

PROCEEDINGS OF THE FIRST
INTERNATIONAL SCIENTIFIC MEETING ON THE
POLAR BEAR

at Fairbanks, Alaska • 6-10 September 1965



U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF SPORT FISHERIES
AND WILDLIFE, and
THE UNIVERSITY OF ALASKA

The Department of the Interior, created in 1849, is a department of conservation, concerned with management, conservation, and development of the Nation's water, wildlife, fish, mineral, forest, and park and recreational resources. It has major responsibilities also for Indian and Territorial affairs.

As America's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States, now and in the future.

The University of Alaska, established in 1917 as a land-grant university, is unique among the institutions of higher learning in the United States in that it serves, within the scope of its resources, all of the public educational needs beyond high school of an entire State.

Through its academic colleges and research institutes the University conducts significant studies of the environment of the Far North, of Alaska's wealth of natural resources, and the ways in which these resources can be utilized and renewed.

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THE FIRST INTERNATIONAL
SCIENTIFIC MEETING ON THE
POLAR BEAR

Held at the University of Alaska

Fairbanks, Alaska, U.S.A.

6-10 September 1965

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Conferences, and Short Courses**



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FOREWORD

Scientists and conservationists from Canada, Denmark, Norway, the U.S.S.R., and the United States gathered at Fairbanks, Alaska, 6–10 September 1965, in the First International Scientific Meeting on the Polar Bear. The meeting was held “to permit scientists and conservationists from interested Arctic nations to meet to discuss the future of the magnificent polar bear which inhabits the Arctic Polar Basin and roams at will without regard to national boundaries.” The participants shared a feeling of responsibility for the preservation of Arctic animals and a concern about the sufficiency of scientific knowledge on which effective management of polar bears must depend.

The meeting was held on the campus of the University of Alaska, in connection with the university’s conference series. The University joined with the Bureau of Sport Fisheries and Wildlife, U.S. Department of the Interior, in hosting the conferees. Discussions began in the morning of 6 September and ended in the evening of 10 September. On the weekend after the formal meeting, a field trip was arranged for observing the fauna, flora, and natural wonders of Mount McKinley National Park.

The delegates agreed on several immediate measures to help preserve the polar bear; they reemphasized the necessity for intensive study to provide the knowledge essential to sound management; and they developed a number of suggestions for obtaining the data needed. This report on the international meeting contains the briefs presented by the delegations of the five participating nations, several associated submissions, and the statements and conclusions of the meeting. A list of the participants is appended.

JAMES A. SLATER,
Secretary General,
First International Meeting on the Polar Bear.

CONTENTS

	<i>Page</i>
FOREWORD, <i>by James A. Slater</i>	iii
AGENDA	vii
INTRODUCTORY REMARKS, <i>by C. Edward Carlson</i>	1
WELCOMING ADDRESS, <i>by William A. Egan</i>	2
WELCOMING ADDRESS, <i>by William R. Wood</i>	3
OPENING ADDRESS, <i>by E. L. Bartlett</i>	4
OBJECTIVES OF THE CONFERENCE, <i>by C. Edward Carlson</i>	7
PLAN OF WORK	8
CANADIAN WILDLIFE SERVICE BRIEF, <i>by the Delegation of Canada</i>	9
Summary	9
Canadian Wildlife Service brief	10
Current scientific knowledge and research programs	10
Evolution and history	10
Morphological adaptations and taxonomic relationships	10
Life history	11
Population	11
Distribution	11
Current research	11
Management activities	12
Exploitation	12
Reserves and sanctuaries	12
Value	12
Harvest limitations	12
Additional scientific information	12
Future research plans	13
Conservation measures	13
Report	13
Recommendations	13
Internal recommendations	13
Management	13
Research	13
International recommendations	13
Management	13
Research	15
THE POLAR BEAR IN GREENLAND, <i>by the Delegate of Denmark</i>	16
Summary	16
Preservation regulations	16
The polar bear in Greenland	17
Preservation regulations	17
Polar bear research	17
Conclusions and recommendations	25
Resolution	25

	<i>Page</i>
THE POLAR BEAR, NORWEGIAN HUNT AND MANAGEMENT, <i>by the Delegation of Norway</i>	26
Summary	26
The polar bear, Norwegian hunt and management	26
Introduction	26
Norwegian harvest	26
Hunt by sealing vessels	27
Hunt by wintering trappers, weather station crews, summer expedi- tions, and others	28
Regulations of the hunt	28
Discussion of harvest and abundance	29
Contributions to knowledge about the polar bears	29
Current research	30
References	30
Preliminary plans for a Norwegian polar bear research expedition to Kong Karls Land (Svalbard) 1967-68, <i>by Norsk Polarinstitut</i>	37
Organization of the expedition	37
Composition—Work	37
Working area	37
Planned schedule of activities	37
Conclusions and recommendations	38
THE POLAR BEAR: DISTRIBUTION AND STATUS OF STOCKS; PROBLEMS OF CONSERVATION AND RESEARCH, U.S.S.R., <i>by</i> <i>the Delegation of the Union of Soviet Socialist Republics</i>	39
Summary	39
The polar bear: Distribution and status of stocks; problems of conserva- tion and reseach, <i>by Ministry of Agriculture of the Union of Soviet Socialist</i> <i>Republics, Main Administration of Conservation, Sanctuaries, and Game</i>	39
Conclusions and recommendations	43
THE POLAR BEAR IN ALASKA, <i>by the Delegation of the United States</i>	44
Summary	44
The polar bear: A review of management and research activities in Alaska with recommendations for coordinated international studies	45
Introduction	45
Population size	45
Distribution	46
Value	46
Harvest	47
Hunting methods	47
Distribution of harvest by area	47
Distribution of harvest by time	48
Distribution of harvest by class of hunter	48
Composition of harvest	48
Population characteristics	49
Litter size	49
Population composition	49
Regulations	50
Research	51
Current research	51
General recommendations	51
Specific research recommendations	52
Summary	52
Partial bibliography	53

	<i>Page</i>
THE POLAR BEAR, ETC.—Continued	
Conclusions and recommendations	56
Conclusions	56
Internal recommendations	56
General recommendations	56
Comments on other papers	56
I.U.C.N. SUBMISSION, <i>by C. R. Harington</i> , Delegate from the International Union for the Conservation of Nature and Natural Resources	58
A PROPOSAL FOR RESEARCH ON THE ECOLOGY OF THE POLAR BEAR, <i>by the Arctic Institute of North America</i>	59
Summary	59
A proposal for research on the ecology of the polar bear	60
AMERICAN COMMITTEE FOR INTERNATIONAL WILDLIFE PROTECTION SUBMISSION	64
SOME ASPECTS OF RESEARCH ON POLAR BEARS REQUIRED, <i>by John S. Tener</i>	65
STATEMENT OF ACCORD approved by the Delegates	66
RESOLUTIONS APPROVED BY THE FIRST INTERNATIONAL SCIENTIFIC MEETING ON THE POLAR BEAR UNDER ITEM 12 OF THE AGENDA	67
FINAL LIST OF PARTICIPANTS AT THE FIRST INTERNATIONAL CONFERENCE ON THE POLAR BEAR	69
Officers of the meeting	69
National delegations	69
Canada	69
Denmark	69
Norway	69
Union of Soviet Socialist Republics	69
United States of America	70
International organizations	70
Arctic Institute of North America	70
International Union for the Conservation of Nature and Natural Resources	70
Observers	70
Secretariat	72

