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SCIENTIFIC MEETING ON THE
POLAR BEAR

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CANADIAN WILDLIFE SERVICE BRIEF

by the Delegation of Canada

SUMMARY

Polar bears have evolved from a brown bear stock in the latter part of the Pleistocene. There is some evidence to indicate that Eurasia has been the dispersal center for the species.

Romans evidently knew of polar bears about 57 A.D. Other early references to the species occur in the Japanese Imperial Records and Norse sagas.

Adaptations of polar bears to cold are thick winter pelt and short furry ears. Their white coats help to hunt seals more efficiently on the pack ice. Their teeth indicate specialization from a formerly omnivorous back to a mainly carnivorous diet (seals).

At present the most appropriate scientific name for the polar bear seems to be *Ursus maritimus* Phipps 1774. Until more detailed taxonomic studies are completed, it is suggested that polar bears be considered as belonging to a single circumpolar species.

Although polar bears of both sexes and various ages occupy dens, pregnant females seem to be most regular in this habit, usually denning from October to April. Common denning areas in Canada are southern Banks Island, Simpson Peninsula, eastern Southampton Island, and eastern Baffin Island. Females bring forth their young, usually twins, in late November or early December. Mothers with cubs leave their dens in March or April and journey down to the sea ice to search for whitecoat seals. Mating usually occurs in mid-April. Gestation period in the polar bear lasts about 8 months. There is reason to believe that embryonic development begins about late September or early October. Sexual maturity occurs about the third or fourth year. Adult females can bring forth cubs the third winter after a previous birth. Limited evidence suggests that the sex ratio of polar bears in the Canadian Arctic is 50:50. Although lactation may continue for 21 months, polar bear cubs are generally weaned by July. Cubs usually become independent at 18 months of age. Moulting, which

begins as early as May, is completed by August. Polar bears can live to over 30 years of age.

During the last glaciation and within historic times, polar bears occurred south of their present range.

Canadian Wildlife Service polar bear investigations have included collections of pathological, reproductive, and skeletal material, besides particular studies of den ecology, milk composition, and taxonomy.

The Canadian kill has approached 600. In Canada most bears are taken by Eskimos with dog sleds, about 70 percent of the kill falling between March and May. Highest kills occur near Southampton Island, Resolute Bay, Clyde River, and Sachs Harbour. Generally kills are divided equally between the sexes and about 20 percent of the entire kill is cubs (0-2 years).

Polar bears are hunted mainly for their skins. Revenue from pelts can greatly augment the income of Canadian Eskimos; it may be particularly valuable during poor trapping periods. Eskimos in the Northwest Territories retain about 20 percent of the pelts for personal use, selling the remainder.

In Canada only northern natives may legally hunt polar bears. Northwest Territories legislation prohibits killing of cubs under 1 year of age, or females accompanied by cubs under 1 year of age. Scientific licenses to take polar bears are issued with great care. Revisions to present legislation are being considered.

Some decreases experienced in regional polar bear stocks may not have been entirely due to overhunting, but may have been influenced by encroaching warm ocean currents which destroyed essential elements of polar bear habitat.

Future research should involve establishment of confident population estimates, and major patterns of population movement. A thorough study of polar bear reproductive biology and population-limiting factors under natural conditions should be carried out, in addition to collection of other data

necessary for a life equation of the polar bear. Reliable aging techniques for polar bears should be developed. The Canadian Wildlife Service plans to continue earlier research, while looking into some of the problems mentioned.

International cooperation might be exercised effectively in publication of an international polar bear data sheet each year. Basic information could include total kill, sex and age composition of kill,

kill chronology, in addition to brief notes on general progress of critical problems in research and management.

International collaboration might involve exchange of personnel for polar bear marking projects.

Consideration should be given to an international agreement protecting mothers with cubs up to 2 years of age, and polar bears generally during the May-October period in international waters.

CANADIAN WILDLIFE SERVICE BRIEF

Current Scientific Knowledge and Research Programs

EVOLUTION AND HISTORY

Comparative studies of skulls and teeth of bears by Erdbrink and Thenius indicate that polar bears and brown bears stemmed from a common ancestor *Ursus etruscus* in the early Pleistocene. Thus the polar bear may be regarded as a specialized descendant of the brown bears. Kurtén and Harington suggest Eurasia as a dispersal centre for the species. Few fossils of polar bears have been found. Most of our present knowledge on polar bear evolution has been summed up by Kurtén. Fossils are known from Hamburg, Germany, and Hjørring, Denmark, and a number of subfossil remains have been discovered in Scandinavia. On the basis of a femur from Pleistocene deposits at Kew Bridge, England, Kurtén has erected a new subspecies, *Ursus maritimus tyrannus*.

Polar bears were evidently known by the Romans about 57 A.D. Living polar bears and their pelts were known in Japan and Manchuria as early as 658 A.D., according to translations of the Japanese Imperial Records (Nihongi) by Florenz and Aston. The earliest known Northern European record occurred about 880 A.D. Hennig and Oleson have contributed greatly to our knowledge of the early history of polar bears.

MORPHOLOGICAL ADAPTATIONS AND TAXONOMIC RELATIONSHIPS

Polar bears are well adapted to an arctic environment. Their thick winter coats provide protection against cold air and water. Whiteness of polar bear hair not only decreases heat loss, but also serves as camouflage, resulting in more efficient hunting of seals on the sea ice. The short, furry ears of the bears are also well adapted for life in a cold climate.

Polar bear teeth show an important adaptation to environment. Reduction of ridge and tubercle development on the occlusal surfaces of the teeth, and increased elevation of the cusps indicate a specialization from a formerly omnivorous back to a carnivorous diet (seals). Their extraordinarily keen sense of smell may lead polar bears to food many miles away (or food thickly covered by snow and ice), which is very important for survival in a region where food is often scarce.

Phipps in 1774 seems to have been the first to mention the polar bear as a distinct species after the manner of Linnaeus. He called the bear *Ursus maritimus*. The generic and subgeneric names *Thalassarctos*, *Thalarctos*, and *Thalatarctos* were applied later. Although the polar bear has been widely referred to as *Thalarctos maritimus* following Grey (1864), the authority on bears, Erdbrink, has recently approved the designation *Ursus (Thalarctos) maritimus*. Thenius agreed and also mentioned the frequently successful breeding between brown and polar bears in captivity to support the case. He evidently wished to avoid subgeneric separation however, stating that serological evidence indicated it to be unnecessary. Now the most appropriate scientific name for the polar bear seems to be *Ursus maritimus* Phipps 1774.

Many opinions have been expressed on the possible existence of species and subspecies of the polar bear. Knottnerus-Meyer distinguished five species and one subspecies in the group, but his arguments were later proved invalid by Birula, who concluded that the animals belonged to a single species, consisting of three subspecies. Bachofen von Echt later expressed the view that all polar bears belonged to one indivisible species. Manning is presently working on this problem, using more refined techniques. His results may have important implications concerning major movement patterns of polar bears.

LIFE HISTORY

Although polar bears of both sexes and various ages occupy dens, pregnant females seem to be most regular in this habit, usually denning from October to April. Common denning areas are: the fiorded, northeastern coast of Greenland; the east coast of West Spitsbergen, Edgeoya, and Kong Karls Land in the Norwegian Arctic; Franz Josef Land, Severnaya Zemlya, the New Siberian Islands and Wrangel Island in the Soviet Arctic; southern Banks Island, Simpson Peninsula, eastern Southampton Island and eastern Baffin Island in the Canadian Arctic.

In late November or early December females bring forth their young—usually twins. Mothers with cubs leave their dens in March or April and journey down to the sea ice to search for whitecoat seals. Mating generally occurs in April, but their is no reason to disbelieve or disregard reports of summer or autumn mating. The gestation period lasts 8 months according to Kostyan, and although there is no proof of delayed implantation, there is good reason to believe that it is characteristic of polar bears and that embryonic development begins about late September or early October (see Dittrich, L., and H. Kronberger, *Zeitsch. für Säugetierk.* 28(3): 129–155. 1963). Females become sexually mature when they are approximately 3 years old, males when they are 4. Adult females can bring forth cubs the third winter after a previous birth. It has been estimated that polar bears remain fertile to 25 years of age. Limited evidence suggests that the sex ratio of polar bears in the Canadian Arctic is 50:50.

Although lactation may continue for 21 months, polar bear cubs are generally weaned by July. Cubs usually become independent at 18 months of age. Molting, which begins as early as May, is completed by August. Variations in the molt are due to age, sex, and fatness. Polar bears can live to over 30 years of age.

POPULATION

Intensive polar bear hunting by whalers and sealers since the early 17th century has probably resulted in a reduced population. Depletions were first noted on the west coast of Spitsbergen and Novaya Zemlya in the middle of the 19th century. Further significant depletions, attributed to overhunting, have occurred in Greenland and the Soviet Arctic since the 1930's.

Scott and others (1959) concluded that about 2,000 to 2,500 polar bears existed near the Alaskan coast. By extrapolation they arrived at a total polar bear population of 17,000 to 19,000 animals. Uspensky (1961) estimated the world polar bear population at 5,000 to 8,000 animals. Harington (1964) has given an estimate of 6,000 to 7,000 polar bears for the Canadian Arctic and believes the world polar bear population is well over 10,000. Approximately 18 percent of the total Canadian Arctic population is cubs (0–2 years old).

DISTRIBUTION

During the last glaciation polar bears lived south of their present range (e.g., Kew, Hamburg, Hjørring). In 1690 Von Siebold reported that polar bears reached the northern island of Japan, and they were once more common in the Bering Strait and Iceland than they are now. Comments on polar bear migration are speculative at this stage. Nevertheless there is little reason to suppose that polar bears would not tend to remain near good hunting and denning areas, rather than passing in a continual stream around the pole in a clockwise fashion, as Pedersen has indicated.

CURRENT RESEARCH

In Canada, autumn aerial surveys of polar bears have been carried out by Manitoba and Ontario government biologists. They have also collected data on polar bears from natives of the Hudson Bay coast of these provinces. The Canadian Wildlife Service (Federal Government) initiated a polar bear project in 1961. The objectives are to review the effectiveness of protective legislation and to integrate, verify, and add to the scattered and often fragmentary information existing on polar bears. Consequently an extensive review of the literature is being undertaken in order to assess the status of research on the subject, and to discover basic problems requiring further investigation. Biological work has involved collection of liver and kidney specimens for vitamin A analysis, and the collection of pathological, reproductive, and skeletal material. A start has been made on sectioning of polar bear teeth in an attempt to establish an aging technique. Detailed studies have been carried out on polar bear lactation and milk composition, and are in progress on the structure of the polar bear eye. Emphasis has also been placed on studies of den ecology and life history. T. H. Manning is re-

viewing the taxonomic relationships of various polar bear populations throughout the species' circum-polar range for the Canadian Wildlife Service.

Management Activities

EXPLOITATION

Only natives are allowed to hunt polar bears in Canada. Recently, the Canadian kill has approached 600 (of which about 10 percent is taken in Manitoba, Ontario, Quebec, Newfoundland, and the Yukon Territory, the majority being taken in the Northwest Territories). In Canada, most polar bears are killed by Eskimos with dog sleds between February and June. About 70 percent of the total annual kill falls between March and May. Occasionally polar bears are shot from boats in the autumn. The highest kills occur near Southampton Island, Resolute Bay, Clyde River, and Sachs Harbour. Generally kills are divided equally between the sexes and about 20 percent of the entire kill is cubs.

RESERVES AND SANCTUARIES

Reserves and sanctuaries specifically for polar bears are Kong Karls Land in the Norwegian Arctic, and Wrangel Island in the Soviet Arctic.

VALUE

Polar bears are hunted mainly for their skins. Pelt prices have risen greatly in the Northwest Territories in the last few years. Now the price of a good pelt averages about \$200, and consequently Eskimo purchasing power can be greatly augmented by income from them. Such revenue may be particularly valuable during poor trapping periods. In the Northwest Territories approximately 20 percent of the skins are retained by Eskimos for use as sled robes, sleeping platform covers, and occasionally trousers, boots, and mitts. Fragments of hide are also used for icing sled runners. Because of their water resistance and buoyancy, polar bear hairs are used commercially for the production of fishing flies. In Scandinavia, pelts with poor fur are often tanned to produce excellent leather. There also, bear fat is processed in factories like seal blubber. The meat of young bears is very palatable, but meat of older bears tends to be tough and stringy. Meat should be boiled thoroughly to avoid

trichinosis. Polar bear livers should not be eaten because of their high Vitamin A content. Capture of live cubs can be profitable in some countries. Scientific study of physiological adaptations, acute sense of smell, and fat metabolism in polar bears may be of value to man. Culturally, polar bears are valued as display animals because of their beautiful appearance, their unusual way of life, and their rarity.

HARVEST LIMITATIONS

Both legal and natural restrictions limit the harvest of polar bears. In Canada, only northern natives may legally hunt them. Northwest Territories legislation prohibits the killing of cubs under 1 year of age, or females accompanied by cubs under 1 year of age. Scientific licenses to take polar bears are issued with great care. An export tax of \$5, one imposed on each polar bear skin leaving the Northwest Territories, has been repealed. Revisions to present legislation are being considered.

Natural restrictions to the harvest occur in years of very heavy pressure ice, which make hunting by dog sled difficult and provide much cover for polar bears. Poor weather during the spring hunting period also curtails the harvest.

The depletion of polar bears off western and southeastern Greenland might have been influenced by encroaching warm ocean currents which destroyed essential elements of polar bear habitat. The significance of these and other natural factors limiting polar bear numbers and harvests is difficult to assess now.

Additional Scientific Information

Some problems confronting polar bear research involve:

1. Establishment of confident population estimates.
2. Establishment of major patterns of population movement.
3. Collection of other data necessary for a life equation of the polar bear.
4. A thorough study of polar bear reproductive biology and population limiting factors under natural conditions.
5. Development of a reliable aging technique for polar bears.

6. A thorough study of sensory capacities of the polar bear to facilitate interpretation of its behaviour.

Future Research Plans

The Canadian Wildlife Service plans to continue earlier research, while looking into some of the problems listed above (particularly 2 and 5).

International cooperation might be exercised effectively in publication of an international polar bear data sheet each year. Basic information could include total kill, sex and age composition of kill, kill chronology, in addition to brief notes on general progress or critical problems in research and management. Perhaps the data could be collected

and edited by the I.U.C.N. International collaboration might also involve exchange of personnel for polar bear marking projects.

Conservation Measures

Consideration should be given to international agreement protecting mothers with cubs up to 2 years of age, and polar bears during the May–October period in international waters.

Report

A report of the meeting should be prepared and edited for submission to various governments concerned.

RECOMMENDATIONS

(submitted by the Delegation of Canada)

Internal Recommendations

MANAGEMENT

1. That the hunting of polar bears with the aid of any motorized vehicle (e.g., snowmobiles, motor toboggans, aircraft) be forbidden.
2. That the number of polar bears taken by one hunter be limited to six per year, and that no hunter be allowed to fill the bag limit of any other hunter.
3. That a closed season on polar bear be enforced from May 15 to October 1.
4. That hunting of mothers with cubs up to 2 years of age, and cubs up to 2 years of age be forbidden.

RESEARCH

1. That the Canadian Wildlife Service reinvestigate a cooperative effort with the provinces of Manitoba, Ontario, and Quebec to ascertain a minimum polar bear population for the Hudson Bay region by simultaneous aerial survey work in autumn.
2. That efforts be made to investigate patterns of polar bear movement in the Hudson Bay

region by using a wide spectrum of marking devices and techniques.

