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PROGRESS IN POLAR BEAR RESEARCH AND CONSERVATION IN THE ARCTIC NATIONS

*By Thor Larsen**

The polar bear (*Ursus maritimus*) has always been an important game and fur animal for the indigenous people of the Arctic. More recently, and particularly after the second world war, the polar bear has also become an attractive object for sport hunters. Simultaneously, conservationists have become increasingly concerned with the protection of the big carnivore, which, because of its glamour and beauty, has become the symbol of the Arctic itself.

This article describes the developments in polar bear research and conservation efforts up to 1973, when an international agreement for the conservation of the species was signed by the five Arctic nations—Canada, Denmark, Norway, the Soviet Union and the United States—in Oslo, Norway.

Until a few decades ago, information about the biology and the ecology of the polar bear was rather fragmentary. Reliable information was scarce, and theories on the life history and biology of this mammal were often contradictory. Much information can be found in geographical descriptions and faunal summaries from the Arctic; Uspensky has given a valuable account of the most important polar bear literature up to the late sixties.¹

I. THE 1965 CONFERENCE

In 1965, the United States called an international conference on the polar bear in Fairbanks, Alaska. The conference, called the First International Scientific Meeting on the Polar Bear, gathered scientists and experts from Canada, Denmark, Norway, the USA, and the USSR. One of the major objectives of the conference was “. . . the establishment of a machinery to gather, evaluate, and distribute information for the future.”²

At the conference, biologists and decisionmakers involved in the management and conservation of polar bears discussed national research efforts and results, conservation measures, and hunting regulations. A summary of their reports is presented below.

At that time, the Canadian polar bear hunt was reserved for the northern native people, but there were few restrictions on hunting methods and means. The annual Canadian kill was approximately 600 bears, most of them taken in the Northwest Territories. The Canadian Wildlife Service initiated a polar bear project in 1961, the objective of which was to review the effectiveness of the protective legislation. Work included studies of taxonomy, den ecology, and various biological studies, for instance pathology, vitamin A studies, and reproductive studies. The Canadian Wildlife Service planned to continue their research and to increase their efforts in fields related to conservation and management of polar bears.

The Danish representative reported that only residents were allowed to hunt polar bears in Greenland. Cubs and females with cubs were protected in North and Northeast Greenland, where polar bear hunting was only permitted between 1st November and 31st May. Use of poison, foot-traps, set guns, and hunting from aircraft, were prohibited. About 100 bears were killed in Greenland annually. Most bears were taken in Northeast and Northwest Greenland. Apart from Alwin Pedersen's work³ and Vibe's studies on climatic fluctuations and their impact upon animal abundance in Greenland,⁴ little polar bear research had been done in that part of the Arctic. The Zoological Museum in Copenhagen collected polar bear skulls whenever possible.

The Norwegian polar bear hunting regulations prohibited the use of poison and foot-traps, and required a rifle-calibre of 6.5 mm or more. Sport hunters were limited to one bear each, and could not shoot cubs or females with cubs. But the traditional and much criticized set gun was still permitted. The set gun system (Norwegian: 'selvskudd') consisted of a wooden box mounted on four poles about 2½ feet above the ground. A rifle or a shotgun was mounted in the box and bait—a piece of blubber or meat—was placed before the muzzle and connected with the trigger by a metal string. When improperly mounted, the set gun might merely wound the bears, who would flee into the sea, and might not be found by the trappers when the set gun was checked hours or sometimes days later. The set gun cannot distinguish between single bears and females with cubs. When a mother bear is killed by the set gun, her cubs are either killed by other bears or starve to death. After the second world war, the sealers accounted for most of the Norwegian polar bear harvest. But beginning in the mid-fifties there was a gradual change, and a higher percentage of bears began to be taken by wintering trappers and weather station crews, who used the set gun

almost exclusively. Between 1945 and 1965 and annual Norwegian polar bear harvest averaged 324 bears.