AGENDA

1. Introductions by C. Edward Carlson, Temporary Chairman.
2. Welcoming addresses by William A. Egan, Governor of Alaska, and William R. Wood, President of the University of Alaska.
3. Opening of the meeting by Senator E. L. Bartlett, Presidential Representative.
4. Election of permanent chairman.
5. Objectives of the meeting, by the Chairman.
6. Adoption of formal agenda.
7. Reports by each country and international organization and discussion of each report:
 - a. Status of current scientific knowledge of polar bears.
 - b. Inventory of management activities.
 - c. Description of research programs.
 - d. Additional scientific information desired.
 - e. Description of future research plans.
 - f. Identification of areas offering possibilities for international collaboration in research.
8. Need for additional conservation measures.
9. Summarization of salient points discussed during the meeting.
10. Discussion of the joint report:
 - a. Body.
 - b. Conclusions.
 - c. Recommendations.
11. Status of other arctic fauna (ungulates, birds, furbearers, marine mammals, and predators):
 - a. Presentation of data.
 - b. Discussion.
 - c. Recommendations.
12. Acknowledgments, announcements, and closing remarks.



Polar Bear

Photo courtesy U.S. Coast Guard

INTRODUCTORY REMARKS

by *C. Edward Carlson, U.S.A.*
Temporary Chairman

As temporary chairman, it is my personal and professional pleasure to open this conference of scientists representing five great Nations, the largest State of the United States of America (Alaska), and members of several organizations, all of whom are anxious to elucidate and share information basic to the conservation of a unique and valuable animal, the polar bear. In a few moments, you will be fittingly welcomed and addressed by several personages who have distinguished themselves in public life. For my own part, I take this occasion to greet you with all the warmth of my heart.

We want your visit to be both enjoyable and productive. Accordingly, do not hesitate to call upon me and my coworkers at any time should there be things we might do to accommodate you. Make yourselves at ease and know that you are in a friendly atmosphere.

We are now well along in the observance and work of the International Cooperation Year. As you will recall, the General Assembly of the United Nations unanimously passed a resolution on November 21, 1963, designating 1965—the twentieth anniversary of the United Nations—as International Cooperation Year. I take great pride in saying that my Government has taken this resolution seriously. For we do not regard ICY merely as a year of celebration, but also as one of constructive work.

It was President Johnson himself who set the tone for ICY in the United States when, on October 2 of last year, he signed a proclamation at the White House designating 1965 as ICY in the United States. At the same time, he called upon both the Government and private sectors to report to him at the end

of the year with recommendations as to how we can best improve international cooperation. I should like to think that this singular request for policy advice from a chief executive to an informed citizenry reflects well the democratic process as practiced in my country. The President called this “the assignment of the century.”

There are a number of committees already at work in response to the President’s invitation. They will report to him at a White House Conference on International Cooperation to be held from November 29 to December 1 of this year. We in the United States can only hope that others are also working hard to make this a banner year in international cooperation.

I should like to add that our meeting here today is international cooperation in its pure sense. In this conference, as in others, we may not always agree on the steps that are necessary to develop greater cooperation among nations, but in the final analysis our success lies in our meeting and reasoning together. This is the essence of cooperation.

My Government urges that the countries represented at this meeting make a special effort to improve those areas of existing cooperation and, even more importantly, to discover entirely new areas where we can work together to further the common aim of peace and prosperity for all mankind.

It is in that spirit, I am confident, that we are here convened. Certainly, so far as a new area of joint effort is concerned, we have a worthy one indeed. The polar bear and our other Arctic fauna will warrant this attention.

WELCOMING ADDRESS

by William A. Egan
Governor of Alaska

Senator Bartlett, Distinguished Delegates to this
First International Conference on the Polar
Bear:

It gives me great pleasure to welcome you to the
State of Alaska and to the University of Alaska. I
extend greetings from all Alaskans.

This is a highly significant occasion. Men of
science—men of goodwill—from five nations have
come here to consider the status of the polar bear
and discuss ways of perpetuating the world popula-
tion of this magnificent animal.

Alaskans are highly honored that you have chosen
to hold this historic conference in our State.

It is appropriate, I believe, that this conference
should be held here in Fairbanks. The University's
Arctic Research Laboratory has made significant
contributions to man's knowledge of the Arctic, and
Alaska is an air crossroads in this northern region of
the world.

You have come here because of your concern for
an animal which roams widely in this region. Alas-
kans—ever mindful that fish and game constitute
one of our greatest resources and must be perpetu-
ated—can understand and share this concern.

Because the polar bear knows no national bound-
ary and belongs to all the world, it is fitting that
this conference should be international in scope.
We who live in the Northern Regions and are repre-
sented here have a rare opportunity to demonstrate
to the world that solid achievement can result from
international cooperation.

This conference will result, I am sure, in an ex-
change of valuable scientific information which can
only lead to a wider knowledge of the widely roving
animal with which it is concerned. Without ex-
tensive knowledge, there can be no meaningful effort
to insure perpetuation of this species.

I am proud of the fact that the State of Alaska has
for some time been actively engaged in polar bear
research and am sure that representatives of the
Alaska Department of Fish and Game at this confer-
ence will make significant contributions.

For several years the Department has required
that all polar bear hides be sealed within 30 days
after the animals have been killed or before they are
shipped from the State. This year the Alaska Board
of Fish and Game—which establishes policy for fish
and game management—wrote a regulation requir-
ing that all polar bear skulls be brought in with the
hides.

Because of the sealing regulation, Alaska now has
records for several years on the sizes, locations, and
sex of all polar bears taken by hunters—and the new
skull regulation will make it possible to determine
more accurately the ages of animals harvested.
From this important information can be drawn a
number of conclusions concerning the bear popula-
tion as a whole, including indications of production
and mortality rates.

As I have mentioned, the data that have been
obtained by the State of Alaska will be made avail-
able here at this historic first conference on the polar
bear. These animals are a valuable resource and
we Alaskans are vitally interested in any program
aimed at perpetuating them.

In closing, I want to say again we have a great
opportunity here to demonstrate that great things
can be achieved through cooperation. Alaskans
have been greatly pleased to assist in a small way in
the arranging of this conference.

Again, on behalf of all Alaskans, I extend greet-
ings and best wishes for a productive conference.

WELCOMING ADDRESS

by William R. Wood

President of the University of Alaska

Mr. Chairman and Distinguished Delegates:

The University of Alaska is honored to be your host and to serve as the location for this conference of special international significance.

I hope that each of you will feel at home in our community, and that while you are here you will visit our research facilities and meet our faculty and students.

The bringing together of several nations in the polar regions of the world that share similar environments, problems, resources, and potentials for scientific and cultural exchange has long been an exciting dream of the University. Through the lively interest of the leaders of your countries—Canada, Denmark, Norway, and Russia—and through the initiative of our Departments of State and the Interior and Senator Bartlett, this dream is brightening into reality.

One must appreciate, of course, that along with the interest of the spokesmen of our respective countries there has had to be the strong interest of the persons most directly concerned with the status of our peripatetic polar bear. That is you, the scientists.

Let us take full advantage of this opportunity to explore an area of mutual interest to the circum-polar nations of the world and build from it many subsequent gatherings on other topics of mutual interest and concern.