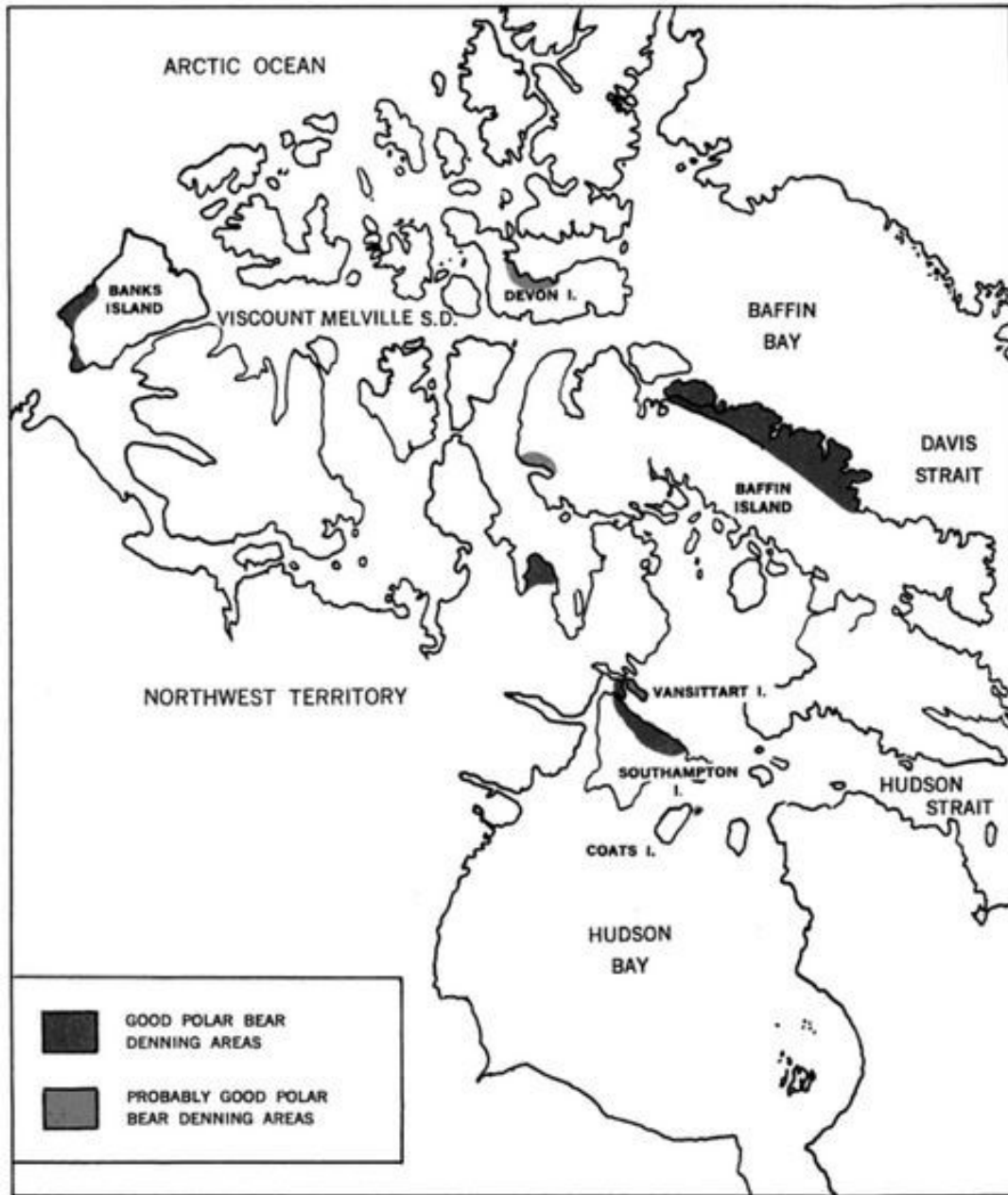
3. That the Bear Bay area of Devon Island be examined as a possibly common denning area for polar bears.

International Recommendations

MANAGEMENT

1. That each nation concerned take steps to conserve adequately the polar bear in its respective territories until such time as sound data are available on national bear stocks so that more precise management measures can be applied.
2. That the I.U.C.N. be approached with regard to organization and distribution of an international polar bear data sheet, as generally outlined in the I.U.C.N. submission to this conference.
3. That consideration be given to an international agreement protecting mothers with cubs up to 2 years of age, and polar bears generally during the May–October period in international waters.

POLAR BEAR DENNING AREAS IN CANADA



THE POLAR BEAR IN GREENLAND

by the Delegate of Denmark

SUMMARY

In Greenland the polar bear has three important breeding places: East Greenland (especially Northeast Greenland), Melville Bay, and the Kane Basin. Lone bears may be found all over Greenland, although they are rare along the west coast between Frederikshåb and Diskobugt. Occurrence in Northwest Greenland is closely related to the mass of Baffin Bay ice in the eastern part of Davis Strait, and occurrence in East and Southwest Greenland is closely related to the mass of East Greenland ice east off Greenland and in the southern part of Davis Strait and to the number of ringed seals in these two ice concentrations.

Trading statistics for polar bear harvest in Greenland go back to 1793.

The polar bear catch as a whole was on the increase in Northwest Greenland until approximately 1865, while it was falling in Southwest Greenland during the same period. Then the picture changed. After about 1865 the bag rose in Southwest Greenland and dropped in Northwest Greenland. After 1930 the bag was poor all over West Greenland but still high in East Greenland.

The number of polar bears killed in Greenland was highest around 1920 with approximately 200 animals. At present the figure is about 100. Occasionally 1 to 4 cubs have been taken by the Greenlanders at Scoresbysund and sent to the zoo in Copenhagen. The decrease is hardly due to exaggerated hunting, since after 1920 the drift ice has been scarcer and the ringed seals have gone north in both East and West Greenland. Hence the bears prefer to remain in the north, in the Spitsbergen area and in Northern Canada. All through the extensive area of the East Greenland ice, the polar bear is closely related to the ringed seal and occurs in numbers when the ringed seals are plentiful.

We will rarely have many polar bears simultaneously at Southwest Greenland and Northwest Greenland because mass penetrations of East Greenland ice do not coincide with mass penetrations of Baffin Bay ice towards the coast of Greenland—and the polar bear depends on these two masses of ice for transportation.

The polar bear curve for Southwest Greenland shows approximately 11-year maxima. A similar "rhythm" is found for the harp seal, the eider duck, the Greenland whale, and other animals dependent upon the drift ice.

The sun-spot curve hardly has a direct influence on the number of polar bears, but it may possibly have one on the drift ice which serves the polar bear as biotope and as transportation.

The climatic conditions of the present day on both sides of Greenland are too unstable for the country to hold any very great population of polar bear. Wintering and breeding in a den, the polar bear needs a constant Arctic climate without periods of thaw and melting of snow in the winter. Such conditions often occurring with the periodical penetration of the Atlantic climate far to the north, alternately in East and West Greenland, the polar bear cannot have established breeding territories in the southern parts of the country.

The polar bear is of great importance for the Greenland population in Thule, Scoresbysund, and Angmagssalik, and Greenland will be very interested in any work concerning protection of this animal.

Preservation Regulations

In the inhabited parts of Greenland no preservation regulations for polar bear are in force for the

resident population. People who are not resident in the country may not carry on polar bear hunting. Motorboat hunting in Melville Bay is prohibited.

In the instructions of the Royal Greenland Trading Department to ship masters, the following provisions are to be found: "The crew and passengers of the ship are forbidden the discharging of shots from the ship on polar bears."

In Northeast Greenland, north of Scoresbysund, and in North Greenland, north of Petermanns Gletcher, the following preservation regulations were introduced in 1956 in regard to polar bears:

- "1. Polar bear cubs as well as female polar bears accompanied by cubs are unconditionally protected.
- "2. The hunting of other polar bears is permitted only from November 1 to May 31, inclusive.

"3. The hunting of polar bears is permitted only with rifles of a calibre not less than 6.5 mm. and with soft-nosed bullets. Only persons experienced in hunting and in the use of rifles are permitted to hunt.

"4. The use of poison, foot-traps, or spring guns is prohibited.

"5. Along the coast between the trapper's cabin at Cape Borlase Warren and Cape Berlin, and on the neighboring islands, the use of spring guns is permitted as a protective measure at cabins which are temporarily abandoned, on the condition that the spring guns be distinctly marked and the nearest authorities informed. These spring guns must be removed at the close of the trapping season. (This point will be abolished as soon as possible.)

"6. Hunting from aircraft is prohibited."

THE POLAR BEAR IN GREENLAND

The most important food of the Polar Bear (*Thalarectos maritimus* Phipps) at Greenland is the ringed seal. It spends most of its life on the sea ice so is dependent on a prey which is always present. In Greenland, it has three important breeding places: East Greenland, Melville Bay, and Kane Basin with the sounds to the north.

It is most frequently found with little cubs on the firm winter ice along the coasts of the breeding places mentioned, although females with cubs may also drift with the drift ice down along all of East Greenland, all the way to the Julianehåb district in southwest Greenland. Lone polar bears may be found all over Greenland, although the polar bear is rare along the west coast between Frederikshåb and Diskobugt. On the latter stretch, it is found on the present day only at intervals of 1 or more years. In a few cases, it has been found on and near the ice cap, under circumstances indicating that stragglers will from time to time wander across the inland ice from east to west. Most of the polar bears that reach the west coast of Greenland from the south, north, or east are presumably shot at the settlements. There being no connection between the drift ice of the East Greenland Current and that of the Labrador Current, the polar bears that drift with the drift ice south around Greenland must

either go ashore, and there they are rarely met with, or perish.

Around 1740, the polar bear was very common in West Greenland from Holsteinsborg north. At that time, the Baffin Bay drift ice lay closer to Greenland than in the present day.

The occurrence of the polar bear in Northwest Greenland and Southwest Greenland has always been closely related to the mass of Baffin Bay ice (Vestis) in the eastern part of Davis Strait (periods with cold winters), and to the mass of East Greenland ice (Storis) in the southern part of Davis Strait (periods with cold summers).

To the eskimo population, the polar bear has always been a coveted prey, its skin having found application for clothing and as objects of trade. From 1795 through 1950, the skin has been subject to purchase in the stores of the Royal Greenland Trading Department, as a monopoly commodity, so that it is safe to assume that the greater part of the bag within the area of the monopoly has been purchased and registered. In Thule and Scoresbysund, polar bear skin is used for winter trousers for men and children, so that many skins from there have evaded the stores. In the remaining parts of Greenland, seal skin and skin of dog and caribou have been used with preference for clothing.

During the operations of the private Norwegian and Danish hunting companies in East Greenland during the first half of the 20th century, a number of polar bears have been shot, some of which would otherwise have landed in the Greenland stores, but now happened to evade these.

The polar bear hunt around Greenland has never been remarkably great, which may be due to an essential part of the East Greenland polar bears keeping far out in the drift ice, where they cannot normally be reached from land. The yearly bag lies at present (1965) around 100 animals for all of Greenland, although an exact figure cannot be given. Based on information received from East, West, and North Greenland (apart from the weather stations), the following numbers have been shot since 1959:

1959-60	-----	101
1960-61	-----	92
1961-62	-----	67?
1962-63	-----	83

These figures are decidedly somewhat below the true figures. Hunting at the weather stations most often amounts to 15 to 20 animals yearly. Through intensive research it should be possible to arrive at a satisfactory numerical material for the period after 1950, when the monopolized trade ceased.

Preservation Regulations

In the inhabited parts of Greenland, no preservation regulations are in force for polar bear for the resident population. People who are not resident in the country may not carry on polar bear hunting.

The population of the Thule district of Northwest Greenland, in accordance with an agreement with Canada, is allowed to carry on polar bear hunting along the coast of Ellesmere Island within the present Canadian fishing limit of 12 nautical miles, up to 3 nautical miles from the shore. In this area, it is not allowed to kill polar bear cubs less than a year old, nor mother cubs accompanied by such cubs.

In the instructions of the Royal Greenland Trading Department to ship masters of the Department's own and chartered ships, the following provisions among others for ships in Greenland waters are to be found: "The crew and passengers of the ship are forbidden the discharging of shots from the ship on polar bears, baleen whales, toothed whales (except killers), walrus, seals, and sea birds."

In Northeast Greenland, north of Scoresbysund, the following preservation regulations were introduced in 1956 in regard to polar bears:

- "1. Polar bear cubs (*Thalarctos maritimus*) as well as female polar bears accompanied by cubs are unconditionally protected.
- "2. The hunting of other polar bears is permitted only from November 1 to May 31 inclusive.
- "3. The hunting of polar bears is permitted only with rifles of a calibre not less than 6.5 mm. and with soft-nosed bullets. Only persons experienced in hunting and in the use of rifles are permitted to hunt.
- "4. The use of poison, foot-traps, or spring guns is prohibited.
- "5. Along the coast between the trapper's cabin at Cape Borlase Warren and Cape Berlin, and on the neighboring islands, the use of spring guns is permitted as a protective measure at cabins which are temporarily abandoned, on the condition that the spring guns be distinctly marked and the nearest authorities informed. These spring guns must be removed at the close of the trapping season.
- "6. Hunting from aircraft is prohibited."

Of these provisions, point 5 will presumably be abolished as soon as possible.

Polar Bear Research

No Danish research work has been carried into effect in regard to the biology of the polar bear. However, this author has for some years been occupied by a thesis regarding "Arctic Animals in Relation to Climatic Fluctuations in the Period 1800 to 1950," in which the occurrence of the polar bear in Greenland during the period mentioned is also dealt with. This thesis is in the process of being printed by "Meddelelser om Grønland."

Annex I shows the purchases of bear skins at the stores of the Royal Greenland Trading Department. The curves represent three-year sliding averages for Northwest Greenland (Upernavik-Egedesminde), Southwest Greenland (Holsteinsborg-Julianehåb), and East Greenland (Angmagssalik since 1897 and Scoresbysund since 1928). Part c the skins purchased at Julianehåb derive from the Angmagssalik district.

It will be seen from the curves that the polar bear catch as a whole was on the increase in Northwest Greenland until approximately 1865, while it w:

falling in Southwest Greenland during the same period. Then the picture changed. After about 1865, the bag rose in Southwest Greenland and dropped in Northwest Greenland. After 1930, the bag was poor all over West Greenland but still high in East Greenland.

As a whole, the development of the bag curve for Northwest Greenland strongly resembles the bag of ringed seal for Egedesminde, which was rising until about 1864, and then falling—as well as the narwhal bag at Umanaq which culminated in 1866. This brings to mind the ice conditions in Baffin Bay. The period of approximately 1810–60 was extremely cold in the parts northeast of Baffin Bay. The climatic conditions of West Greenland suggest that Baffin Bay has been blocked by ice in the winters. The ringed seals were few in number in the Upernavik district, from where they went southward to the parts around Diskobugten and Egedesminde. Northern populations of polar bear followed the ringed seals, so the polar bear hunt could continue at a high level in Northwest Greenland, as long as the Baffin Bay ice was lying close to the coast of Greenland.

The walrus, too, followed the Baffin Bay ice to Greenland—or was forced by the increasing quantity of ice in the north-northwest to winter in West Greenland waters where there were many walrus in 1862–88.

At the same time, the East Greenland ice had small extension west of Kap Farvel, but after approximately 1860 it started coming around Kap Farvel and penetrated into Davis Strait in much greater masses than usual. During the following decades, the bag of ringed seal at Julianehåb increased far beyond the usual level, and the same was true of the bag of polar bear. The explanation seems to be that the great ice masses off East Greenland have brought about thicker winter ice in the East Greenland fjords. This forced the ringed seals to go for winter quarters along the edge of the drift ice which they followed around Kap Farvel

to Southwest Greenland. It was to be a tough time of hunger for the East Greenland population because the seal disappeared from the hunting grounds.