In Norway, the Directorate of Fisheries has collected information about the annual polar bear harvest since 1924. Some investigations were made by Nansen,⁵ by Iversen,⁶ and by Lønø.⁷ But at this meeting the Norwegian delegation presented plans for a long-term polar bear project in Svalbard, to be carried out as a joint effort between the Norwegian Polar Institute and the University of Oslo.

Before 1948, Alaska had no significant regulations governing polar bear hunting. Bag limits were introduced in 1955, and cubs and females with cubs were protected in 1957 and 1959, respectively. Closed seasons were introduced in 1960, and sealing of hides, an identification system used to prevent poaching, was introduced in 1961. Before the mid-fifties, most bears were taken by resident natives, hunting from dog sledges along the coast in the early spring. From then on the polar bear trophy hunt developed in Alaska. Ski-equipped single engine light aircraft worked out from Teller, Kotzebue, Point Hope, and Barrow, and tracked bears in the ice pack. Usually two aircraft hunted together. When a bear was spotted, one plane with a hunter landed and shot it. The hide was brought back to the coast to be fleshed and tanned. Trophy hunters took increasing numbers of bears, while the Eskimos bagged only a few, as bears became scarcer close to the coast where they used to hunt. The steadily increasing interest in polar bear hunting was reflected in the number of killed bears, which rose from 152 to 292 between 1961 and 1965.

Through the Alaska Department of Fish and Game, the United States had an established research program on polar bears related to the management of the species. Reproductive tracts, teeth and other biological samples were collected from Alaskan polar bear hunters on a regular basis. Guides and hunters reported on bears observed. Size of bear hides and skulls, sex, and other data were recorded for each bear killed.⁸

In the USSR, the polar bear was already totally protected in 1956. Nevertheless, polar bear research had been conducted for many years in the Soviet Union. Work focused primarily upon evaluation of the number of bears, distribution, denning biology, parasitology, and studies of polar bears in captivity.⁹

It was evident from the discussions at the Fairbanks conference that much more information was necessary for proper management of the polar bear throughout the Arctic. Topics considered to be of particular importance were studies of population discreteness, the relative and absolute numbers of bears in various parts of the Arctic,

migratory patterns, studies of denning biology, reproduction and mortality factors, and food biology investigations. Pedersen's theory of a circumpolar migration of polar bears¹⁰ was much discussed, since the validity of such a theory would have important management implications, both nationally and internationally. If all bears belonged to one common stock, management and conservation measures had to be based on international agreements and recommendations. But if there were several stocks, with limited exchange of individual animals across the boundaries between them, necessary steps could be national or bilateral.

Population estimates were also presented and discussed. Soviet scientists put the world population of polar bears at not more than 8,000 animals,¹¹ while air counts by American biologists indicated a count of about 20,000.¹² A Canadian estimate was between the two, at well over 10,000 animals.¹³ The great variation between the estimates demonstrated above all the necessity for new and more reliable counts. The conference agreed that in order to obtain data and samples, it would be necessary to develop effective live capturing methods. An effort in this respect was made a few months prior to the conference, in March and April 1965, off Barrow. The Arctic Institute of North America sponsored a pilot study, in which two biologists searched the pack ice with two small fixed wing aircraft. Whenever a bear was spotted, they landed and tried to shoot it with a syringe gun and immobilizing drugs. It was difficult to land close enough and fast enough to use the short range syringe gun effectively. Pressure ridges and loose snow prevented the pursuit of bears on foot. No bears were captured.¹⁴ It was assumed that better results would be obtained by the combined use of a fixed wing aircraft and a helicopter, by searching the summer pack ice with icegoing vessels, or by capturing polar bears with foot traps. In addition, effective tagging and marking techniques and census methods had to be worked out.

It was further recommended that the International Union for the Conservation of Nature and Natural Resources (IUCN) should serve as a clearing house for future collaboration and exchange of information between polar bear workers.

II. DEVELOPMENTS FOLLOWING THE CONFERENCE

During 1966 new initiatives were taken in the capturing, handling and marking of polar bears. The Canadian Wildlife Service centered its work around the Cape Churchill area, and trapped four polar bears with foot snares.¹⁵ The foot snare is of simple construction.