Alaska, its public university, and the United States through its support of the University of

Alaska's research programs, have accepted this challenge to explore the great northland. Our studies of the Arctic and Subarctic span a distance of several thousand miles. They involve nine different research units dealing with physical, biological, and social sciences. The usefulness of the information we are gathering extends beyond the borders of Alaska and the United States, just as the research of your countries is providing results that extend beyond your borders—results which when combined with information of others become even more valuable.

Let us join inquiring minds as well as our hands and our hearts in a quiet yet determined onslaught against ignorance, misinformation, and misconception of environmental factors that obtain in the high latitudes of the earth.

Further, let us pledge our common strengths and our individual enthusiasms toward achieving the evolutionary utilization of the extraordinary natural and human resources of far northern regions.

Let this be done in a manner to provide the best possible benefits for the burgeoning populations of this world.

Let this be done with wisdom that comes from a full knowledge of the fundamental needs of men, cultural, social, and economic.

Let this be done in amity that stems from the understanding heart as well as from the understanding mind.

OPENING ADDRESS

by *E. L. Bartlett, U.S. Senate*

REPRESENTING THE
PRESIDENT OF THE UNITED STATES

I consider it a high honor to have been chosen to welcome representatives of Canada, Greenland, Norway, the Union of Soviet Socialist Republics, and the United States to this country and particularly to the University of Alaska here at Fairbanks, known so long and appropriately as the golden heart of Alaska. To the best of my knowledge, this meeting is unique. Nothing like it has ever been held before. From it can flow benefits of many kinds to those nations bordering the Arctic. I extend this welcome not only in the name of the citizens of Alaska, but also in the name of those unique citizens of the Arctic icepack, those stately and stateless animals, the polar bears.

The polar bear has a proud past, and a long one. The polar bear has been known in recorded history since early Roman times. And it may have existed in identical or similar form for countless thousands of years before then.

But we are not meeting here to marvel at the polar bear's past, his history or his vintage. We are here to compare, gather, and exchange information so that man can take steps to insure a future for this proud animal.

I have been concerned about the polar bear for some time, not because of any facts that we know, but because of the information which is not available. I suspect that your presence here indicates a similar concern, for you have come from around the polar world as proof of this common sentiment.

If, as some people fear, the polar bear is in danger of becoming extinct, the world will be less for the loss. Because the creature, man, is involved with all nature and all life, the death of any species would thus diminish mankind. We are all aware of the growing number of endangered and extinct species in recent decades. And I need not dwell on the eclipse of the passenger pigeon, the whooping crane, or the bison.

There is no need for me to discuss the reasons for the lack of information available about the polar

bear. You know this far better than I. However, I should like to speak for a few moments on what can be achieved at this significant conference and about the broader meaning of this meeting.

The minimum accomplishment in this week of talks will be a fruitful exchange of information. In the hours and days ahead, current scientific knowledge will be advanced, research programs will be described, inventories of management activities will be given, and future research plans will be defined. The maximum immediate outcome of this conference will be, we all hope, the establishment of machinery to gather, evaluate, and distribute information for the future.

The long-range accomplishment will hopefully result in international cooperation toward solving a problem of mutual concern. It is possible that those areas offering possibilities for international collaboration may be identified, and collaboration accomplished. Perhaps this might be the greatest result in this world, too often torn by and fraught with misunderstanding.

I am not going to suggest that any great international conflicts will be solved because five nations met and agreed on polar bears. I will suggest, though, that there is great hope for the future of the world if men from different nations are still concerned enough to sit down and discuss the future of an animal. There is something ennobling in this concept, something that speaks out in favor of man's concern for his environment. And at no other time in history has there been such a great need for this concern. Man's population is growing at a rapid rate, and with this expansion of man on his planet, beauty occasionally suffers and is diminished proportionately.

Henry David Thoreau put this concern most succinctly when he observed: "The perception of beauty is a moral test." And this conference, in its way, suggests a moral issue. No great civilization will stand or fall because of any concern for the polar

bear in and of itself. Greatness appears when man is able to share beauty and preserve nature in concert with his fellow man.

If man can still take the time to see and understand the dignity and magnificence and uniqueness of polar bears, there is a good chance that man will meet and pass the necessary moral test.

Finally, I believe it is important to note the relationship between science and government. Before governmental representatives can make intelligent policy and draft enlightened legislation, it is first necessary to gather information. This meeting was not convened to determine what actions should be taken to insure the continued protection of the polar

bear—we are here only to gather the available information in the hope that sound policy will appear in the future.

On a personal basis, I should like to express here the hope that this will be but a beginning, that other meetings on this and perhaps related subjects will follow, that we of the Arctic world will learn how to enjoy in every way and maintain forever these other living creatures which share this world with us.

In closing, I should like to again thank all of you for your participation in this international conference. I look forward to the sound conclusions and constructive recommendations I know will be reached.

Senator Bartlett Presented the Following Letter

THE WHITE HOUSE
WASHINGTON

August 24, 1965

DEAR BOB:

I am delighted that you will be able to convey my greetings on the opening of the First International Scientific Meeting on the Polar Bear. I am happy that the United States is host for this meeting, and I am hopeful that in the years ahead it will be possible to have similar discussions in numerous subjects of common concern.

Cooperation on polar scientific problems will be of benefit in many ways. It will provide a means of exchanging important data and information and a framework for coordinated action leading to the proper management and conservation of Arctic natural resources.

International cooperation, now being fostered world-wide by International Cooperation Year, has a value over and above the immediate results of this conference. Peace and the avoidance of world destruction are paramount and the problems of man the world over are indivisible. Anything that furthers man's ability to cooperate with his neighbor serves the cause of peace.

Clearly, this conference is exemplary in serving this cause. May your discussions regarding the polar bear provide another path to continued international cooperation.

Sincerely,

(S) LYNDON B. JOHNSON

HONORABLE E. L. BARTLETT
United States Senate

OBJECTIVES OF THE CONFERENCE

by C. Edward Carlson, U.S.A.
Permanent Chairman

I sincerely trust that the confidence in me as demonstrated by your vote will prove to be well founded. Please know of my personal thanks and that of my Government for having the honor to act as permanent chairman of the First International Scientific Meeting on the Polar Bear, *Ursus maritimus* Phipps 1774. I shall serve to the best of my ability to insure a cordial, illuminating atmosphere leading to the successful accomplishment of our conference objectives. Please be frank and prompt to advise me of any faltering or misdirection which, in your judgment, may impede the orderly and expeditious flow of work.

In his excellent and stirring presentation a few moments ago, Senator Bartlett capsuled the objectives of our purpose here when he stated: "I have been concerned about the polar bear for some time, not because of any facts that we know, but because of the information which is not available." In a speech to the U.S. Senate on April 1 of this year he further remarked: "I am informed that at the present time there are no accurate or reliable figures available on the total world polar bear population or on the size of the annual kill. Scientists know very little about the habits or habitat of the polar bear. They know very little about polar bear movements, reproduction, longevity, or population structure. They do not even know the answer to the basic question whether there is but one population of polar bears moving from nation to nation on the slowly revolving ice pack, or whether there are two or more populations." These are some of the questions which we must ventilate in the next several days.

Essentially, as scientists, we must put into the common pot those data which have been amassed over the years concerning population status, life history, habits, ecological relations, and habitat requirements of the polar bear. We must view these items in the light of what is missing and needed for intelligent conservation of the resource. I am using the word "conservation" as we define it in America to mean "wise use". This implies regulation or

harvest of surplus animals where and when such may exist, maintenance of adequate numbers to suffice esthetic and cultural values, and, by all means, the preservation of this creature in its rightful place as a part of the community of living things.