Once the great ice masses ceased, approximately 1920, the great occurrences of ringed seal and polar bear in Southwest Greenland also stopped. These remained at the east coast of Greenland or at Spitsbergen.

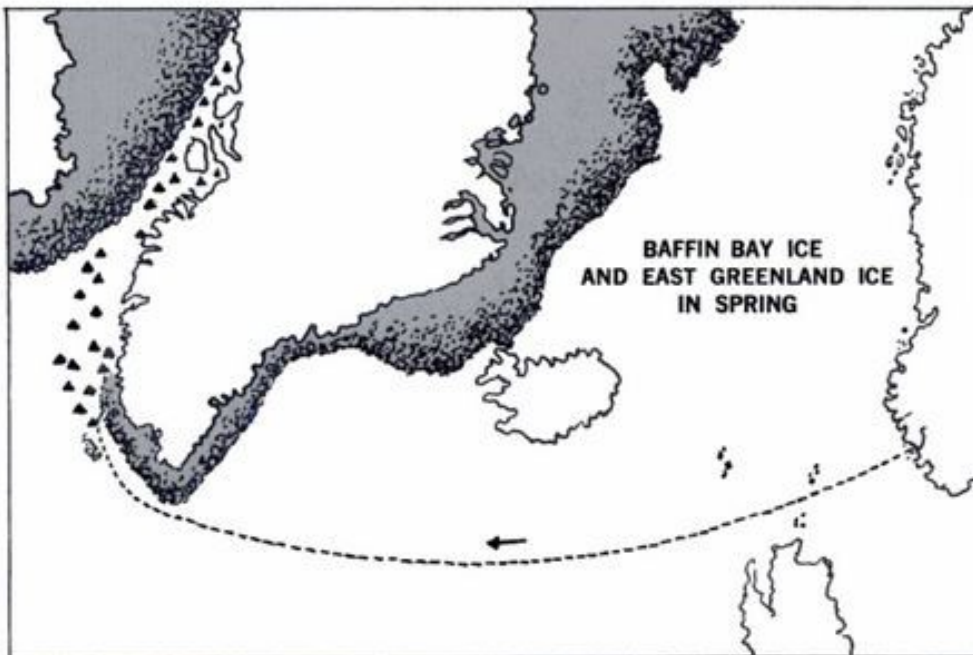
All through the extensive area of the East Greenland ice, the polar bear is closely related to the ringed seal and occurs in numbers when the ringed seals are plentiful.

We will rarely have many polar bears simultaneously at Southwest Greenland and Northwest Greenland because mass penetrations of East Greenland ice do not coincide with mass penetrations of Baffin Bay ice—and the polar bear depends on these two masses of ice for transportation.

The polar bear curve for Southwest Greenland shows approximately 11-year maxima. A similar "rhythm" is found for the Greenland seal, the eider duck, and other animals dependent upon the drift ice.

If we compare the sun-spot curve with the polar bear curve for Southwest Greenland for the period 1870–1930, during which the fluctuations are very evident, we find a great similarity between these two curves. The sun-spot curve hardly has a direct influence on the number of polar bears, but it may possibly have one on the drift ice which serves the polar bear as biotope and as transportation.

The climatic conditions of the present day on both sides of Greenland are too unstable for the country to hold any very great population of polar bear. Wintering and breeding in a den, the polar bear needs a constant Arctic climate without periods of thaw and melting of snow in the winter. Such conditions often occurring with the periodical penetration of the Atlantic climate far to the north, alternately in East and West Greenland, the polar bear cannot have established breeding territories in the southern parts of the country.



Purchase of Polar Bear Furs in Greenland

[Some figures have been revised owing to newly found archival documents]

Year	Northwest Greenland	Southwest Greenland	Angmagssalik	Scores-bysund	Year	Northwest Greenland	Southwest Greenland	Angmagssalik	Scores-bysund	Year	Northwest Greenland	Southwest Greenland	Angmagssalik	Scores-bysund	Year	Northwest Greenland	Southwest Greenland	Angmagssalik	Scores-bysund
1790					1830	12	20			1870	33	2			1910	19	42	105	
1					1	22	8			1	12	(5)			1	14	41	(87)	
2					2	16	9			2	(16)	(6)			2	14	20	69	
3		14			3	11	10			3	19	9			3	9	22	72	
4	32	18			4	15	7			4	31	21			4	8	28	158	
5	2	23			5	12	(12)			5	9	53			5	39	37	100	
6	3	3			6	27	17			6	19	32			6	16	12	89	
7	2	5			7	16	9			7	29	17			7	13	29	67	
8	2	(21)			8	32	5			8	45	15			8	14	27	88	
9	3	37			9	16	3			9	25	12			9	22	63	125	
1800	2	23			1840	29	7			1880	(31)	(10)			1920	20	31	102	
1	9	12			1	16	7			1	37	7			1	25	52	183	
2	5	22			2	34	12			2	18	45			2	15	38	66	
3	5	24			3	15	9			3	28	43			3	14	32	157	
4	5	24			4	15	5			4	13	66			4	20	23	42	
5	2	24			5	22	3			5	15	27			5	18	28	131	
6	18	11			6	21	12			6	18	20			6	23	10	92	
7	5	8			7	31	4			7	21	26			7	15	2	20	
8	21	1			8	26	3			8	14	36			8	11	7	60	72
9	7	6			9	27	7			9	4	12			9	13	7	47	73
1810	21	5			1850	45	14			1890	19	13			1930	15	1	69	64
1	(16)				1	28	11			1	22	26			1	12	7	82	78
2	11				2	52	15			2	24	6			2	7	3	42	34
3					3	27	18			3	24	33			3	9	6	21	55
4					4	52	23			4	44	53			4	3	19	36	36
5					5	34	16			5	33	45			5	7	7	17	14
6	4	19			6	52	4			6	19	24			6	6	3	32	46
7	2	7			7	25	1			7	19	62	83		7	9	2	57	50
8	14	30			8	31	1			8	29	29	62		8	3	6	58	47
9	4	8			9	48	13			9	42	33	69		9	1	15	70	33
1820	6	6			1860	24	2			1900	29	22	71		1940	2	7	91	64
1	16	4			1	(29)	24			1	16	23	68		1	4	8	66	26
2	17	5			2	57	13			2	25	20	66		2	8	3	44	42
3	18	7			3	39	6			3	24	34	68		3	1	8	30	22
4	(16)	5			4	39	(20)			4	21	12	114		4	5	13	27	42
5	(16)	23			5	80	10			5	39	46	111		5	2	11	17	18
6	(17)	6			6	42	2			6	72	27	78		6	6	11	48	46
7	15	18			7	58	(2)			7	20	16	103		7	4	9	22	36
8	20	12			8	27	1			8	35	82	104		8	4	2	12	23
9	10	21			9	37	3			9	32	40	51		9	5	2	28	31
															1950	8	14	46	38

The above figures have been extracted from:
 1793-1860: Koloniregnskabsblanketterne.
 1861-1918: Skematisk Indberetninger.
 1919-1939: Indhandlingslisterne.
 1940-1950: Fangstlisterne.

The figures in parentheses are estimated figures. In the period before 1823 a number of half furs and parts of furs were purchased. In these cases, 2 half furs or parts of furs are considered equal to 1 whole fur. Furs of cubs have apparently not been purchased.

From Thule which was founded in 1910, no complete material of figures is available. The present kill amounts to 15-30 polar bears a year.

During the first 50 years of our century, some

hunting activity has been undertaken in East Greenland by Norwegians and Danes. The relevant figures are published in the Norwegian and Danish hunting reports.

From 1940 some polar bears have been shot from weather stations in East Greenland, at present annually about 20.

The number of polar bears killed in Greenland was highest around 1920 with 200 animals. At present, the figure is about 100. The decrease is hardly due to exaggerated hunting, since after 1920 the drift ice has been scarcer and the seals have gone north in both East and West Greenland. Hence the polar bears prefer to remain in the north, in the Spitsbergen district and in Northern Canada.

CONCLUSIONS AND RECOMMENDATIONS

(submitted by the Delegate of Denmark)

Under the impressions of the negotiations of the First International Scientific Meeting on the Polar Bear, the Danish Delegate will propose to the Greenland Government that the aspects of research which have been laid out by Dr. Tener and Dr. Harington be considered in regard to the support it can be given from Greenland particularly by collecting data, skulls, and other desirable parts of Polar Bears killed in Greenland, by collecting information on observed dens, by registration of all bears obtained in Greenland and surrounding sea area, and by supporting any tagging and marking experiment which might be desirable and practically possible, including returning of tags.

Concerning preservation regulations, the Danish Delegate will propose to the Greenland Government that:

1. The protection of polar bear cubs in North-east Greenland be in force for cubs in their first and second year.
2. The prohibition of spring guns shall be extended to cover the whole of Greenland.
3. The prohibition of use of aircraft for hunting shall be extended to cover the whole of Greenland and the high seas around Greenland for aircraft starting from Greenland Territory.
4. Hunting by snowscooters and motorsledges be prohibited.

Resolution

At the First International Scientific Meeting on the Polar Bear it was agreed:

1. That the polar bear belong to all nations and that the governments in the countries around the Polar Sea, Canada, Denmark, Norway, U.S.S.R., and United States, are responsible for the preservation of this animal.
2. That each government is requested to encourage scientific investigations on the biology and environs of the polar bear to solve many still unknown questions concerning this animal.
3. That the harvest of the polar bear never must reach such a high that it brings the existence of this animal in danger.
4. That in any legislation on the conservation of the polar bear, particular regard will be taken to the right of the native populations in the countries concerned, their methods of hunting and particular need for this valuable animal in their daily way of living. For other hunters the polar bear only means money, but for the native population, it means existence and the whole way of life.

THE POLAR BEAR, NORWEGIAN HUNT AND MANAGEMENT

by the Delegation of Norway

SUMMARY

Hunting statistics show that the Norwegian take averaged 324 polar bears per year during the period 1946-65, making up a total of 6,808 bears for these 21 years.

Although the bears have been caught from Newfoundland-Labrador to Novaya Zemlya, the largest number have been harvested in the Svalbard area, either by wintering hunters and weather station crews or by sealing vessels operating there during summer. The total harvest shows a decreasing trend in this period due to smaller catches by sealing vessels. Hunting by wintering hunters and weather station crews shows increase during these years, and rough estimates of catch per unit of effort indicate that polar bears have been increasing in numbers in the Svalbard area during recent years. However, several factors affect the validity of this conclusion.

In the management of the polar bear in Svalbard,

both the demand that it should be preserved as an outstanding element of the Arctic fauna and the economic importance of the animal as an object of hunting and a predator of seals should be kept in mind.

Current regulations render the species complete protection in Kong Karls Land in the eastern part of Svalbard where denning occurs, regulate the living cubs.

catch by trophy hunters, and prohibit the catch of

Proposed bag limits on harvest by trappers and weather station crews can make it possible to keep the total annual catch at a desired level.

Norwegian research on the polar bear has been occasional only. An expedition to study polar bear biology in Kong Karls Land during the winter of 1967-68 might contribute to an international effort in future polar bear studies.

THE POLAR BEAR, NORWEGIAN HUNT AND MANAGEMENT

Introduction

The exploitation of animal resources in arctic regions is a traditional Norwegian trade, and as one of several objects of the hunt, the polar bear still is a factor of some economic importance to Norway. The species also is a conspicuous element of the fauna in arctic areas controlled by Norway (i.e., Svalbard), and for both reasons Norwegian authorities, naturalists, hunters, and general public are interested in this animal.

Norwegian Harvest

Estimates based on rather incomplete data indicate that the average annual Norwegian harvest of polar bears was 144 animals in the period 1875-92,

and 415 animals during the years 1893-1908 (Iversen 1939). Statistics on the Norwegian harvest, collected by the Directorate of Fisheries from 1924 on (Fiskeridirektøren), are still lacking in desired detail and coverage, but indicate an annual harvest of 355 animals in the period 1924-39 (Iversen 1939). Supplemented by other data, the statistics show that the total annual catch of polar bears during the period 1945-65 has varied between 523 in 1947 and 137 in 1961. The average annual Norwegian catch for these postwar years has been 324 animals, making up a total of 6,808 polar bears. A survey of the Norwegian harvest of polar bears during the same period, based on the official statistics (Fiskeridirektøren) with some modifications to be mentioned later, is given in table 1 and table 2.

From these tables it will appear that throughout

these years the larger part of the harvest has been taken in Svalbard or in waters near these islands.

Disregarding the large variations from one year to the next, and the increasing catches during the last four years, one can detect an overall decreasing trend in the total annual catches during the postwar years. This decrease is explained by a conspicuous decline in the number of polar bears taken by our sealing vessels as shown in figure 1. Since 1959 an annual average of 58.8 percent of the total harvest has been caught by trappers and weather station crews wintering in the Svalbard area.

Hunt by Sealing Vessels

A recent account of sealing in North Atlantic waters was given by Sergeant (1965).

Norwegian sealing vessels, hunting mainly in the breeding and molting lairs of harp and hooded seals on the ice in North Atlantic waters from Newfoundland-Labrador to Novaya Zemlya, account for more than 50 percent of the Norwegian polar bear harvest during the 21 postwar years. Specifications of this catch, based on the official statistics, are given in table 2. All figures in table 2 have been checked against the original records, and therefore it has also been possible to separate catch in Svalbard waters from catch in the Barents Sea.

As a general rule one can state that the sealers kill polar bears only occasionally, when the bears come close to the ships, disturb the seal hunt, or when no seals are to be found.

The largest catches of polar bears however, have been taken in Svalbard waters ("Nordisen"), where a few of the smallest vessels hunt for bearded and ringed seals during summer. These seals are not found in dense and large congregations on the ice, and in this area some of the sealers may kill polar bears at every opportunity, and also spend some of their time chasing bears in the ice.

The number of vessels operating here (see column IV of table 2 and figure 2) decreased from 30 in 1948 to 1 in 1962. This decline in participation was followed by a new temporary increase to 11 vessels (expeditions) in 1964 because of top market prices for bearded-seal skins. The decreasing participation naturally has led to lower annual harvest of polar bears in the area. Average annual catches over 5-year periods have been: 1945-49, 216 bears;

1950-54, 209 bears; 1955-59, 189 bears; and 1960-64, 59 bears. A single vessel concentrating on the hunt of bearded seals caught no polar bears in the 1965 season.

In 1945, 195 bears were caught by 5 expeditions in "Nordisen." A new peak in catch per expedition was reached in 1955-57, and such rough computations of catch per unit of effort indicate that polar bears are as numerous in "Nordisen" in recent years as they were during the first postwar years.

In "Vesterisen," the pack ice near Jan Mayen Island in the Greenland Sea, where at the average 41 Norwegian vessels have hunted harp and hooded seals in March-April every year, 206 bears have been caught by 820 expeditions from 1946 to 1965 (see column III of table 2, and figure 3).

The largest catches were taken in 1950, and for the whole period a downward trend is apparent. However, catch per expedition has increased during the last 10 years or so, indicating that polar bears now are found in increasing numbers in this area.

In "Østisen," just outside Soviet territorial waters in the Barents Sea where molting harp seals are hunted in April-May, 191 bears have been caught by 264 expeditions during the years 1946 to 1965 (column V of table 2 and figure 4). Very few bears were caught there from 1955 to 1962, but in 1963 the bears were far more numerous in the area than indicated by the 14 bears that were killed by 10 expeditions (observations by a representative of the Institute of Marine Research). The catch in 1964 was four bears, and in 1965 no bears were caught in the area.