Some big logs are placed in the shape of a V, at the bottom of which a wire rope loop is anchored to a very heavy log, a stone, a barrel filled with gravel, or other heavy object. A bait is placed behind the snare. When the bear puts its paw in the middle of the snare loop, a spring device is triggered, throwing and tightening the wire loop around the animal's leg. When thus restrained, bears were immobilized with drugs delivered by a syringe gun. Such traps had previously been successfully used on black bears (*Ursus americanus*)¹⁶ and grizzly bears (*Ursus horribilis*),¹⁷ and gave equally good results on polar bears. When the snares were properly mounted, and checked at daily intervals, bears were never harmed. The method was cheap, and required little manpower. Simultaneously with the Canadian efforts, polar bears were captured in the pack ice east of Svalbard in the Norwegian Arctic. Bears were chased by icegoing vessels and four were immobilized by means of a syringe gun. This method proved successful too.¹⁸

By 1967, the polar bear research programs expanded considerably in Canada, Norway, and the USA. In Canada, 20 individual bears had been marked, and trapping efforts continued; aerial surveys of polar bears, telemetry work, and other aspects were included in the research program.¹⁹ In Svalbard, Norwegian biologists performed monthly aerial bear observation surveys over the pack ice between March and October, and 51 bears were marked from ships during July and August. Blood, teeth, milk, and measurements were taken from captured bears. Physiological investigations were made on captured bears, kept in cages on board or ashore.²⁰ Data and samples were also collected by Norwegian polar bear hunters.

In the spring of 1967, the Alaska Department of Fish and Game captured bears using a fixed wing aircraft and a helicopter, and immobilized them from the air by means of a syringe gun. Thirty-one bears were successfully captured, marked and studied.²¹ Other investigations included aerial surveys and counts, age determination by tooth sectioning, and reproductive studies. Alaska biologists continued to collect samples and data from American polar bear hunters.

The research efforts soon yielded valuable information which could be used for management and conservation purposes. Marking and recovery data from many regions showed that polar bears were not circumpolar migrators, but rather belonged to several separate stocks. Individual bears could be found in the same general area from one year to another. Morphological investigations showed that there were distinct size differences between bears from various re-

gions. Bears from East Greenland and Svalbard were definitely smaller than those from Canada and Alaska.²² Craniometrical studies and marking/recovery results helped to define boundaries between separate populations. The scientists believed that there were at least five or six and probably more relatively separate populations of polar bears in the Arctic. Some of the populations crossed country borders, for example Greenland/Canada, Canada/Alaska, Alaska/USSR, and USSR/Svalbard, while others were confined to one country, for instance the USSR or Canada.

Recovery data also yielded information about harvest pressure in various regions, and could be used to estimate population sizes. Age composition analyses indicated changes in population status and composition as a result of harvest. Data were collected on the theoretical and practical reproductive capacity in polar bears. New information was obtained about the dependence of polar bears upon the ice conditions and the ice drift throughout the year, about food habits, and about other characteristics. But as research efforts increased, there was an accelerating interest in polar bear hunting throughout the world. In many regions local people, who had previously used polar bear hides for clothing and other items, found it more beneficial to sell them and use modern textiles instead. Sport hunting of polar bears developed in many parts of the Arctic. Modern rifles, motorized vehicles, and better field equipment, together with a rapidly rising demand and higher prices for polar bear hides, indicated an increasingly higher take in years to come. Canada was concerned about the increasing number of polar bears taken within its territory each year. In 1966-67, 710 bears were killed in Canada.²³ The number of hides sold annually had tripled between 1945 and 1966, and the total value had increased five times in the same period.²⁴ Because the Northwest Territories accounted for about 90% of the Canadian polar bear harvest, an annual hunting quota was introduced there in 1967.