Then, gentlemen, we should discuss when, where, and by what process the loopholes in the available knowledge might be plugged. In this regard, we should consider both those contributions which might be made by the individual participants and, hopefully, the prospects for joint action on problems beyond the scope of a single nation or organization. I do not anticipate that any of us come prepared to commit our sponsors in the way of time, funds, or personnel, but I do believe that among the talent here assembled we can outline what we know, what we need to know, and what it will take to get that which is missing. Additionally, we should consider any other factors affecting the welfare of the polar bear and what can be done among the several governments to insure its future. By this I mean any recommendations for the enhancement of the species. We should put all this together into a report which we can jointly stand behind as our best thinking on the subject.

When we have completed our charge so far as *Ursus maritimus* is concerned, we should direct our attention to the status, research needs, and management requirements of other Arctic fauna including, but not necessarily limited to, reindeer and other ungulates, furbearers, upland game birds, waterfowl, and marine mammals.

As Stewart L. Udall, Secretary of the United States Department of the Interior, stated in his joint announcement (with Senator Bartlett) of this Conference, "It is in such forums that experts from many lands can discuss conservation problems of mutual concern and establish the foundations for future actions that can benefit all men."

With these few remarks, I will now proceed to the ground rules for the conduct of business and consideration of the formal agenda.

PLAN OF WORK

It is suggested that the meeting focus on the following objectives:

Inventory of current scientific knowledge of polar bears and current research programs.

It is hoped that the assembled scientists would be able to discuss and to compile, at least in summary form, existing information on—

1. History and evolution.
2. Morphological adaptations and taxonomic relationships.
3. Life history, e.g., reproduction and denning areas, seasonal cycles, movements, longevity, and sex ratios.
4. Population (former and present), characteristics, one or more populations, structure of each, and theoretical population.
5. Distribution (former and present), sex and age ratios, migration and movements, circum-polar or restricted.
6. Current research activities.

Inventory of management activities.

The meeting might compile information on—

1. Exploitation by native peoples, by others; hunting methods and techniques—use of aircraft, boats, vessels, dogs; distribution; size and composition of kill; and trends.
2. Location and extent of polar bear reserves and sanctuaries.
3. Value: economic (hides, skins, fur, flesh), scientific, cultural, other.
4. Limitations on the harvest.

Additional scientific information desired.

It is hoped that gaps in existing information can be identified and a consensus reached on additional research required, and on research priorities.

Inventory of future research plans and identification of areas offering possibilities for international collaboration in research.

It is hoped that governments can indicate plans for future research on polar bears and that these plans may be discussed, adjusted, and coordinated as may appear appropriate, and that concrete suggestions may be forthcoming for international collaboration in research, including exchange of data and scientific personnel, and future meetings of this type.

Need for additional conservation measures.

It is hoped that consideration can be given to need, if any, for additional conservation measures, among which might be additional harvest limitations, and additional reserves and sanctuaries, and that areas offering possibilities for intergovernmental collaboration in this regard will be identified.

Preparation of a report of the meeting.

It is hoped that a report for submission to governments, dealing with the items listed above and such others as may appear appropriate, can be prepared in draft form before the meeting adjourns.

Status of other Arctic fauna.

Upon completion of the above work concerning the polar bear, the status of other Arctic fauna will be analyzed. It is hoped that all meeting participants will bring data and be prepared to discuss the following subjects:

1. *Ungulates*—reindeer, musk ox, caribou, moose, and Dall sheep.
2. *Furbearers*—otter, beaver, mink, marten, fisher, and weasel.
3. *Marine mammals*—seals, sea otter, and walrus.
4. *Predators*—lynx, timber wolf, bear, and fox.
5. *Birds*—snow geese, brant, ptarmigan, and grouse.

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 there 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.

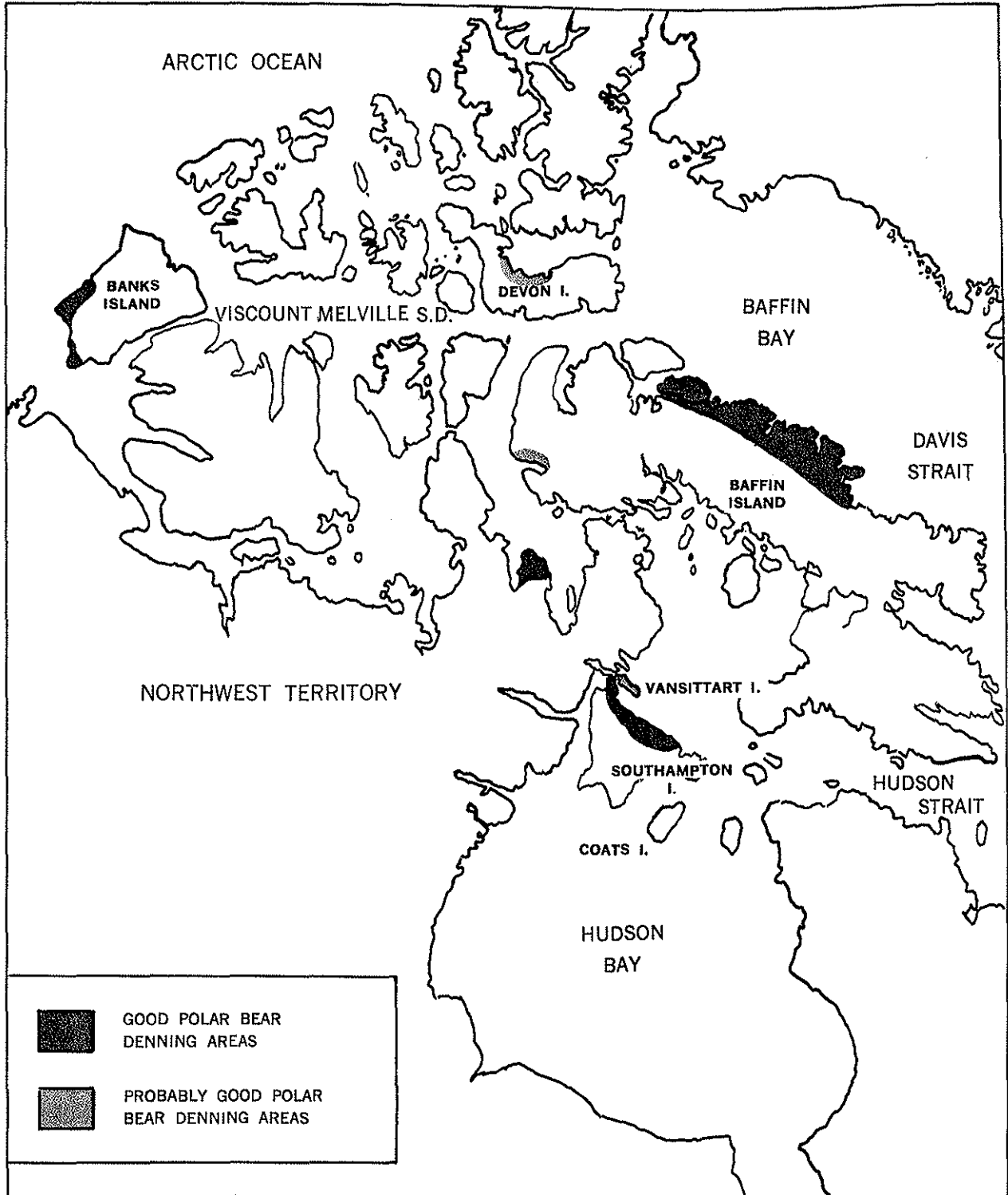
3. That the Bear Bay area of Devon Island be examined as a possibly common denning area for polar bears.