At Newfoundland, the most important grounds for Norwegian sealing vessels which hunt there in March-April every year, the polar bear is just an occasional visitor in the seals' breeding lairs. In this area a total of 24 bears have been caught by 214 expeditions during the years 1946-65 (column I of table 2).

Polar bears have been somewhat more numerous among the molting hooded seals on the polar pack ice of the Denmark Strait in June-July. A total of 51 bears were killed or caught alive there by 226 expeditions from 1945 until this hunt was stopped in 1960 (column II of table 2 and figure 5).

Off the west coast of Greenland, one vessel hunting walrus in the Davis Strait caught no bears in 1949, but 16 bears in 1951. These two expeditions are included in column VI of table 2.

Hunting by Wintering Trappers, Weather Station Crews, Summer Expeditions, and Others

Lønø (1965) who summarized Norwegian polar bear harvest for the years 1945-63, has collected data on catch by other agencies than the sealing vessels. Because of incomplete records the official statistics give fragmentary information only on this hunt, and Lønø's data have been reproduced in columns II, III, IV, and VI of table 1.

Table 1, column III, and figure 6 show that on the islands of Svalbard 21 trappers wintered in the 1946-47 season, and caught 300 polar bears. The number of expeditions and men then dropped abruptly, and no trappers wintered on the islands in 1952-53 or 1953-54. In later years, however, the number of men has increased from two in 1954-55 to six in 1964-65. The number of bears taken has varied greatly during the latter period, but the largest numbers, both totally and per man, have been caught in the last few years. The Svalbard trappers have caught a total of 1,296 polar bears from 1946 to 1965.

The crews of meteorological stations in the Svalbard area hunt and fish throughout the year. In the period 1946-65 they have harvested a total of 931 polar bears, including 4 bears killed on Jan Mayen Island (table 1, column IV, and figure 7). In 8 years for which records are available, the catch by 4-man crews on the small isolated island of Hopen averaged 78.2 percent of the total catches on weather stations. Assuming this percentage a representative average for the whole postwar period, the catches per man on Hopen Island, set out in figure 7, have been calculated. Evidently, the crews on this station have increased their annual catches greatly during the years from 1946 to 1965.

Trophy hunting expeditions for foreign tourists in Svalbard waters, the "Arctic safaris," got a somewhat accidental start with one expedition in 1952. Every year since 1953 a small specially designed yacht has been used regularly in this traffic, and in 1961 a sealing vessel also started operations. The number of ships was three in 1962, two in 1963, three in 1964, and two in 1965. A couple of other ships have brought camera hunters on occasional expeditions to Svalbard without killing any polar bears. For obvious reasons the "Arctic safaris" represent a more profitable exploitation of polar bears than any other hunt. Specifications, summarized in column V of table 1, have been received from the

shipowners organizing the hunt. On an average the trophy hunters have caught 30 bears per year since 1952. These catches total 419 bears when provisional data for the 1965 season are included, and account for 10.4 percent of the Norwegian harvest during the last 14 years.

"Permanent residents" of the mining communities at Svalbard, scientific and other exploratory expeditions to the islands, occasional summer hunters, and the Governor's vessel have, according to data collected by Lønø (1965) and other available records, caught 228 polar bears during the postwar years (table 1, column VI).

Norwegian trappers have wintered on the Northeast Greenland coast until 1959, when the last weather station crew was brought home. In 13 years, 40 living and 60 dead polar bears were caught by the trappers and ships on summer expeditions in this area. One ship on a summer expedition there in 1964 caught no bears.

During the period 1945-57, living polar bear cubs intended for zoos on an average amounted to 10.1 percent of the total Norwegian harvest. For the years 1958-65, however, living cubs average only 0.7 percent of the catches.

Regulation of the Hunt

Current rules and regulations concerning polar bear hunting in Norwegian territories or by Norwegian citizens or companies have been decreed pursuant to the "Svalbard Act" of 1925, the "Jan Mayen Act" of 1930, the "Animal Protection Act" of 1935, and the "Polar Bear Act" of 1957. The more important regulations are as follows:

Since 1939 polar bears have been rendered complete protection on Kong Karls Land, a small group of islands to the East of the larger Svalbard islands.

A general interdict was placed against the capture of living polar bears in 1957, special permits to be granted only when commissions from recognized zoological gardens can be documented.

In 1963 the number of bears to be killed on tourist "safaris" was limited to 1 bear per tourist hunter, and minimum requirements to weapons were introduced (cal. 6.5 mm. guns). In 1965 it was forbidden for such expeditions to kill cubs or females accompanied by cubs.

In addition rules prohibiting certain killing methods and prescribing methods for transport of living bears are in force.

Discussion of Harvest and Abundance

When discussing the statistics presented above in relation to abundance of polar bears, some factors affecting the rough units of effort used should be kept in mind. Nature's own influence through changing weather and ice conditions affect the behavior of the bears, but also the hunting possibilities of trappers and ships.

With regard to the sealing vessels, it has already been hinted that very little effort is put into the bear hunt at all. A man with some experience may skin even a large seal in about 90 seconds, and three seal pups in about 2 minutes, whereas a skilled man will have to use about 20 minutes to skin one polar bear properly. The monetary value of a polar bear skin may be balanced by two or three seal skins, and as the bears most frequently are found where the seals are, it clearly is a waste of time to kill bears. It has been stated before that sealers who operate in Svalbard waters during summer do give chase to polar bears. Participation in the hunt in this area, however, is determined by prices paid for bearded seal skins, and because the bearded seal is the most important object of their hunt, the sealers to some extent will concentrate on seals in years when few vessels are competing for them, and divert their efforts to polar bears in years when competition is stronger.

The men who winter as trappers or weather station crew kill most of their bears with guns mounted in open wooden boxes and provided with baits which are connected to the triggers (Norwegian: "selvskudd"). The number of such "gun traps" operated, the area covered, and the number of hunting days might have been included in units of hunting effort if records were available. These factors depend upon the men's physical fitness, eagerness, hunting skill, and equipment, and must be significant. On Hopen Island for example, where crew members often stay for several winters in succession, increased hunting skill gained by experience has resulted in larger catches per man. Another illustration could be given: Two trappers who have stayed at Svalbard during two winters, last season extended their range by the use of snow-scooters, and killed more bears.

However, assuming that most of the variable factors tend to be balanced over the years, some conclusions can be made from the available data.

The hunting statistics give few clues to solve the question of polar bear abundance on the Newfoundland-Labrador coast, in the Davis Strait, or on the Northeast coast of Greenland. For the Denmark Strait a decreasing trend can be detected for the years up to 1960.

Total catch on the permanent weather stations, especially the catch on one of them, and catch per sealing expedition on the Jan Mayen grounds have been increasing lately, and may indicate that polar bears are becoming more numerous in the Svalbard area. Data for harvest by wintering trappers, sealing vessels in Svalbard waters, and vessels operating in the Barents Sea are not conclusive. The fact that polar bears in Soviet territories to the east (where they are protected) increase their numbers (Uspenskii 1965), supports the conclusion that the abundance of bears at Svalbard has been increasing during the last 8 years.

An unusually high number of bears was caught by wintering trappers and weather station crews in Svalbard last winter. Provisional regulations of this hunt therefore have been proposed for next season. The sealing vessels' decreasing share of the polar bear harvest suggests that future overexploitation may occur as a result of excessive hunting during winter. Bag limits on harvest by trappers and weather station crews as have been proposed by Norsk Polarinstitutt, therefore most likely will make it possible to keep the total annual catch on any reasonable desired level.

Contributions to Knowledge About the Polar Bears

Norwegian research on polar bears has been occasional. In addition to the statistics and Nansen's account (1924) of his own experiences, only a couple of articles have been published:

Iversen (1939) who summarizes hunting statistics and gives a general account of the bear's biology and behavior based on his own experiences in Arctic regions, also gives data on size and weight. Løns has published (1957) observations from his experience as a trapper at Svalbard.

From published and unpublished observations it may be mentioned that in the Svalbard region denning occurs most frequently in the eastern parts—east of 20° E., with a concentration on Kong Karl's Land where the polar bears are protected all through the year. The number of bears breeding

in the Svalbard region presumably is lower than 1,000, possibly not exceeding 500 animals.

Current Research

In connection with seal research in North Atlantic waters, the Institute of Marine Research is collecting material and data on polar bears whenever possible. Necessarily, this is a long-term project. The Statistics Office of the Directorate of Fisheries collects data on harvest.

During the season 1964-65, O. Lønø, with some support from Norsk Polarinstitutt, has wintered on Halvmåneøya in Svalbard to collect data and material for further studies of polar bear biology.

Sponsored by Norsk Polarinstitutt, a group of 7 graduate students of zoology at the University of Oslo is planning a wintering expedition to Kong Karl's Land in 1967-68, to study aspects of polar bear biology there.

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Table 1.—Norwegian Polar Bear Harvest, 1945 to 1965

[n=number of trappers, l=number of living cubs, d=number of dead bears]

Year	I—sealing vessels, all areas		II—trappers and expeditions ¹ East Greenland		III—trappers, Svalbard			IV—weather stations, Svalbard ²		V—tourist hunters, Svalbard area		VI—expeditions, miners, etc., Svalbard		VII—total harvest		
	l	d	l	d	n	l	d	l	d	l	d	l	d	l	d	l+d
1945.....	0	195	0	0	0	0	0	0	0	0	0	0	0	0	195	195
46.....	55	316	0	0	1	0	5	0	27	0	0	0	2	55	350	405
47.....	28	166	2	13	21	3	277	0	25	0	0	1	8	34	489	523
48.....	21	176	1	4	13	10	184	2	43	0	0	0	3	34	410	444
49.....	24	194	4	6	2	0	14	1	50	0	0	0	10	29	274	303
1950.....	60	439	0	14	1	0	0	0	21	0	0	0	2	60	476	536
51.....	33	236	0	10	3	3	52	0	32	0	0	0	8	36	338	374
52.....	13	68	0	5	2	0	2	0	32	5	14	0	7	18	128	146
53.....	43	247	2	4	0	0	0	1	41	0	8	0	3	46	303	349
54.....	19	128	2	0	0	0	0	0	22	0	34	0	3	21	187	208
1955.....	46	249	11	2	2	0	72	0	22	0	30	0	47	57	422	479
56.....	43	197	10	2	1	0	7	2	43	0	31	0	9	55	289	344
57.....	17	233	4	0	2	0	1	0	18	0	31	0	9	21	292	313
58.....	2	81	0	0	4	0	1	0	29	0	32	0	36	2	179	181
59.....	0	128	4	0	2	0	123	0	45	0	24	0	12	4	332	336
1960.....	0	11	0	0	3	0	57	0	70	0	24	0	23	0	185	185
61.....	0	42	0	0	4	0	9	0	52	0	23	0	11	0	137	137
62.....	2	40	0	0	6	0	11	2	83	0	39	0	19	4	192	196
63.....	1	126	0	0	4	0	62	0	86	0	32	0	7	1	313	314
64.....	0	147	0	0	5	0	132	0	62	0	56	0	0	0	397	397
1965.....	1	7	0	0	6	3	³ 268	0	³ 120	0	³ 36	0	³ 8	4	439	³ 443
Sum.....	408	3,426	40	60	82	19	1,277	8	923	5	414	1	227	481	6,327	6,808
Annual average.....		183		8			72		49		30		11			324

¹ Including catch by summer expeditions (ships): 7 living and 16 dead bears.

² Including 4 bears killed on Jan Mayen Island.

³ Provisional data.

Table 2.—Specification of Polar Bear Harvest by Norwegian Sealing Vessels, 1945 to 1965

[n=number of expeditions, l=number of living cubs, d=number of dead bears]

Year	I—New-foundland			II—Denmark Strait			III—Jan Mayen area			IV—Svalbard waters			V—Barents Sea			VI—Total, all areas		
	n	l	d	n	l	d	n	l	d	n	l	d	n	l	d	n	l	d
1945	0	0	0	9	0	0	0	0	0	5	0	195	0	0	0	14	0	195
46	1	0	0	13	0	4	16	0	1	21	55	311	5	0	0	56	55	316
47	1	0	0	20	4	5	31	0	1	29	22	141	5	2	19	86	28	166
48	4	0	1	19	0	4	51	0	25	30	21	144	7	0	2	111	21	176
49	6	0	0	20	2	7	44	0	11	23	22	170	16	0	6	110	24	194
1950	14	0	1	13	0	6	41	5	44	18	47	306	31	8	82	117	60	439
51	11	0	0	25	1	5	55	0	2	29	28	217	25	0	0	146	33	236
52	11	0	0	13	1	4	48	0	1	7	12	39	18	0	24	97	13	68
53	11	0	0	18	0	0	39	0	12	12	43	232	8	0	3	88	43	247
54	9	0	0	12	0	0	41	0	1	6	18	105	15	1	21	83	19	128
1955	10	0	4	11	0	0	44	1	1	8	45	243	16	0	1	89	46	249
56	10	0	0	14	0	6	43	0	8	6	43	182	21	0	1	94	43	197
57	15	0	6	12	0	0	37	0	1	6	17	225	20	0	1	90	17	233
58	13	0	1	12	0	0	42	2	33	3	0	47	10	0	0	80	2	81
59	13	0	1	7	0	1	45	0	3	7	0	123	5	0	0	77	0	128
1960	16	0	3	8	0	1	44	0	7	1	0	0	9	0	0	78	0	11
61	13	0	2	0	0	0	40	0	5	3	0	34	11	0	1	67	0	42
62	13	0	0	0	0	0	42	0	22	1	2	17	8	0	1	64	2	40
63	13	0	1	0	0	0	43	0	8	5	1	103	10	0	14	71	1	126
64	16	0	2	0	0	0	36	0	5	11	0	136	13	0	4	76	0	147
1965	14	0	1	0	0	0	38	1	6	1	0	0	11	0	0	64	1	7
Sum	214	0	24	226	8	43	820	9	197	332	376	2,970	264	11	180	1,758	408	3,426
Annual average	11	.....	1.2	14	.....	3.2	41	.....	10.3	12	.....	167.3	13	.....	9.6	.....	.....	182.6

¹ Including 1 expedition to the Davis Strait: no bears.

² Including 1 expedition to the Davis Strait: 4 living cubs and 12 dead bears.