In Norway too, the prices on polar bear hides increased markedly, stimulating the polar bear winter harvest in Svalbard. Because the set gun was still permitted, a weather station crew or a wintering trapper team could take close to 100 bears at the best stations, the record being 145 bears at Halvmåneøya in 1964/65.²⁵ Some found it worthwhile to leave a good job at home to spend a winter in Svalbard trapping polar bears. Some hunters started to use snowmobiles, thereby expanding their range considerably. By the late sixties, wintering trappers and weather station crews accounted for more than 60% of the total Norwegian polar bear harvest. The sum-

mer sport hunt developed rapidly during the sixties. In the summer, the sport hunters operated from icegoing vessels in the drift ice off Svalbard. The total Norwegian polar bear harvest averaged more than 300 bears annually.

In the United States there had been an almost total shift from hunting by local people using traditional hunting methods to trophy hunting. By the late sixties, most of the Alaskan polar bears were taken by trophy hunters working from the villages and settlements in Alaska by means of fixed wing aircraft. Between 1961 and 1966, the number of polar bears killed by hunters rose from 139 to 399. In 1966 airplane hunters accounted for 87% of the harvest. In an effort to reduce the hunting pressure, each licensed guide was allowed to take out only six hunters from 1967 onwards.

III. COOPERATIVE RESEARCH EFFORTS: THE POLAR BEAR SPECIALIST GROUP

With the many research activities now well under way, it was evident that international cooperation and coordination were required. In 1968 IUCN, which already served as an advisory body to many national and international institutions and agencies, invited polar bear scientists from the five Arctic nations to a meeting in Morges, Switzerland. Representatives from Canada, Norway, the USA, and the USSR met, but Denmark was unable to attend because of other urgent matters. The scientists reported on progress in research since 1965 and changes in management and conservation regulations. The participants agreed to standardize techniques and research methods, to exchange data and biological samples, and to cooperate on matters of bilateral or multilateral interest. It was recommended that research related to population discreteness (i.e., the study of the degree of exchange of individuals between separate populations) and population sizes, migration, reproduction and dynamics, be given high priority. To get a reasonable division of labour and avoid double work it was agreed that Alaskan scientists should work out age determination methods, Canada should focus on polar bear skull morphology and geographical variation, and Norway on blood analysis.

Shortly afterwards, IUCN established the Polar Bear Specialist Group, under the auspices of its Survival Service Commission. IUCN already had other specialist groups on other endangered species, collecting and disseminating data, planning and coordinating research, and forwarding their recommendations to IUCN and other agencies concerned. The governments of the five circumpolar coun-

tries were asked to nominate representatives to the polar bear group.

When the Polar Bear Specialist Group met in 1970, the delegates were able to report considerable progress. More than 450 bears had been captured and marked in Alaska, Canada and Svalbard, and there were several recoveries. On the basis of these data, which were compared with the results of the Canadian morphological investigations,²⁶ it was agreed that several relatively discrete populations of polar bears existed. Some of them belonged to at least two nations. The USSR probably shared a population with Norway in the west (Svalbard-Franz Josef Land-Novaya Zemlya) and with the US in the east (Wrangel Island-western Alaska). There were probably discrete populations in East Greenland, the Hudson Bay-James Bay area, the Canadian High Arctic-Northwest Greenland, and Canadian High Arctic-Eastern Alaska. New telemetry techniques were tested in North America, and infrared scanning equipment was used in the census of polar bears in the pack ice.²⁷

The group expressed its concern for the future of the polar bear, because of the increasing human activities in many parts of the Arctic. The group was particularly concerned about the rapidly developing oil industry and the transportation and construction connected therewith. Polar bears are vulnerable to disturbances, particularly in their denning areas, and the comprehensive activities connected with oil exploration and oil production might well have a detrimental effect upon the polar bear as well as on other Arctic fauna. They are also particularly vulnerable to pollutants. A massive oil spill in the high Arctic might easily deplete polar bear food resources, and toxic pollutants might accumulate through the food chain, resulting in intolerable levels in predatory species such as polar bears.