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



4. That legislation forbidding the killing of denned mothers in order to capture live cubs for scientific or display purposes be considered, particularly if a method of taking the young from their mothers in the water proves widely feasible (see Khuzin, *Priroda* 10, 1960). Reference: "Some Aspects of Research on Polar Bears Required," *Techniques* 3 [see p. 65].

RESEARCH

1. That 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. Reference: "The Polar Bear in Alaska," *General Recommendations* 2 [see p. 51].

2. That research be emphasized on the effect of variations in climate, sea ice conditions, snow cover on land, coastal topography, degree of open water, and ocean currents in relation to abundance of polar bears. References: "The Polar Bear in Alaska," *Research Recommendations* 5 [see p. 52]; "The Polar Bear in Greenland" [see p. 16 ff.].

3. That attempts be made to establish confident population estimates of polar bears on regional, national, and international levels.

4. That attempts be made to establish major patterns of polar bear population movement on regional, national, and international levels.

5. That thorough studies of polar bear reproductive biology and population limiting factors under natural conditions be carried out.

6. That an international polar bear meeting of this nature be held again in 1968.

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 (*Thalarctos 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 in 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 at 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 of 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 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.

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 walruses 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.

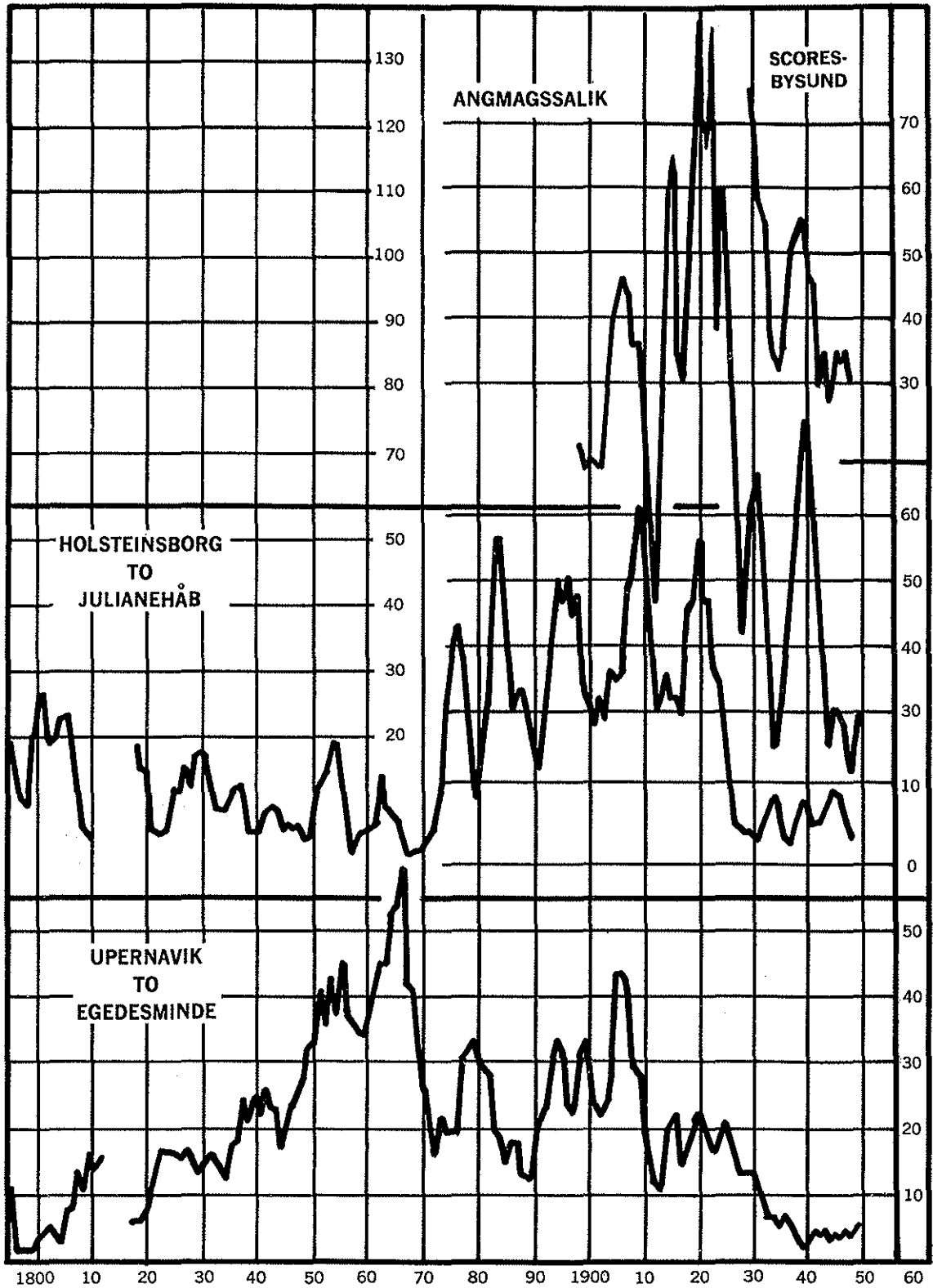
We will rarely have many polar bears simultaneously at Southwest Greenland and Northwest Greenland because mass penetrations of East Greenland ice do not coincide with mass penetrations of Baffin Bay ice—and the polar bear depends on these two masses of ice for transportation.