Value of Polar Bear Skins in Norway

[In Norse kroner]

Year	Prime skins, winter	Skins, summer
1945	300	125
1960	500	.....
1962	.....	400
1965	700	250

Table 2.—Specification of Polar Bear Harvest by Norwegian Sealing Vessels, 1945 to 1965

[n=number of expeditions, l=number of living cubs, d=number of dead bears]

Year	I—New-foundland			II—Denmark Strait			III—Jan Mayen area			IV—Svalbard waters			V—Barents Sea			VI—Total, all areas		
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1945	0	0	0	9	0	0	0	0	0	5	0	195	0	0	0	14	0	195
46	1	0	0	13	0	4	16	0	1	21	55	311	5	0	0	56	55	316
47	1	0	0	20	4	5	31	0	1	29	22	141	5	2	19	86	28	166
48	4	0	1	19	0	4	51	0	25	30	21	144	7	0	2	111	21	176
49	6	0	0	20	2	7	44	0	11	23	22	170	16	0	6	110	24	194
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51	11	0	0	25	1	5	55	0	2	29	28	217	25	0	0	146	33	236
52	11	0	0	13	1	4	48	0	1	7	12	39	18	0	24	97	13	68
53	11	0	0	18	0	0	39	0	12	12	43	232	8	0	3	88	43	247
54	9	0	0	12	0	0	41	0	1	6	18	105	15	1	21	83	19	128
1955	10	0	4	11	0	0	44	1	1	8	45	243	16	0	1	89	46	249
56	10	0	0	14	0	6	43	0	8	6	43	182	21	0	1	94	43	197
57	15	0	6	12	0	0	37	0	1	6	17	225	20	0	1	90	17	233
58	13	0	1	12	0	0	42	2	33	3	0	47	10	0	0	80	2	81
59	13	0	1	7	0	1	45	0	3	7	0	123	5	0	0	77	0	128
1960	16	0	3	8	0	1	44	0	7	1	0	0	9	0	0	78	0	11
61	13	0	2	0	0	0	40	0	5	3	0	34	11	0	1	67	0	42
62	13	0	0	0	0	0	42	0	22	1	2	17	8	0	1	64	2	40
63	13	0	1	0	0	0	43	0	8	5	1	103	10	0	14	71	1	126
64	16	0	2	0	0	0	36	0	5	11	0	136	13	0	4	76	0	147
1965	14	0	1	0	0	0	38	1	6	1	0	0	11	0	0	64	1	7
Sum	214	0	24	226	8	43	820	9	197	332	376	2,970	264	11	180	1,758	408	3,426
Annual average	11	1.2	14	3.2	41	10.3	12	167.3	13	9.6	182.6

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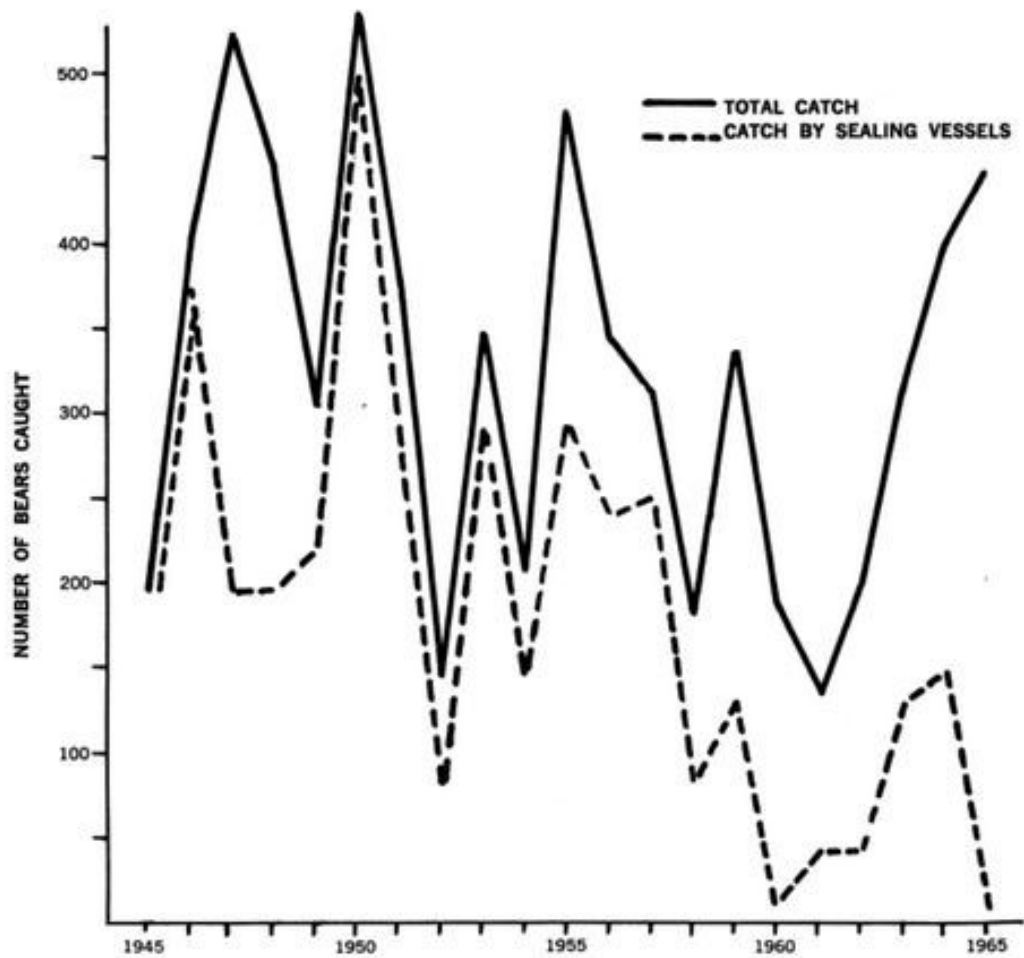


Figure 1.—TOTAL NORWEGIAN CATCH AND CATCH BY NORWEGIAN SEALING VESSELS OF POLAR BEARS IN ALL AREAS 1945-1965.

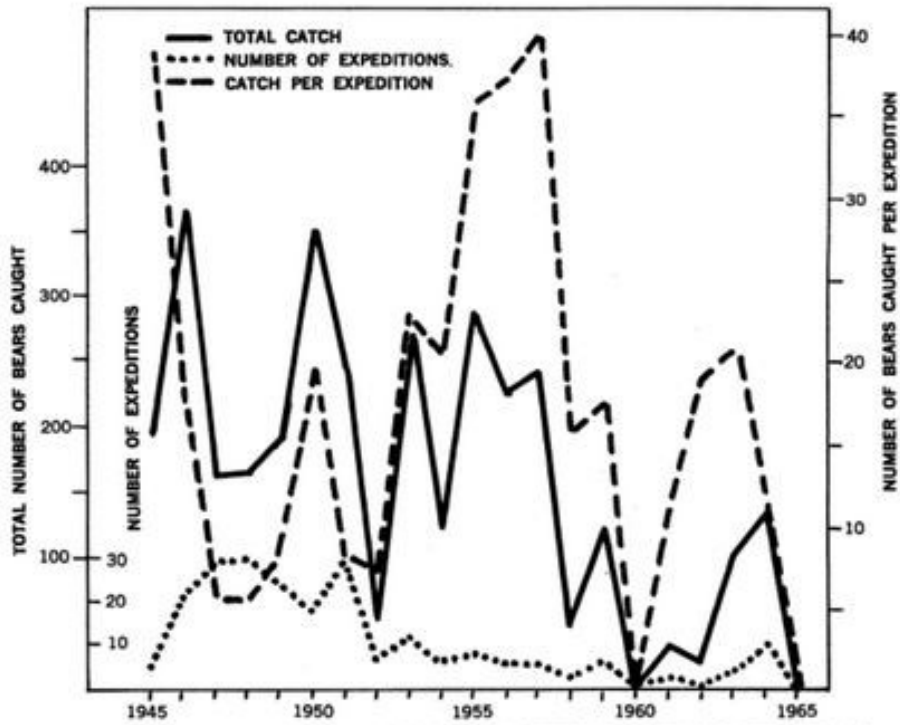


Figure 2.—CATCH OF POLAR BEARS BY NORWEGIAN SEALING VESSELS IN SVALBARD WATERS (NORDISEN) 1945–1964.

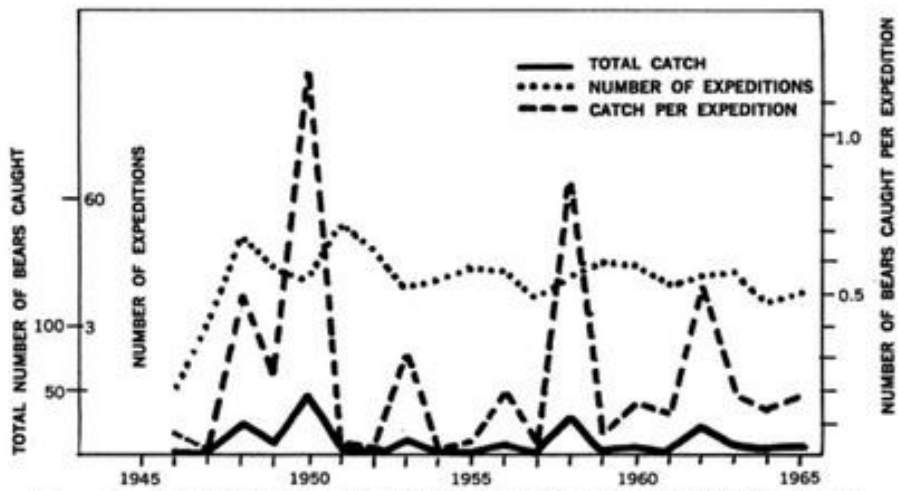


Figure 3.—CATCH OF POLAR BEARS BY NORWEGIAN SEALING VESSELS IN JAN MAYEN AREA (VESTERISEN, GREENLAND SEA) 1946–1965.

PRELIMINARY PLANS FOR A NORWEGIAN POLAR BEAR RESEARCH EXPEDITION TO KONG KARLS LAND (SVALBARD) 1967-68

by *Norsk Polarinstitutt*

Organization of the Expedition

Plans for an expedition for polar bear research in the Svalbard area have been under preparation since 1964. The planned expedition will consist of seven persons, three scientists and four assistants, forming three teams.

In the organization of the expedition, cooperation between the University of Oslo and Norsk Polarinstitutt has been established.

Norsk Polarinstitutt will act as the administration center of the expedition.

Composition—Work

Plans are only briefly given below:

Team 1

Studies of polar bear biology.
Migration, marking, population estimates.
Leader: Cand. Mag. Thor Larsen.

Team 2

Studies of polar bear physiology.
Material will be provided in connection with the planned marking operations.
Leader: Cand. Mag. Nils Arne Øritsland.

Team 3

Studies of the ecosystem of Kong Karls Land.

Ornithological studies. Bird fauna in relation to the polar bear population.

Leader: Cand. Mag. Magnar Norderhaug.

Working Area

Kong Karls Land in the eastern part of Svalbard has been chosen. If ice conditions do not permit landing, the Edge Island will offer possibilities as working area.

Planned Schedule of Activities

Time proposed: 1967-68 (or 1968-69).

1. *Starting expedition*: August 1966.

A station at Kong Karls Land will be established. Heavy equipment will be brought up. No personnel will stay during the winter in the area.

2. *Main expedition*: April-May 1967-August 1968.

Group one: Three men (Larsen, Norderhaug, and one assistant) intend to land by airplane, bring with them only personal equipment on a small plane. Time: April-May 1967.

Group Two: Four men (Øritsland and three assistants) will be brought up by a sealer with the rest of the equipment. Time: August 1967.

The expedition plans to work until August-September 1968.

CONCLUSIONS AND RECOMMENDATIONS

(submitted by the Delegation of Norway)

The proceedings of the First International Scientific Meeting on the polar bear have confirmed that our knowledge of polar bear abundance, population dynamics, and biology is far from being sufficient as a foundation for sound policies of management. However, data presented at the meeting indicate that the polar bear throughout a substantial part of its circumpolar range may still be abundant.

The Norwegian Delegation to the meeting therefore recommends to its Government that:

1. Attention should be given to the question of promoting research on polar bears.
2. Future research should (*a*) be planned according to the requirements outlined by the elected Technical Secretary, Dr. John Tener, Canada, in the proceedings of this meeting [see p. 65], and (*b*) as far as possible be coordinated with research performed in other countries.
3. Efforts should be made to make sure that, until further knowledge has been gained by national or international research, the annual Norwegian harvest of polar bear not exceed a reasonable level. Bag limits on harvest by wintering trappers and weather station crews should be considered as means to achieve this. Additional regulations should be imposed to render polar bear cubs and females accompanied by cubs a greatly increased degree of protection.
4. Information on research, management, and harvest should be exchanged on a regular basis with all interested nations, organizations such as I.U.C.N., and research workers. An agency or office should be assigned the duty of receiving and distributing polar bear information both nationally and internationally.

THE POLAR BEAR: DISTRIBUTION AND STATUS OF STOCKS; PROBLEMS OF CONSERVATION AND RESEARCH

by the Delegation of the Union of Soviet Socialist Republics

SUMMARY

In view of the fact that the polar bear is found on the territory of several countries, and that its numbers have decreased throughout its range, necessitating effective measures for its conservation, it is desirable that all nations having possessions in the Arctic prohibit the harvesting of polar bears. As a minimum measure, the harvesting of this species should be prohibited for a period of 5 years, beginning January 1966, and subsequently limited.

The limitation of the world catch of polar bears, beginning in 1971, and the capture of live cubs for zoological parks, beginning in 1967, should be established by special agreements between the governments of the U.S.S.R., United States, Canada, Denmark, and Norway, or by their designated organizations.

Each of the nations named in paragraph 2 should independently determine on its own territory the regular and mass breeding places (denning places of pregnant females) within the next 5 years and establish, at its own discretion, permanent sanctuaries and reserves in such areas.

National groups for the study of polar bears should be established as part of competent government agencies of the U.S.S.R., United States, Canada, Denmark, and Norway, the objectives of such groups to include the preparation of information on measures taken by each country for the conservation of polar bears, and on the results of biological research. On our part, we wish to state that in the U.S.S.R. such a group exists as a part of the Main Administration of Conservation, Sanctuaries, and Game, Ministry of Agriculture of the U.S.S.R.

THE POLAR BEAR: DISTRIBUTION AND STATUS OF STOCKS; PROBLEMS OF CONSERVATION AND RESEARCH

*by Ministry of Agriculture of the Union of Soviet Socialist Republics,
Main Administration of Conservation, Sanctuaries, and Game*

Mr. Chairman, Gentlemen:

Permit me to express our sincere gratitude to the U.S. Government for the invitation to participate in this important meeting, as well as to express our thanks for your warm welcome and for extending this opportunity to scientists and government conservation workers to hold a free exchange of views on questions of mutual concern.

We greatly appreciate the initiative taken by Senator Bartlett in this matter, considering how busy he is with other important matters of state as a member of the U.S. Senate.

U.S.S.R. scientists question the belief that there exists more than one species of polar bears (includ-

ing the two in the Soviet Arctic). Variations in the size of animals, particularly of those found in the western and eastern regions of the Soviet Arctic, may be explained by the difference in the density of human habitations in those regions, as well as by the greater age of the bears in the eastern bear populations. This view is supported by craniological evidence that shows a great variation with the age of the animal, not only in the size but also in the proportions of the skull, and especially by the present knowledge concerning the distribution and migration of polar bears. Thus, there is a basis for regarding this as a monotype species, i.e., that there are no locally prevalent "national" polar bear races

or populations, but that all animals constitute a common resource of all nations having Arctic territories and that any bear may sooner or later appear near the coast of Canada, Greenland, Spitzbergen, or Alaska.

Extensive research in the Arctic, particularly research conducted in recent years from drifting stations, has contributed much new knowledge regarding the nature of those regions and has considerably increased our understandings of the distribution, location, and ecology of the polar bear. In particular it has been determined that the concentration of animals coincides both with the edge of the ice and with the periphery of the central Arctic. It has long been known that in this region there appear areas of open water, the so-called Arctic leads. As was shown by Ia. Ia. Gakkel (1957), such leads occur mainly at places of contact of dynamically different ice masses—stationary shelf ice and drift ice. Approximately above the 200-meter isobath they form a closed system in the Arctic. This ring-like strip of open water has an enormous importance for the distribution of Arctic animals, including the polar bear, and may rightfully be called the "Arctic ring of life." The system of Arctic leads is particularly important in the life of the polar bear in the winter, when the ice area expands. During the summer, with the appearance of numerous stretches of ice-free water, the animals are distributed more evenly throughout their range.

Our scientists have determined that, in their movements in search of water and forage, bears reach the high Arctic latitudes, as far as the North Pole, where bears of different sex and age groups have been known to occur. Neither do land areas constitute an insurmountable obstacle for migrating bears. For instance, in the northeastern U.S.S.R. there are overland "highways" which are used more or less regularly by bears moving from the Chukchi Sea to the Bering Sea and vice versa. The "warming up" of the Arctic occurring over the past 50 years and the resulting contraction of the area of drift ice has restricted the range of the polar bear, a reduction particularly evident in the Barents Sea.