Heavy hunting in many areas would increase with the development of industrial activities, as more and more people obtained access to high Arctic areas. In 1970, more than 1,300 polar bears were taken throughout the Arctic. Scientists at the meeting expressed their concern that there might be an over-harvest in some areas, for instance Alaska and Svalbard. As polar bear females ovulate for the first time at the age of five or six years, thereafter producing one or two cubs every third year at the most, the growth in polar bear population is rather slow compared with other mammals. For the population to remain stable, less than 10 percent of the bears can be harvested each year, but the many recoveries of marked bears from some regions, together with analyses of harvest data, showed that actual harvest was sometimes much higher. Close to

20 percent of the population was harvested in some years in the Svalbard area.²⁸ When, therefore, the Soviet delegation proposed to set up an appeal that called for a drastic curtailment of polar bear harvests over a five year period, it was unanimously endorsed by the group. They all agreed that although important national steps had been taken to restrict polar bear hunting on a nationwide basis, such measures were not enough. The appeal was forwarded to the IUCN Executive Committee.²⁹

When the group met for the second time in 1972, the reports showed that polar bear research was well under way in all countries, except Denmark. But there was a realistic hope that Denmark would launch a three-year polar bear research program in 1973. Some 850 polar bears had been marked. The recoveries confirmed the previously defined discrete populations, although a few migrators indicated some exchange between populations. Canadian scientists suspected that there were several different polar bear populations in the Canadian Arctic alone. Different polar bear management zones, which more or less coincided with the boundaries of those populations, had been proposed. The Canadian Wildlife Service had expanded their polar bear research to include the High Arctic. The research program was closely linked with other institutions, and several biologists and graduate students in biology, ecology and physiology took part. There was also some progress in conservation. In Canada, polar bears had been totally protected in Newfoundland and along the Labrador coast. Several provinces had introduced sealing or identification systems of polar bear hides to prevent poaching.

Denmark was planning a huge national park in Northwest Greenland, between Scoresby Sound in the south and Hall Basin in the north. Covering more than 700,000 sq. km, the park would be the world's largest, and would give ample protection for the east Greenland polar bears and their habitat. Norway introduced new polar bear hunting regulations for Svalbard in 1970. The set gun was prohibited, cubs and females with cubs were protected, and a quota system was introduced. The quotas were to be steadily reduced over a three-year period. Sport hunting was prohibited in 1971. In 1972, Norway established three national parks and two large nature reserves in Svalbard, protecting all important polar bear denning areas and habitat in the archipelago. The Alaskan polar bear hunt, which was now regulated by quotas, was reduced from 350 in 1970 to 300 in 1971. The use of aircraft in polar bear hunting was also banned in Alaska after 1972. Soviet polar bear biologists had con-

centrated their field activities in Wrangel Island and the eastern Soviet Arctic, where they performed den surveys and bear counts. They had also initiated the capturing of polar bears on Wrangel Island for tagging and various studies. Female polar bears were immobilized by means of a syringe gun while still in their dens.³⁰

The scientists estimated the world's total polar bear kill to be 900 in 1971, a number which was acceptable from a conservation point of view. The number of bears killed was expected to become even smaller in some areas, for instance Alaska and Svalbard.³¹

The group gave considerable effort to the reviewing of a draft of an international convention on the polar bear, which had been prepared by IUCN. The delegates felt that they had no power to speak for their governments, but they reviewed the draft as professionals in order to advise IUCN on the topic. IUCN was requested to prepare another draft on the basis of the discussions, and to circulate it to the group members. After discussing the second draft with their respective authorities, the group reported the results at a short meeting in Banff, Canada, in September 1973.

After this meeting, Norway offered to be Depositary for an international agreement for the protection of the polar bear, to be based on the preparatory work by IUCN and its Polar Bear Specialist Group. The Norwegian Government called a conference for the preparation of such an agreement in Oslo, in November 1973. There the discussions were finalized and the agreement was signed by Canada, Denmark, Norway, and the USA. The USSR signed in early 1974.

IV. PROVISIONS OF THE AGREEMENT

According to this agreement, the taking of polar bears is prohibited by the contracting parties, i.e. the five Arctic nations, except: for *bona fide* scientific purposes; for conservation purposes; to prevent serious disturbance of the management of other living resources; by local people using traditional methods in the exercise of their traditional rights; or wherever polar bears have or might have been subject to taking by traditional means.

The skins and other items of value from bears taken for conservation purposes, or from nuisance bears, shall not be available for commercial purposes under the terms of the agreement.