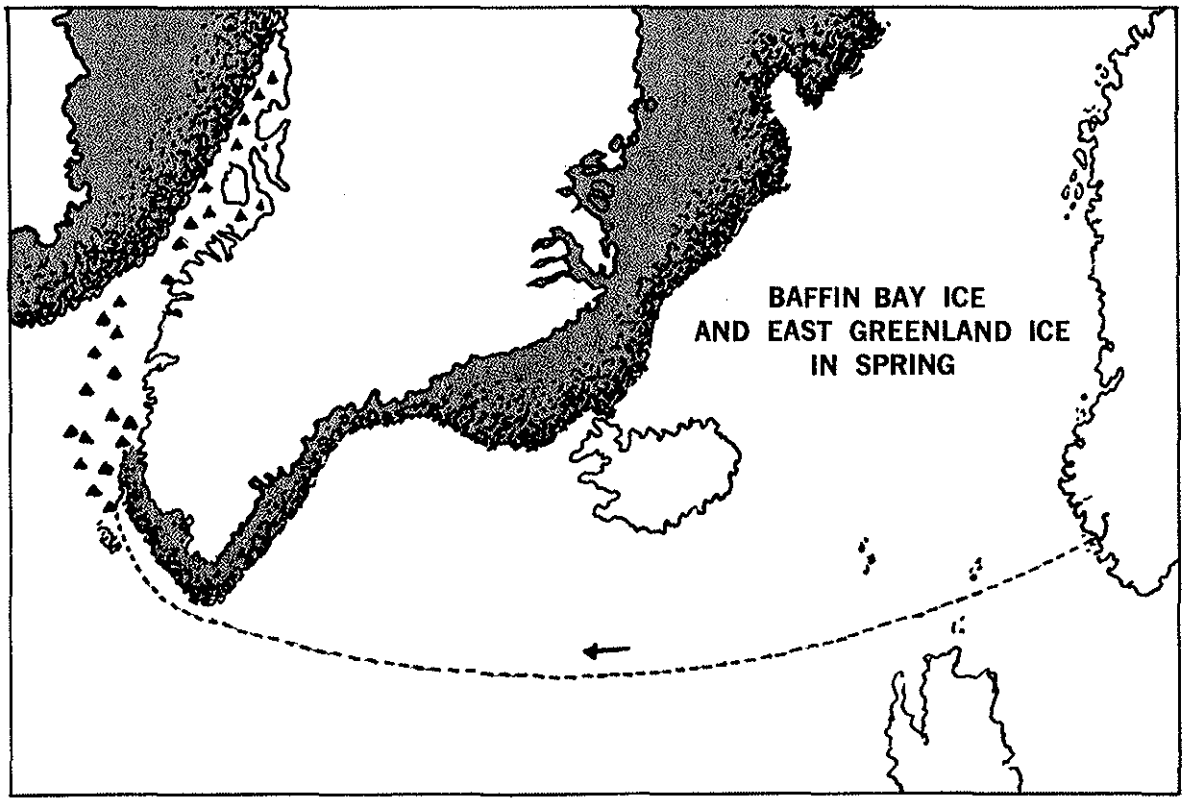
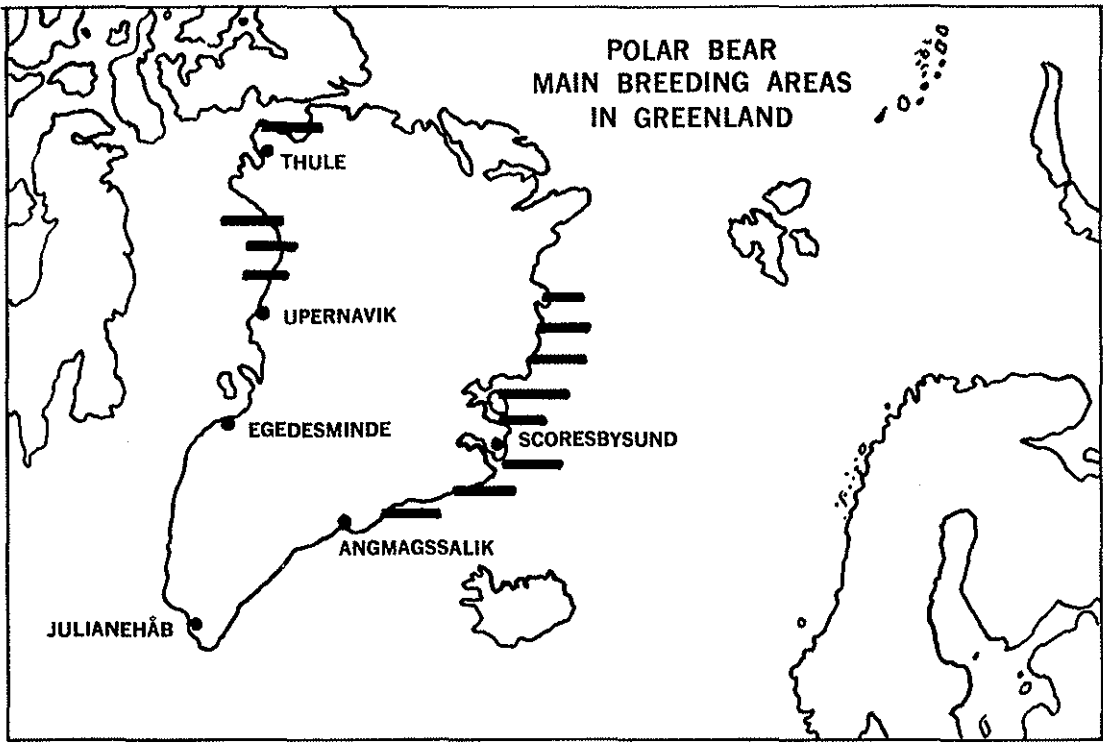
The polar bear curve for Southwest Greenland shows approximately 11-year maxima. A similar “rhythm” is found for the Greenland seal, the eider duck, and other animals dependent upon the drift ice.

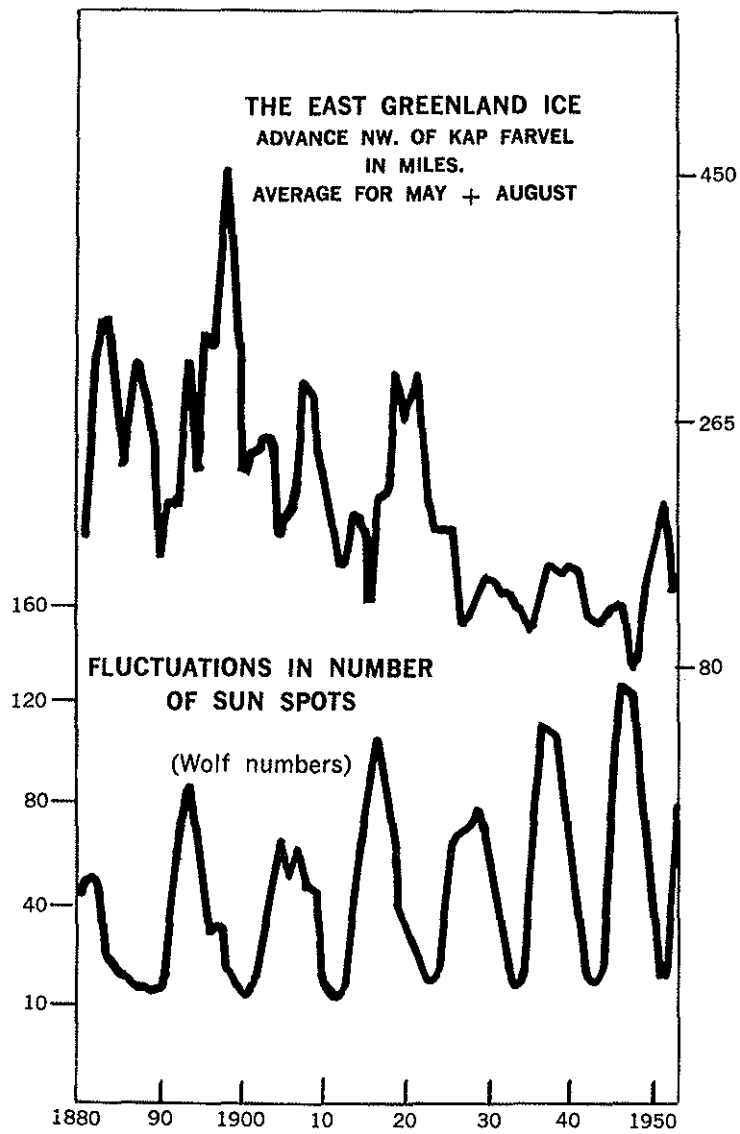
If we compare the sun-spot curve with the polar bear curve for Southwest Greenland for the period 1870–1930, during which the fluctuations are very evident, we find a great similarity between these two curves. The sun-spot curve hardly has a direct influence on the number of polar bears, but it may possibly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