A. Pedersen (1945) was the first to suppose that in addition to active migrations, polar bears also engage in passive movements within the Arctic—with the drifting ice. In recent years ice drift in the Arctic Ocean has been thoroughly studied, and the facts tend to support Pedersen's view. In particular, it was found that the average rate of ice drift (and the bears moving with the ice) is 2.4 miles per

24-hour period; maximum recorded drift speed was 8 miles in a 24-hour period (Gakkel, 1957). The most striking instance of such migration is the mass movement of bears out of the Soviet Arctic into the Greenland Sea. Evidently a part of the bears pass south of Greenland and, moving north, return to the central Arctic regions and once more rejoin the cycle (this, in our view, is the main reason for precluding the formation of local races or populations of the species).

The breeding places of the polar bear (denning of pregnant females) represent a small portion of the animal's range. Most commonly the females prefer to make their dens on hilly islands located near regular roaming areas of the animals and sparsely settled by man; rarely they may also choose coastal areas on the mainland (instances of denning on ice are unknown and unlikely). There are particular areas of land which seem to be especially well suited for denning, and such places serve as the main "maternity settlements" used by the females regularly and with a high degree of density. Over the past decade, despite the sharp decrease of polar bear numbers, the population of "maternity settlements" has not changed much, indicating the existence of progressively fewer suitable denning areas in the Arctic.

In the Soviet Arctic, the main denning areas are located in the western regions of Franz Joseph Land and Vrangal Island. Novaya Zemlya, Severnaya Zemlya, the small islands in the Kara Sea, the Novosibirsk and Bear Islands, the coasts of the Taimyr and Chukchi Peninsulas are of secondary importance in this regard. According to the estimates of V. Ya. Parovschikov (1954), Franz Joseph Land accommodates 100 to 150 females (with 10 to 15 dens found every year on Alexandra Island and 15 to 20 dens on George Island). The Novosibirsk Islands, including the small islands of the DeLong Archipelago, have in recent years provided denning places for 40 to 50 females. Yearly, 20 to 30 dens are built on the northern and eastern coasts of the Taimyr Peninsula and the adjacent small islands, and about 50 on the northern coast of the Chukchi Peninsula and the Bear Islands.

The most thorough study of a denning area was made on Vrangal Island by expeditions of the Main Administration of Game and Sanctuaries of the R.S.F.S.R. It was determined that this denning place accommodates at least 150 females (116 inhabited dens were recorded and catalogued there in 1964.) In addition, about 50 dens were located on

neighboring Herald Island. It appears that the total number of dens built by the females on Vrangal Island has remained virtually unchanged in recent years and that the same land areas are densely settled by the animals from one year to the next. In a number of instances denning (undoubtedly by different females) is known to have occurred in the same part of a slope, a ravine, etc.

Certain areas of Vrangal Island are settled to a density of up to two and even three dens per square kilometer. The females here show a marked preference for coastal areas, with more than half of all inhabited dens in 1964 located within 10 kilometers of the shore, although individual females were found to den as far as 20 to 30 kilometers from the coastline. It was determined that the character of the snow cover, i.e., the existence in the fall of unthawed deposits from the previous year, was a crucial factor in the choice of den locations. Slopes tend to be favored fairly regularly as den locations. As a rule slopes with an eastern or northern exposure, rather than the warmer southern exposure, are chosen for this purpose. The depth of snow accumulations, and hence the relative ease of the establishment of a denning place, depends on the nature of the terrain and, in particular, on the steepness of the slope. The heaviest snow deposits, as well as the largest numbers of dens, occur on slopes of 25° to 45°. Because of snow accumulation characteristics, the overwhelming majority of dens on Vrangal Island was found to occur on the upper third of the slope (where the snow reaches a depth of from 2 to 3 meters).

The work of the expeditions on Vrangal Island has also helped to determine more precisely the chronological sequence of the denning cycle from the time of establishment until emergence. It has also shed light on the structural characteristics of the den proper, its size, etc., and on the size of the litters. A technique for surveying denning places from the ground was developed and tested.

Animals begin to approach the island and search for convenient den locations in the latter half of September. The time of the appearance of bears on the island depends largely on ice conditions in the surrounding coastal waters (whenever the ice approaches the coast late in the season, the females will be correspondingly late in landing). If the ice appears only along the western coast, the animals will land from the west, and vice versa. In years with average ice conditions, the main body of the animals starts the denning cycle during September.

The first dens are unsealed and the animals begin to emerge usually in the early days of March. The mass exodus of bears occurs later that same month (in 1964 these dates were March 2 and March 10–25 respectively). Some individual sows remain in their dens until late April, or even (rarely) early May. Approximately 3 to 5 days elapse from the moment the den is unsealed until the family abandons it for the sea ice (unless snowstorms intervene).

A detailed survey of 20 dens showed them to be constructed in a fairly uniform fashion. They are oval chambers 2 to 2.5 meters in length and about 1.5 meters wide. The interior walls and roof are usually highly compacted and their entire surface is covered with the female's claw marks. None of the dens examined had any nooks or side chambers. The length of the passage connecting the interior of the den with the outside usually varies between 50 centimeters and 2 to 3 meters. It is usually 50 to 100 centimeters in diameter.

The 1964 survey showed that up to 25 percent of the sows had only one cub. Evidently, the young females breeding for the first time tend to have a single cub. They are also the last to leave their dens.

In our view the best time for surveying denning places is the time of mass exodus (March 10–25 on Vrangal Island; later in the winter the dwellings are less easily detectable, although it is possible to locate them until the end of April, when the disintegration of the snow cover sets in).

The dens, bear tracks, and traces of their diggings in the snow stand out most clearly during the morning and evening hours.

In the course of the survey promising areas were systematically inspected by dog sled and the slopes studied through field glasses (in good visibility and using 8-power glasses, a den appeared as a black spot against the snow and was detectable at distances greater than 500 meters). "Suspicious" areas, where one could expect to find still-occupied dens, the slopes were "combed" with dogs on a long leash.

Dens were entered on the map as they were located. The exposure of the slope, its inclination, and the height of den location were noted at the same time. Experience indicates that cross-country vehicles may be used instead of dog sleds for covering the survey routes.

It also appears feasible to use airplanes (with cruising speeds of 150–120 kilometers per hour) or helicopters for this purpose. Optimum altitudes of flight for detecting dens are 100 to 300 meters. The

discretion, permanent sanctuaries and reserves in such areas.

4. National groups for the study of polar bears should be established as part of competent government agencies of the U.S.S.R., United States, Canada, Denmark, and Norway, the objectives of such groups to include the preparation of information on measures taken by each country for the conservation of polar bears, and on the results of biological research. On our part, we wish to state that in the U.S.S.R. such a group exists as a part of the Main Administration of Conservation, Sanctuaries, and Game, Ministry of Agriculture of the U.S.S.R.

In conclusion, I would like to mention that when the question of exploitation of polar bear stocks was discussed in the U.S. Senate, an incorrect statement was introduced to the effect that despite a general interdict on the hunting of polar bears, substantial numbers of polar bear skins from the U.S.S.R. are supposed to have recently appeared on the world market. In this connection, I wish to state that during the past decade, export agencies of the U.S.S.R. have sold a total of 26 polar bear skins. No skins have been sold on the domestic market. During the same period 96 polar bear cubs of up to 1 year of age have been caught alive for zoological gardens. The annual sale of such cubs did not exceed 15 animals.

CONCLUSIONS AND RECOMMENDATIONS

(submitted by the Delegation of the U.S.S.R.)

We will inform our Government of the results of the meeting and of the fact that in evaluating our proposals on effecting a total prohibition of polar bear harvesting, the meeting did not support these proposals. However, the participants in the meeting gave them a high appraisal and will submit to their Governments a number of proposals for intensifying conservation measures and further restricting the hunting of this species within the limits of their States.

As regards [proposals for] research on the polar bear, they will be carefully studied by the Coordinating Council on the Study of the Polar Bear of the Ministry of Agriculture of the U.S.S.R., and we feel confident that research on a whole series of problems will be carried out.

We will inform all participants in the meeting of the decisions taken.

THE POLAR BEAR IN ALASKA

by the Delegation of the United States

SUMMARY

Population size.—The number of polar bears in areas adjacent to Alaska is unknown. Sows with newborn cubs occur less frequently than would be expected in a typical population. An overharvest of bears adjacent to Alaska is not indicated by studies of biological data from animals killed by hunters.

Distribution.—During winter, bears are found on the sea ice of the Chukchi Sea and Bering Strait south to St. Lawrence Island. As the ice moves northward in spring and summer, bears move with it. Bears do not regularly come ashore in Alaska, and regular denning and foraging places on shore are not known. Bears do not occur on St. Matthew Island as they did during the 1800's, possibly because of changes in ice conditions.

Value.—The main economic value of polar bears has changed during the past 15 years as the harvest has changed. Formerly the main value was as a subsistence item for the Eskimos. Presently the main value is as a source of sport and trophies to hunters and a source of income to Eskimos, guides, and service organizations who supply support to hunters. The 1965 harvest of 292 bears contributed approximately \$450,000 to the economy of Alaska.

Hunting methods.—Small aircraft, working in pairs, fly out from shore bases, locate a bear, and land so that hunters may stalk it. Natives hunt on foot or with dog teams in the vicinity of villages. Regulations preclude hunting from boats in summer.

Distribution of harvest by area.—The majority of polar bears are taken north of Bering Strait in the Chukchi Sea from Diomed Islands to Point Hope, and adjacent to Point Barrow. Lesser numbers are taken in contiguous areas. Few are taken

south of Bering Strait. Areas of seal abundance are favored by polar bears.

Distribution of harvest by time.—Most bears are harvested in March and April. Hunting is not allowed between April 20 and October 15 except by residents (without the use of aircraft), who may kill bears for food. The harvest by Eskimos is small in winter. The take averaged 117 per year during the 1925-53 period. It has risen since then because of increased hunting pressure, and in 1965 the take was 292 bears.

Distribution of harvest by class of hunter.—Harvest methods have changed during the past 15 to 20 years from one primarily by natives to one by sport hunters. This is the result of the development of more efficient hunting methods by trophy hunters and a lessening dependence of Eskimos on game for subsistence.

Harvest composition.—Sex composition of the harvest for the past 5 years has averaged about 75 percent males. Native hunters are nonselective toward sex of bears hunted, resident white hunters are somewhat selective toward males, and non-resident hunters are highly selective toward males. Hide and skull sizes over the past 5 years have remained fairly constant. Average yearly hide measurements (length plus width) have been between 16.4 and 17.4 feet; average skull measurements (length plus width) have been between 23.8 and 24.9 inches. The lack of a downward trend in size of hides and skulls indicates a large reservoir of adult males—that stocks are not presently being overexploited.

Population characteristics.—Guide and hunter observations recorded during March and April since 1958 indicate an average litter size of 1.86 for cubs of the year (14 observations) and of 1.58 for cubs older than 1 year (363 observations). Observa-

tions of more than 2,300 bears made by hunting guides since 1958 during March and April indicate the following population composition:

	<i>Percent</i>
Cubs of the year.....	1
Cubs 1 year plus.....	31
Sows with cubs of year.....	Trace
Sows with cubs 1 year plus.....	20
Other bears.....	47

Most of the relatively few newborn cubs observed on the Alaskan ice pack have been far enough away from shore that it is believed they were born on the ice pack. The large number of cubs older than 1 year that remain with their mother, plus sightings of two sizes of cubs older than cubs-of-the-year, indicates that at least some offspring remain with their mothers for slightly more than 2 years.

Regulations.—Regulations have become more restrictive over the years as hunting pressure has in-

creased. Present regulations allow 1 bear per hunter per year to be taken between October 15 and April 20. Females with young and bears through their second year of life are protected. Since 1961, hunters have been required to show hides to the Game Department for examination and to provide harvest data. Beginning in 1966, hunters will be required to bring skulls to Game Department biologists for examination. If harvest data and life history studies indicate that stocks are being overharvested, regulations will be enacted to limit the harvest within the annual recruitment.

Research.—Present research includes the collection and analysis of harvest data and specimens and a systematic program of recording guide and hunter observations. A much more intensive and extensive research program is required if the polar bear is to be adequately managed in the future.

THE POLAR BEAR IN ALASKA

Introduction

Fortunately, public interest in the conservation of polar bears appears to be keeping pace with the exploitation of these animals, which has, at least in Alaska, increased greatly in recent years. To avoid destruction of the polar bear stocks, it is now clear that harvests must be regulated in accordance with bear productivity. Procedures and mechanics for influencing harvesting activities by humans pose no real problem, but knowing the extent to which restrictions on harvest should be imposed in order to meet, as far as possible, human need or desire to harvest without exceeding sustained yield limits of the bear stocks does present serious and urgent problems. We have in Alaska observed a threefold increase in harvest intensity during the past two decades. Measures have already been taken to control harvests while seeking to gain a better understanding of their effects on the bear stocks.

We decided to confine this presentation mainly to current information and activities relating to polar bears in Alaska with the expectation that delegates from other countries would emphasize information relating to their geographic regions of responsibility. It was decided, furthermore, to omit a recapitula-

tion of the literature which deals with evolution, taxonomy, morphology, physiology, etc., although references to these subjects are cited in the attached bibliography. This approach is dictated by the realization that much reference to polar bears in the literature consists of repeated reviews with very little in the way of new contributions. A thorough synthesis of information already available in the literature would be of great value. We feel, however, that the inadequacies of our present knowledge are apparent and that the pressing current need is for concretely identifying what we know in relation to what we must know if our ultimate objective is to use and still perpetuate the polar bear throughout its range.

Population Size

While estimates of the numbers of polar bears occurring in areas adjacent to Alaska's coasts have been made, all have been based on tenuous assumptions and extrapolation of fragmentary data. Certainly they do not provide a confident basis for guiding management efforts. Two things, however, can be stated.

First, bears observed on the ice pack adjacent to Alaska do not represent a cross-section of a typical population, at least during the season that bears are frequently observed or harvested. Thus, in the Chukchi Sea, sows with newborn cubs are rare in relation to the occurrence of adult bears or sows with yearling or older offspring. Along the Arctic coast of Alaska, the younger cubs are seen more frequently, but certainly not in sufficient abundance to account for the observed recruitment of yearlings.

Second, no decline in the abundance of polar bears adjacent to Alaska has been noted except in the immediate vicinity of certain coastal villages. This is not to say that present levels of harvest can be sustained indefinitely, but rather that if a general decline in the population is being experienced, our methods of observation are too crude to detect it at this point. Methods of attempting to assess population changes are mainly indirect, being based on guide and hunter reports and analyses of harvest data.

Distribution

Bears are common on the sea ice of the Chukchi Sea, excepting Kotzebue Sound, and the Arctic Ocean adjacent to Alaska's Arctic coast. During late winter, they occur, though in much smaller numbers, south of the Bering Strait as far as St. Lawrence Island and rarely beyond. They were once common on St. Matthew Island in the Bering Sea and were even rare visitors to the Pribilof Islands, though they have been absent from these southerly locations in the present century.

During the summer months when the southern extremity of the Arctic ice pack moves northward to or beyond the latitude of Point Barrow, the distribution of polar bears keeps pace. Bears do not come ashore in Alaska with any regularity. At times, when the ice pack moves to the Arctic coast during the summertime and then retreats northward, bears will be stranded ashore for varying periods of time. We are not, however, aware of any common or traditional use of the Alaska mainland by bears for denning or foraging purposes.

