The licensee shall not take or kill calves or suckling belugas or female belugas which are accompanied by calves or suckling belugas"). This regulation is applicable only to the harpoon method of capture wherein the beluga may be seen prior to capture. Even by the harpoon method the young are at times frightened away by the approaching canoe or are not seen until after the female has been harpooned. Thus, this item may be contravened quite unintentionally even in harpooning.

On September 14 an 11-foot white female and a 7-foot blue beluga were taken in nets of the Adanac Company. These animals were entangled in the net in such a fashion as to indicate that these two had been female accompanied by young. Thus, if this regulation is to be enforced on an operation employing nets it is almost a foregone conclusion that item 2 of the beluga regulations will auto-

matically preclude the use of nets. Item 2 must be changed to indicate that it applies only to harpoon hunting and not to the net method of capture. (See also "Methods of capture".)

It should be borne in mind, if a change is contemplated in item 2, that the Adanac Company has already invested a large sum of money in nets and a large net-tending boat. This equipment is now located in Churchill awaiting the 1950 season. It is recommended that item 2 be removed entirely from the beluga hunting regulations and in its place be inserted a clause suggesting that, in the interests of conservation, every effort be made to avoid the capture or molestation of female beluga accompanied by young whenever this is possible.

If it is made absolutely clear that the death of a nursing female also means the death of her calf, and that any beluga regardless of size, caught in Adanac Company's nets must be processed by the Company and count against the district quota, it is thought that it will not be long before voluntary effort will be made to capture, so far as is possible, only large animals not accompanied by calves.

#### 4. Use of aircraft in beluga observations

(a) Flights along the coast should enable observers to ascertain with fair accuracy the number of animals annually subjected to hunting activities at Churchill as well as the general trend of migration of the animals during the summer months. These flights, to be of value, would have to be approximately 100 miles along the coast north and south of Churchill (4 hours flying time in a Norseman aircraft) and quite frequent, weekly if possible.

A chartered aircraft from Churchill at \$93.00 per hour (1949 price) renders this activity inadvisable from a monetary point of view and it is suggested that strong representations be made to the R. C. A. F. re the use of their aircraft on this project.

(b) If the flights along the coasts cannot be arranged, it is then recommended that short flights in the immediate vicinity of Churchill, be made frequently to determine the number of beluga in the Churchill vicinity and check on fluctuations in this number.

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The first part of the report  
 deals with the general  
 situation of the  
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 year. It is  
 followed by a  
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 of the various  
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 achieved. The  
 report concludes  
 with a summary  
 of the work  
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 names of the  
 persons who  
 have assisted  
 in the work.