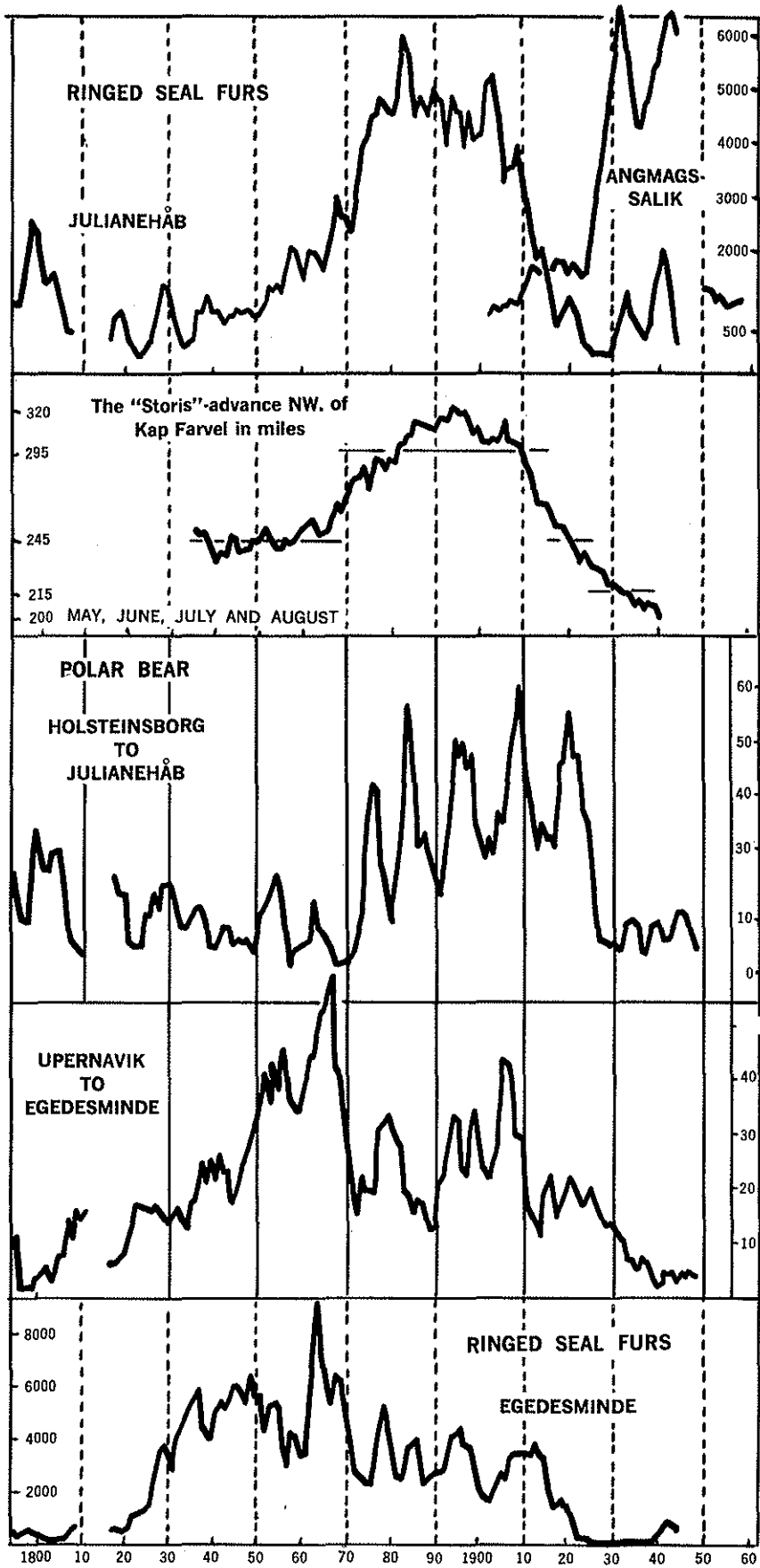
The climatic conditions of the present day on both sides of Greenland are too unstable for the country to hold any very great population of polar bear. Wintering and breeding in a den, the polar bear needs a constant Arctic climate without periods of thaw and melting of snow in the winter. Such conditions 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 SKINS









Occurrence of polar bears in Northwest Greenland (Upernavik to Egedesminde) and Southwest Greenland (Holsteinsborg to Julianehåb) seen in relation to ringed seals and drift-ice. Curves of bears and seals in 3-year sliding average. Curve of "Storis" in 31-year sliding average. (Polar bear curves need a small revision.)

Purchase of Polar Bear Furs in Greenland

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

Year	Northwest Greenland	Southwest Greenland	Angmags-salik	Scores-bysund	Year	Northwest Greenland	Southwest Greenland	Angmags-salik	Scores-bysund	Year	Northwest Greenland	Southwest Greenland	Angmags-salik	Scores-bysund	Year	Northwest Greenland	Southwest Greenland	Angmags-salik	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	...	...	...	...	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: Skematiske 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 Northeast 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 Polarinstitut, 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. Lønø 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	203
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