It has been speculated that the former occurrence of bears on St. Matthew and Hall Islands indicated a larger population of bears in the last century. It is also possible that oceanographic conditions, particularly the extension and duration of the Arctic ice pack to and beyond the latitude of St. Matthew

Island, differed considerably a century ago as compared with the present. A similar contraction of the distribution of Pacific walrus has been observed with the reasons being likewise in question.

Figure 1 depicts the present distribution and relative abundance of polar bears as indicated by harvest data and guide and hunter reports.

Value

The polar bear has always been important in the subsistence economies of many Alaskan Eskimos. Polar bear meat is relished by Eskimos as food. From the advent of whalers in the Alaskan Arctic in the 1850's, prime polar bear skins have also been of economic value. The bears not only provided food and valuable hides that could be sold or bartered, but they were also a significant cultural element in the lives of Eskimos. Ceremonies and dances were related to the harvest of bears, and a man's prestige was enhanced considerably by his success in taking bears. An example of this was related to Brooks by the Reverend Percy Ipalook of the Presbyterian Church at Wales in 1948. One of the native hunters, Bob Tokienna, who was an elder in the church and an unusually successful bear hunter, insisted on doing a polar bear dance and staging a feast in the "Kosgi" after killing a bear. The Reverend Ipalook advised him that the ceremonies were hardly in keeping with his station as a church elder and suggested that he might forego them. Tokienna, who apparently attributed some of his success to these rituals, acknowledged that perhaps the minister had a point but that he, Tokienna, had a large family and couldn't afford to take any chances.

In the late 1940's the hunting of polar bear by use of aircraft began. At first only one or two guides engaged in this type of hunting, but gradually more and more guides acquired the necessary know-how and offered polar bear hunts to sportsmen and trophy hunters. During the past 15 years there has been almost a complete shift from Eskimo hunters utilizing dog teams to white hunters utilizing aircraft. In consequence, there has been considerable change in the economic returns from the bears taken. At the present time, practically no meat is salvaged from the polar bear harvest aside from the relatively few taken by Eskimos. The Eskimos continue to benefit from the polar bear harvest, however, in that they provide many of the

services associated with aircraft hunting in the Arctic. Fleshing of bear hides is done almost exclusively by Eskimo women for which they receive \$25 per skin or more. Guide fees range from about \$500 to \$2,000. Air travel to and from the hunting base, hotel and restaurant charges, special clothing, cameras, guns and personal gear, all contribute to the exchange of money in connection with bear hunting. It would undoubtedly be realistic to say that each polar bear harvested in Alaska at the present time contributes at least \$1,500 to the economy of the State in one way or another. If one considered only the bears taken by nonresident hunters who must, in addition to other expenses, purchase a \$10 license and a \$150 polar bear tag, the value per animal would undoubtedly approach or exceed \$2,000. By this manner of reckoning, the 1965 polar bear harvest of approximately 300 bears directly resulted in the expenditure of about \$450,000 within the State. Considering that a significant part of this money is expended in relatively small Arctic villages, its importance to the economies of these places is substantial. This economic importance of polar bears at the present time is sufficiently great to become a weighty element in management deliberations. Indications are that the demand for polar bears by sportsmen and trophy hunters will continue to increase with corresponding effects on the economics of polar bear hunting.

Harvest

HUNTING METHODS

Aerial hunting as developed by Alaskan guides and bush pilots allows sportsmen to bag trophy animals with a relatively small expenditure of time. This hunting method characteristically involves the use of two light, ski-equipped aircraft working together for reasons of safety. On long flights, as from Kotzebue to beyond the International Date-line, one aircraft will simply fly cover for the other and perhaps carry extra gasoline. Commonly, however, both aircraft carry gasoline reserves and each may hold a guide and a hunter. The guides typically look for bear tracks on the snow and then judge whether the animal that made the track is of trophy size. If so, and if snow and light conditions are good, the track is followed until the bear is found. This may be within a few miles or in excess of 50 miles. One aircraft will then land as

close to the bear as possible and the hunter will stalk it. If an ordinary stalk is impossible, it is commonly reported to us that the cover plane will herd or attempt to herd the bear back within range of the hunter. While many conservationists and sportsmen condemn this type of hunting as not being sportsmanlike or ethical, still some of the most prominent sportsmen in the country have done it and will defend it. Mail received by the Department of Fish and Game indicates a very strong public feeling against aerial hunting, and there is no question that those engaged in it are strongly motivated by either the monetary returns (guides) or the ease with which a rare trophy may be obtained (trophy hunters).

The major bases of aerial hunting operations include the villages of Teller on the Seward Peninsula, Kotzebue, Point Hope, and Barrow. Records compiled during the past 5 years based on guide and hunter reports indicate that the average distance from shore bases at which bears are taken is about 85 miles. Hunters operating from Kotzebue fly the longest distances (average 130 miles), and those from Barrow fly the shortest distances (average 55 miles). Of course, native hunters on foot or with dog teams seldom get more than a few miles off shore.

A few guides have attempted to offer dog team hunts to sportsmen but they have been unsuccessful in developing this type of hunting. The physical exertion and time required are much greater as compared with aircraft hunting, and the trophies taken are usually smaller. Hunting of bears on foot or by dog team as practiced by Eskimos is usually done in association with seal hunting. Bears are shot whenever encountered, and no special hunting techniques, such as trained dogs, are involved.

Some bears are taken nearly every summer by the residents of Barrow while hunting walrus and bearded seals from boats along the edge of the ice pack. While the hides of these bears are of little value, the meat is completely utilized for human food. Sport hunting by boat has not developed because there are regulations specifically designed to prevent it.

DISTRIBUTION OF HARVEST BY AREA

Figure 1 indicates the distribution of the polar bear harvest taken by Alaska-based hunters. To some extent the areas of harvest reflect the distribu-

tion of polar bears. This is particularly true of the area north of Bering Strait where it is evident that bears are concentrated during the principal hunting months of March and April. Hunters from Teller, Kotzebue, and Point Hope all operate in this region. The absence of any significant number of bear kills south of Bering Strait and in Kotzebue Sound reflects scarcity of bears in these areas. But north and east of Point Hope, the harvest distribution probably reflects location of hunting bases rather than concentration of bears.

In the Chukchi Sea and Bering Strait area the abundance of bears is associated with constant fracturing of the ice floes that results in the formation of open water leads. Such areas are favored by seals, which are the sole food of polar bears during the winter season. It seems probable that the availability of seals is an element in promoting the concentration of bears in the southcentral Chukchi Sea just north and northwest of Bering Strait. While little hunting is done between Point Hope and Wainwright, this is in part due to the lack of shore facilities along this coast.

DISTRIBUTION OF HARVEST BY TIME

The major portion of the Alaska polar bear harvest is taken during the months of March and April. During this time daylight hours are increasing rapidly, ice pack formation and southern extension are near maximum, and the availability and quality of bears are optimum.

Furthermore, present regulations prohibit the killing of polar bears between April 20 and October 15 with the exception that residents may take bears without the aid of aircraft for food during the summer period. Actually, fewer than a dozen bears are killed annually during the summertime in an average year. Eskimo hunters do kill bears throughout the winter and have traditionally done so. However, in recent years the harvest by Eskimos has been extremely small (see table 1).

DISTRIBUTION OF HARVEST BY CLASS OF HUNTER

Table 1 illustrates the increasing harvest of polar bears by resident and nonresident trophy hunters in recent years and the sharp decline in harvest by Eskimos. The cause of the recent increase in trophy hunting involves the development and acquisition in large numbers of safe, high performance small aircraft, the increasing ability and experience of guides and bush pilots to hunt successfully with these aircraft, and the great attraction of a polar bear trophy

Table 1.—The Estimated and Known Alaska Polar Bear Harvest According to Hunter Type, 1925–65

[Data sources: 1925–56 annual reports of Alaska Game Commission; 1957 Tovey and Scott, 1957; 1958 Scott et al., 1959; 1959–65 unpublished data in Alaska Department of Fish and Game files]

Year	Non-resident	Resident white	Resident native	Total
1925–53	Few	Very few	Majority	117 (average)
1954	?	?	?	100
1955	?	?	?	128
1956	?	?	?	135
1957	75	53	78	206
1958	69	19	40	128
1959	?	?	53	250
1960	?	?	62	162
1961	70	59	23	152
1962	78	103	16	¹ 201
1963	106	57	22	¹ 189
1964	142	88	23	253
1965 ²	159	116	17	292

¹ Includes 4 bears for which hunter type is unknown.

² Data incomplete.

to affluent sportsmen. The decline in harvest by Eskimos is a result of their being unable to compete with aircraft hunters. The taking of polar bears by Eskimos no longer carries the great and traditional prestige that it formerly did. This significance is lost by witnessing the ease with which white men are able to take bears. Then, too, aircraft activity in the vicinity of villages undoubtedly has a disturbing effect on bear movements, making them less available in accessible close-in hunting areas. In addition, the Eskimos are experiencing a transition in their economies and way of life with a lessening dependence on game resources for subsistence.

COMPOSITION OF HARVEST

The sex composition of polar bears harvested in Alaska during the past 5 years is shown in table 2. It will be noted that Eskimo hunters are apparently nonselective with respect to sex or, in reality, to size. Resident white hunters show a degree of selectivity for larger bears and, therefore, take a greater percentage of males. Nonresident hunters, all of whom are guided, are highly selective, favoring large bears and therefore taking predominantly males. A noteworthy point here is that the larger harvest of polar bears in recent years has not accounted for a proportionately large take of females, and therefore probably has a lesser influence on the reproductive performance of the bear population than one might judge from the total harvest figures.

Table 2.—Sex Composition of Polar Bears Taken by Alaskan Hunters, 1961–65

Year	Nonresident		Resident white		Resident native		All hunters	
	Number	Percent male	Number	Percent male	Number	Percent male	Number	Percent male
1961.....	70	93	59	57	23	52	152	73
1962.....	78	85	103	60	16	50	¹ 201	69
1963.....	106	88	57	68	22	68	¹ 189	79
1964.....	142	89	88	60	23	69	253	77
1965.....	159	89	² 116	64	17	56	292	78

¹ Includes 4 bears for which hunter type is unknown.

² Includes 5 bears collected for scientific purposes.

The size of polar bears taken by various classes of hunters is indicated in table 3. While these data confirm the varying selectivity characteristic of different classes of hunters, we realize that the measurements employed are too coarse to reveal what might be significant changes in the age of bears taken from year to year. This condition results from the fact that bears attain something near their ultimate gross size in from 5 to 7 years, while we are probably harvesting age classes extending through 20 years or more. In the future we will be obtaining tooth specimens from most polar bears harvested, and this will provide a much better indication of changes that may be occurring in the polar bear population through exploitation.

Population Characteristics

LITTER SIZE

A program of systematically querying guides and hunters after flights over the ice has resulted in a compilation of data relating to litter size presented in table 4.

While observations of sows with "cubs of the year" are too few to have real meaning, data relating to the class of "1 year plus" are significant. While it is possible, and even probable (see below), that the "1 year plus" class is composed of both yearlings and 2-year-olds, it is nevertheless indicated that an average of 1.6 cubs per litter survive at least 14 or 15 months after birth.

POPULATION COMPOSITION

Data have also been gathered from guides and hunters relating to their observations of the types of animals observed on hunting flights. This information is presented in table 5. Because these observations mainly were made in March and April when some or most sows with newborn cubs should be out of hibernation, it is apparent that this class of animal is extremely scarce in the areas being hunted. Guides believe that the newborn cubs they do observe are born on the ice pack for they are seen at considerable distances from shore. Furthermore, it is known that denning on the Alaska mainland takes place but rarely.

Table 3.—Average Hide Size (Length Plus Width Plus Flap in Feet) and Average Skull Size (Length Plus Width in Inches) of Polar Bears Harvested by Alaska Hunters, 1961–65

Year	Nonresident		Resident white		Resident native		All hunters	
	Skull	Hide	Skull	Hide	Skull	Hide	Skull	Hide
1961.....	24.9	17.5	22.7	15.8	21.7	14.6	23.8	16.4
1962.....	24.8	17.5	22.7	15.6	20.0	15.0	23.8	16.5
1963.....	25.2	18.1	24.1	16.8	21.5	15.2	24.8	17.4
1964.....	25.4	18.1	23.7	16.5	.....	15.5	24.9	17.2
1965.....	25.3	17.6	22.7	15.9	21.2	15.2	24.4	16.8

Table 4.—Number and Size of Polar Bear Litters as Reported by Alaskan Guides During March and April, 1958-65

Year	Sows with 1 cub		Sows with 2 cubs		Sows with 3 cubs		Average litter size	
	Cubs of year	1 year plus	Cubs of year	1 year plus	Cubs of year	1 year plus	Cubs of year	1 year plus
1958.....		12		22				1.65
1960.....		39		34				1.47
1961.....	2	20	3	11			1.60	1.35
1962.....	1	39	2	43			1.67	1.52
1963.....		70	2	76		4	2.00	1.56
1964.....	1	69	1	113	2		2.25	1.64
1965.....		38		71		1	3.00	1.66
Total.....	4	287	8	370	2	6	1.86	1.58

Table 5.—Population Composition of Polar Bears Observed by Guides off Alaskan Coast During March and April, 1958-65

Year	Sows with cubs of year			Sows with cubs 1 year plus			Other bears			
	1 cub	2 cubs	3 cubs	1 cub	2 cubs	3 cubs	Small	Medium	Large	Undetermined
1958.....				12	22		26	71	22	
1960.....				39	34		27	95	37	9
1961.....	2	3		20	11		32	73	25	
1962.....	1	2		39	43		33	113	42	19
1963.....		2		70	76	4	69	99	51	54
1964.....	1	1	2	69	113	1	105	207	59	85
1965.....				38	71	1	51	96	47	34

Composite Summary

Population element	Number	Percent
Cubs of year.....	26	1
Cubs 1 year plus.....	1,045	31
Sows with cubs of year.....	14	Tr.
Sows with cubs 1 year plus.....	663	20
Other bears.....	1,581	47

The composite summary in table 5 reveals a surprisingly large proportion of sows with yearling or older cubs. We believe that the frequent sighting of such animals indicates a true relative abundance, in that hunters will usually bypass the tracks of sows with cubs and hence will not see as many as would be the case with large bear which are tracked from the aircraft. We interpret this relative abundance of sows with older cubs as evidence that cubs frequently remain with the sow for slightly over two years. Further evidence of this extended parental-cub attachment comes from guides and hunters who report two sizes of cubs larger than cubs of the year. In addition, individual sows in

estrous have been harvested which were capable of lactating slightly but which were not accompanied by cubs.

Regulations

Table 6 lists regulations and regulation changes relating to the harvesting of polar bears in Alaska (including offshore areas).

After July 1, 1960, all nonresidents were required to hire a registered guide to hunt polar bear provided that residents of the Arctic could serve as guides without possessing a registered-guide license. This mandatory guide requirement has since been rescinded.

Before 1960 the polar bear was classified as a fur-bearing animal in Alaska. In 1960, the Alaska Board of Fish and Game classified it as a big-game animal, although sale or barter of the hides is still permitted.

In 1961 the Alaska Board of Fish and Game required by regulation that the hide of each polar bear taken be sealed by a representative of the Department of Fish and Game. This regulation provided opportunity for interviewing all hunters and for sexing and measuring the bear hides. In 1965 the Alaska Board of Fish and Game further required that the skulls of polar bears accompany the hides until they have been sealed. Opportunity is therefore afforded for accurately measuring the skulls and in most cases obtaining a tooth specimen.