Among other things, the agreement's Article 5 prohibits export, import, and traffic within the contracting nations of polar bears or polar bear parts and products taken in violation of the agreement. Article 7 requires the contracting parties to conduct national re-

search programs on polar bears, particularly relating to the conservation and management of the species. They are to coordinate such research and consult with other Parties on the management of migrating polar bear populations, and to exchange information on research and management programs, research results and data on bears taken.

With this agreement the polar bear has been granted an effective protection nationally as well as internationally, initially for a period of five years. The agreement will remain in force after that period, unless one of the parties requests its termination. The agreement requires that each party promote compliance with the agreement by states not parties to the agreement.

In 1973, when the other countries' polar bear research programs were well established, Denmark launched an ambitious research program on polar bears in Northeast Greenland. During a two-month expedition in April and May, large areas were surveyed with two fixed wing aircraft and with snowmobiles. The study included polar bear counts, migratory studies, den studies, studies of breeding biology, food habit studies, live capture, marking, and sampling. During this initial study, 24 bears were successfully captured and marked. The program was repeated in 1974, but this time a helicopter replaced one of the fixed wing aircraft. Forty-two bears were captured, marked, and studied. Eleven of the 24 bears marked the previous year were recovered by the team in the same general area, indicating a local and very small population. One female having two small cubs when captured in 1973, was recaptured in 1974 with four yearlings. She had adopted two cubs in addition to her own.³²

V. CONCLUSION

All Arctic countries have a definite need for continuation of polar bear studies. Up until now physiological and ethological aspects have had low priority in most polar bear programs. It is also necessary to study the incidence of toxic chemical components from industry and agriculture, such as polychlorinated hydrocarbons (PCB's) and heavy metals, which are already present in polar bear tissue throughout the Arctic, sometimes in surprisingly high concentrations.³³ Those nations which have polar bears within their jurisdictions will have to study the impact of the new protective measures upon the polar bear population. In five years' time, when the agreement is to be reviewed, new information must be available to the decisionmakers. Den studies and reproductive studies, as well as renewed population estimates, must have special attention. Al-

though the polar bear as a species is protected now, the scientists agree that it is important to give ample protection to its habitat as well. For that reason, the Polar Bear Specialist Group members are preparing a polar bear ecology map, which will show polar bear abundance in various areas at different times of the year, migratory routes, denning areas, feeding areas, etc. Such a map is difficult to make because quantitative information is not immediately comparable from one region to another, due to different census methods and investigation techniques. But, through their close contacts with colleagues in other countries, most of the polar bear workers have to a large extent joined forces in the field. This will undoubtedly facilitate the work and the efforts to standardize symbols and classifications.

The recent changes in the management and conservation of the polar bear throughout the Arctic provide an example of close cooperation between scientists and legislators. IUCN formed a good platform for this work by establishing the Polar Bear Specialist Group, where discussions and coordination took place. Many group members had close contact with legislators and politicians in their respective countries, which permitted effective and realistic approaches. Whenever the group met, their sessions were closed to everyone except members nominated by the participating nations. The discussions took place in an open and friendly atmosphere, where constructive criticism and free discussions were possible. The group itself was small, and many members were good friends who had worked together in the field and in the laboratories for many years. The dialogue between the polar bear specialists and the IUCN staff members proved to be very fruitful. After the Soviet delegation urged a drastic curtailment of the polar bear harvest throughout the Arctic in 1972, the group and IUCN together sought to find an acceptable practical solution for that demand. It was these efforts which resulted in the Oslo agreement previously mentioned.

The IUCN Polar Bear Specialist Group is still functioning. After the Oslo agreement, there has been a shift in priorities from conservation measures toward research goals. One of the things which receives particular attention now is the development of a computer simulation model for polar bears. Although the scientists for the time being do not expect a model to be very predictive for management and conservation purposes, they hope it will yield valuable information as to research needs and priorities, help standardize the collecting of data, and rationalize future international polar bear research.

FOOTNOTES

* Norsk Polarinstitut, Oslo, Norway.

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