Table 6.—Summary of Alaska Polar Bear Regulations

Period	Closed season	Bag limit
Before 1948..	None.....	None.
1948-49.....	do.....	2.
1953-54.....	do.....	3.
1955-56.....	do.....	Resident—3; non-resident—1.
1957-58.....	do.....	1, excepting females accompanied by cubs.
1959-60.....	do.....	1, excepting cubs or females accompanied by cubs.
1960-61 ¹	May 2-Oct. 14....	1, excepting cubs or females accompanied by cubs. ²
1961-62.....	May 8-Oct. 14....	1 a year, except cubs and females accompanied by cubs. ³
1962-63.....	May 1-Oct. 14....	Do.
1963-64.....	May 11-Oct. 14....	Do.
1964-65.....	May 11-Oct. 14....	Do.
1965-66.....	Apr. 21-Oct. 14....	Do.

¹ First year of State jurisdiction.

² Provided that residents may take polar bear without limit at any time for food.

³ Provided that residents may take polar bear (except cubs and females accompanied by cubs) without limit at any time for food; polar bears so taken shall not be taken by means or use of aircraft.

The State of Alaska exercises jurisdiction over Alaskan based polar bear hunters when they operate in international waters. Furthermore, through regulations governing possession and transportation within Alaska's territorial limits, this authority extends to nonresidents of the State as well. Other than hunting that may be based in Siberia and Canada, all polar bear harvesting on the seas adjacent to Alaska is done by Alaskan based hunters. While disagreements have occurred among Alaskans regarding the specific nature of regulations, problems of enforcement based on lack of jurisdiction have not arisen.

No polar bear reserves now exist in Alaska, and the rarity of these animals on land seems to preclude the need for them.

Research

The goal of research at this time should be to provide information required as an immediate basis for polar bear management. Because their habitat is intact and relatively undisturbed by man, the principal threat to the animals would seem to be exploitation by man. Thus, determining the influence on the bear stocks of known levels of exploitation is vital. Priority should be given to investigating polar bear abundance throughout its range, discreteness of local populations, and productivity in relation to harvests. Techniques or methods for obtaining such information must be decided upon or developed, with direct methods being favored wherever possible over indirect methods. Beyond satisfying these crucial needs, research should be oriented toward population dynamics, life history, ecology, physiology, and other extremely important, but less urgent, subjects.

CURRENT RESEARCH

In Alaska, research and management activities are integrated. Harvest characteristics are being obtained through a well-established program. Data which are collected for each bear harvested include the size of hide and skull, sex, date and location of kill, and type of hunter.

Guides and hunters report numbers, locations and, when possible, the population component of bears seen.

Reproductive tracts are being collected and will be examined to obtain information on breeding biology and productivity.

Teeth are being collected and will be sectioned to obtain a fairly precise indication of age.

The feasibility of aerial censusing for obtaining a statistically valid population estimate is being explored.

GENERAL RECOMMENDATIONS

1. Research should be broadened geographically to encompass all areas of polar bear occurrence.
2. Each country should be responsible for research within its territorial limits and immediately adjacent international waters, though exchange of scientists on a visiting basis should be encouraged to promote liaison and standardization.
3. Standardized methods and techniques of data gathering should be agreed upon.

4. Assignment of research responsibilities to research agencies or groups within each country should be governed by their material means to execute them, the special scientific skills of individual workers, as well as statutory obligations for resource management or welfare.

5. Accord should be reached between countries as to (a) type and magnitude of research to be conducted by each, and (b) periodic exchange of information.

SPECIFIC RESEARCH RECOMMENDATIONS

1. Assessment of harvests—Information derived from bear harvests will always be essential to bear management and conservation efforts. It can provide basic data relating to movements, abundance, population dynamics, effects of exploitation, taxonomy, morphology, and other types of studies. Each country should collect at least the following information and specimens from polar bears taken by their nationals:

- a. Number, sex, size of bears harvested, and the date and location of each kill.
- b. As many skulls as possible, but in any case a tooth specimen and the reproductive organs from each bear harvested.
- c. Parasite and tissue specimens that may be pertinent to disease studies.

2. Seasonal distribution and abundance—Each country should, within its means, conduct aerial or other surveys appropriate to conditions for the purpose of establishing seasonal distribution and abundance of bears. In addition, a systematic program of querying hunters or other Arctic residents relative to polar bear observations ought to be inaugurated.

3. Denning studies—Areas of denning should be defined and efforts made to determine the number of bears utilizing them. Attention should be directed toward the extent of maternal denning on the ice pack as well as on land. Such information will be essential to determining the degree to which discreteness of populations may exist as well as giving basis for productivity estimates.

4. Breeding biology and productivity—Specimens and fundamental data relating to reproduction will be acquired as indicated above. Nevertheless, laboratory analysis and careful theoretical interpretation of all related information will be required to gain confident knowledge of potential and realized productivity.

5. Ecology and life history—The relation of polar bears to oceanographic and ice conditions, food supplies, land areas of different types, and similar ecological elements should be studied. Mortality factors such as intraspecific strife and cannibalism, accidents, diseases, parasites, and similar factors warrant attention. Much information bearing on these subjects can be obtained in connection with other activities and will not initially require a great amount of extra field work.

Summary

Increasing harvests of polar bear in the seas adjacent to Alaska have not resulted in an apparent reduction in numbers. The observed population does not contain all age classes; the population element consisting of sows with newborn cubs must exist outside the areas visited by Alaska based hunters. Bears are common on the ice adjacent to Alaska north of Bering Strait. A late winter or early spring concentration is apparent just north and west of the Strait. There is no common or regular use of the Alaskan mainland for denning or foraging purposes.

Prior to the advent of aircraft hunting, most harvesting was by Eskimos for subsistence purpose and hides. Since the late 1940's, aircraft hunting by sportsmen has developed and now accounts for most of the bears taken. The 1965 harvest of approximately 300 bears contributed about \$450,000 to the economy of Alaska.

Current harvests contain more than 70 percent male bears as a result of selective hunting for large animals. Observations of bears by guides and hunters indicate an average litter size of 1.6.

Regulations limit the take of bear to one per hunter per year, extend complete protection to cub and sows accompanied by cubs, and prohibit hunting during the summer season except for Eskimo food purposes.

Present research involves the collection and analysis of harvest data and specimens. A systematic program of recording guide and hunter observations is also established.

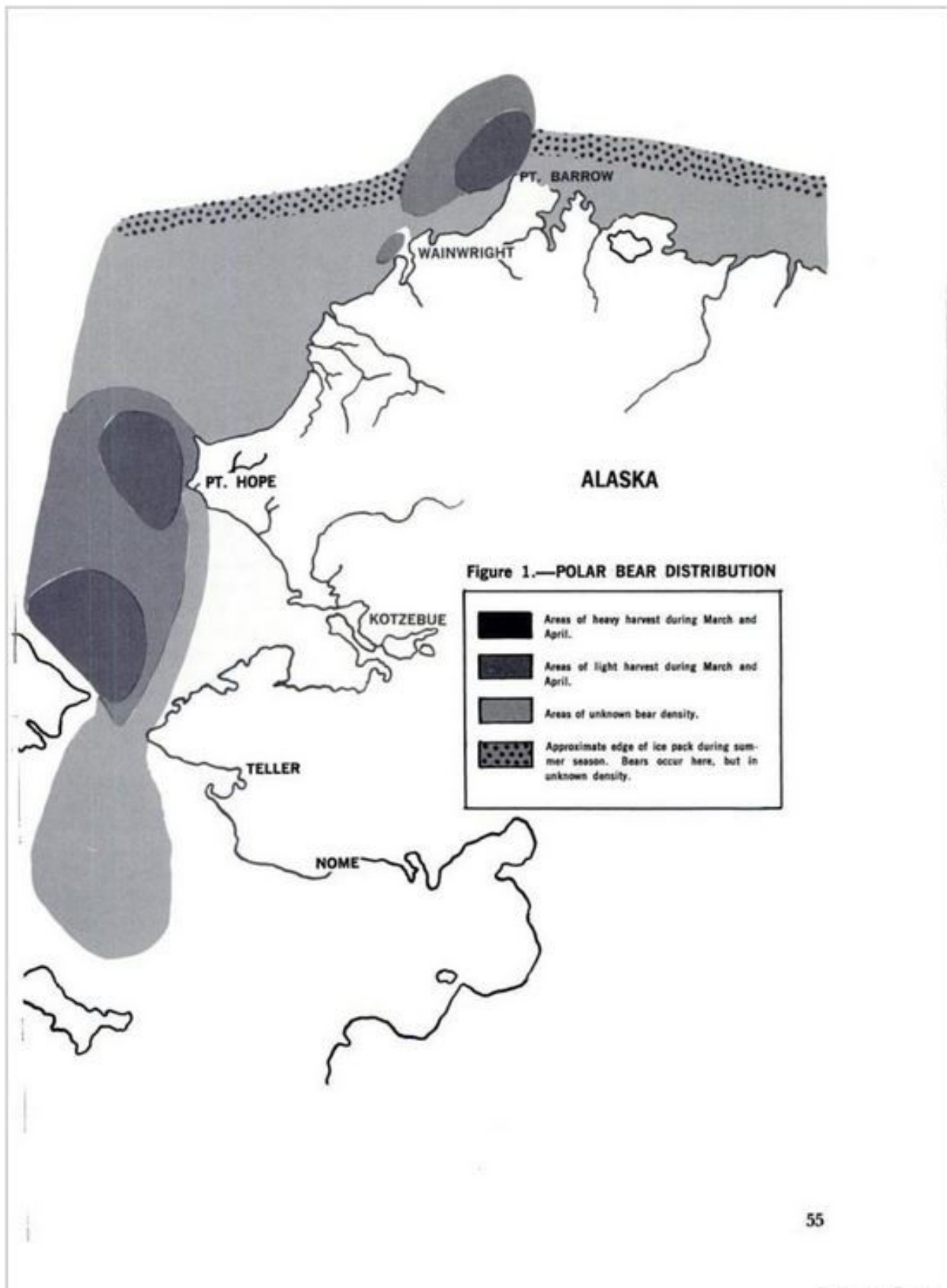
Specific recommendations regarding research include broadening investigations geographically and undertaking new studies to provide an adequate foundation for proper bear management. Close cooperation between countries is urged.

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CONCLUSIONS AND RECOMMENDATIONS

(submitted by the Delegation of the United States)

Conclusions

1. There is much concern throughout the world about the status of polar bear populations and about the methods used by hunters in taking this species.

2. Scientific data presented at the First International Scientific Meeting on the Polar Bear clearly indicate the need for an expanded and an accelerated research program on the polar bear to gather and analyze additional data on (a) population size and structure, (b) mortality, natural and from hunting, (c) movements and distribution, (d) productivity, and (e) related data.

3. Data presented indicate that polar bears may have increased locally during the past several years in some parts of their range. Movements of pack ice influence polar bear distribution and abundance, making it difficult to interpret available data or arrive at population estimates. Since the polar bear feeds largely on seals, it can in some areas and under some conditions compete with man for this resource.

4. Scientific data presented in the papers at this conference have made a great contribution to the storehouse of knowledge on this highly valuable international circumpolar resource. Available data indicate a lack of information on population size and structure, annual increments, mortality rates, movements and distribution, as well as relation of harvest to annual production.

Internal Recommendations

1. The delegates of the United States will recommend to their Government that the necessary resources and manpower be made available to assist in gathering these data.

2. The U.S. delegates will recommend to their Government that present methods of harvest and annual take be studied to determine whether additional restrictive measures are necessary for its nationals in international waters. Adequate harvest regulations cannot be formulated without data on a worldwide basis. The need for investigations by circumpolar nations will be emphasized.

General Recommendations

It is recommended by the delegates of the United States that—

1. An international scientific committee on the polar bear should be established with representatives of Canada, Denmark, Norway, Union of Soviet Socialist Republics, and the United States of America meeting regularly to discuss and analyze research and management data and to make further plans as necessary for the proper management of this valuable resource. The delegates of the United States will recommend to their Government the establishment of such a committee.

2. The nations of the Arctic conduct an expanded and an accelerated research program on the polar bear with emphasis on security data related to (a) population status, (b) mortality factors, (c) distribution and movements, and (d) productivity. Such data should be compiled at least annually and exchanged promptly, through the IUCN or other organizations. Every effort should be made to work cooperatively and to develop new research techniques, procedures, and methods as may be necessary to secure needed data. Consideration should be given to an exchange of scientists, upon invitation between Arctic nations in furtherance of gathering research and management data.

3. As an initial step toward a cooperative international effort, the delegates recommend the compilation of a comprehensive bibliography on the polar bear, the draft material supplied to the other nations by the United States and Norway to be used as the framework for this compilation. The U.S. Delegation offers to publish and distribute this under joint sponsorship.

Comments on Other Papers

Canada.—The U.S. delegates endorse the recommendations of the delegates of Canada with respect to future research plans and conservation measures.

Denmark.—The delegates of the United States endorse the recommendation of the delegate from

I.U.C.N. SUBMISSION

by C. R. Harington, Delegate from the International Union for the Conservation of Nature and Natural Resources

I have been authorized to represent the International Union for the Conservation of Nature and Natural Resources by the Secretary-General of that body, Sir Hugh Elliott. The organization is vitally interested in the progress of the First International Scientific Meeting on the Polar Bear and is receiving a record of the proceedings. Because of the I.U.C.N.'s long concern with the world status of the polar bear (as evidenced by the listing of that species in the I.U.C.N. "Red Data Book") and because of its serious concern for the future of the species, I urge that this truly international organization, with headquarters in Switzerland, be considered as the

clearing house for exchange of current information on international polar bear research and management. I suggest that the I.U.C.N. would be the ideal organization through which to publish a yearly international polar bear data sheet. This data sheet could include basic information on total kill, sex and age composition of kill, size of bears harvested, kill chronology, changes in polar bear legislation, in addition to brief notes on general progress on critical problems in research and management. The need for such a data sheet has been made obvious by delegates from the various nations at this conference.

SOME ASPECTS OF RESEARCH ON POLAR BEARS REQUIRED

by *John S. Tener,*
Technical Secretary

1. Fossil history is incompletely known (lowest priority).

2. Taxonomic review of adequate samples from the several populations. Morphometric, electrophoretic, and other techniques should be used to determine the taxonomic status of those populations. Results will have theoretical and practical importance.

3. Studies of morphology and physiology are needed to understand better the structure and function of organ systems, environmental adaptations, etc.

4. Studies of reproduction are necessary to better understand the species productivity. Conception, gestation, parturition, litter size, litter frequency, age of sexual maturity, all require investigation. Age specific reproductive rates are desirable.

5. Life history studies need continuation, particularly to determine age specific mortality rates and causal mechanisms involved (i.e., postweaning survival). Denning studies should be continued to determine the occurrence, nature and extent of a ice denning, the regularity with which females turn to the same dens in successive years, etc.

6. Ecological studies are required, and should include the assessment of the role of sea ice in bear life, as has been done by Vibe.

7. Assessment of bear populations is required in each country—their numbers, age and sex ratios, productivity and harvest relationships.

8. The distribution and movement of bears in each country require study to determine such factors as discreteness of populations, differential movements of population segments and origin of bears obtained on the high seas.

9. Adequate information on bear harvests in each country is required for a number of purposes: Population dynamics, movements, carcass studies, etc.

Techniques

In some cases, techniques must be developed to get the desired research data. Some are:

1. Devising aerial census methods giving results that have acceptable confidence limits.

2. Tagging and marking techniques require development: Experimentation with dyes, paints, tags, collars, radio telemetry, etc.

3. Better live capture methods are required to eliminate losses of bears and improve efficiency of capture.

4. Harvest methods should be examined to develop those which will ensure minimum disturbance of bear populations.

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