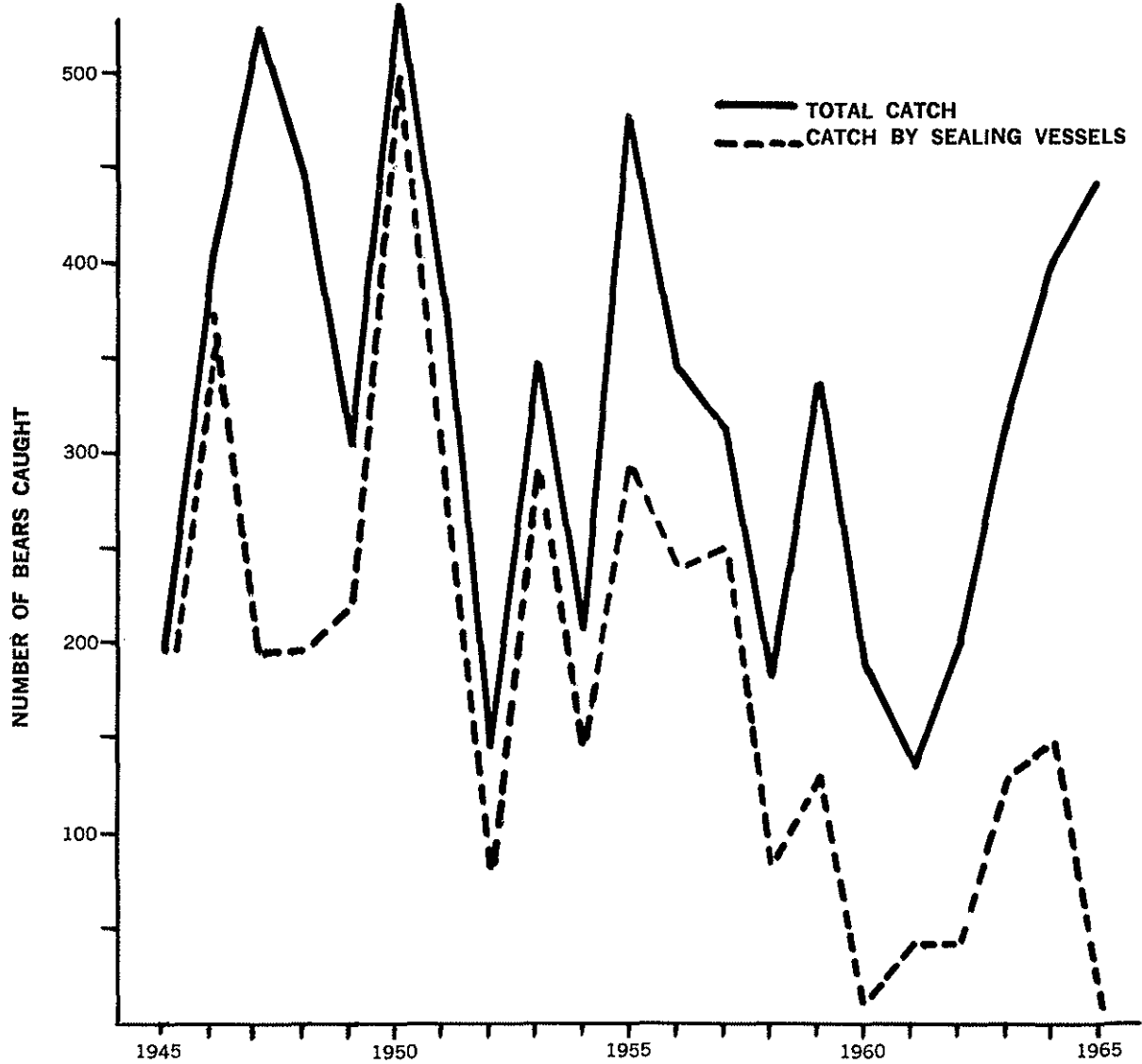


Figure 1.—TOTAL NORWEGIAN CATCH AND CATCH BY NORWEGIAN SEALING VESSELS OF POLAR BEARS IN ALL AREAS 1945-1965.

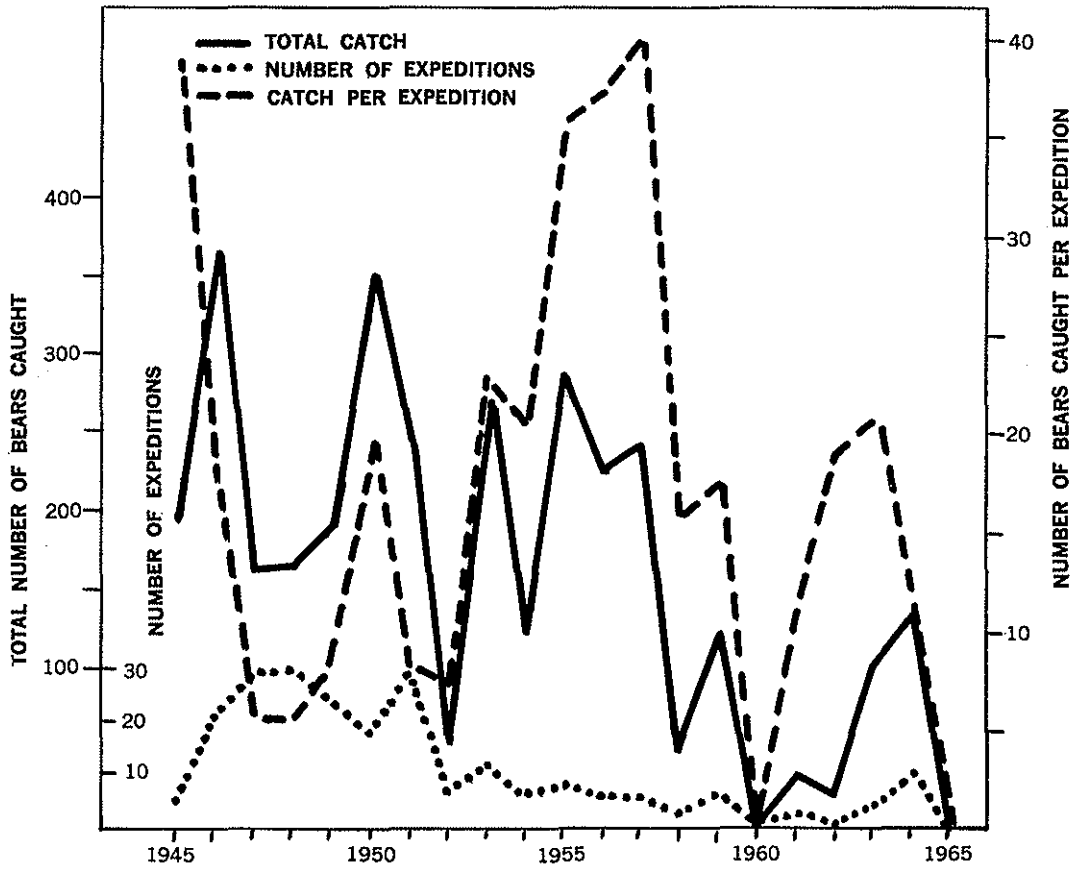


Figure 2.—CATCH OF POLAR BEARS BY NORWEGIAN SEALING VESSELS IN SVALBARD WATERS (NORDISEN) 1945-1964.

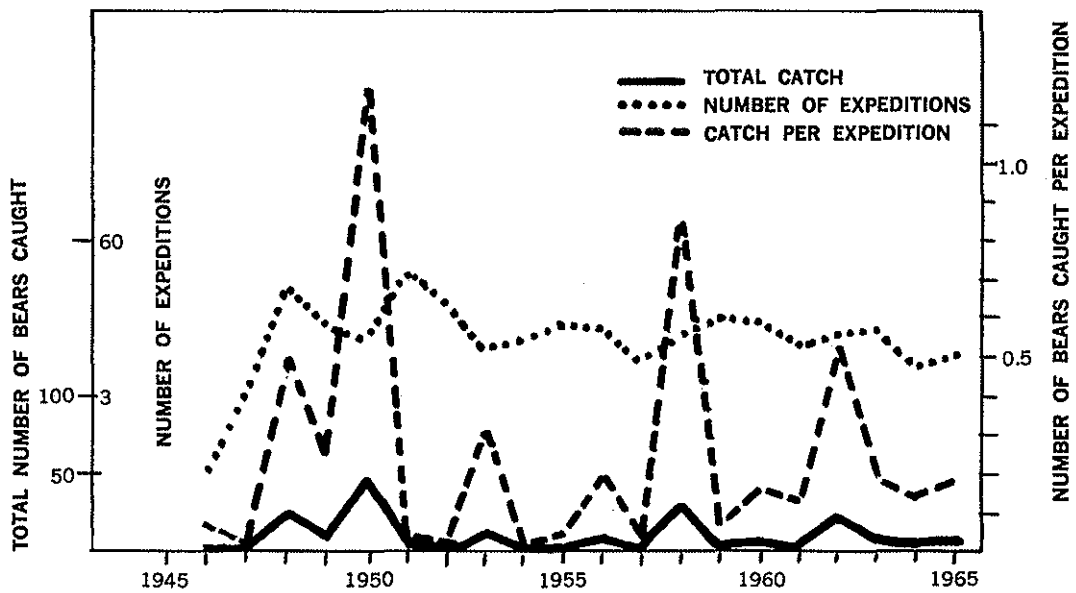


Figure 3.—CATCH OF POLAR BEARS BY NORWEGIAN SEALING VESSELS IN JAN MAYEN AREA (VESTERISEN, GREENLAND SEA) 1946-1965.

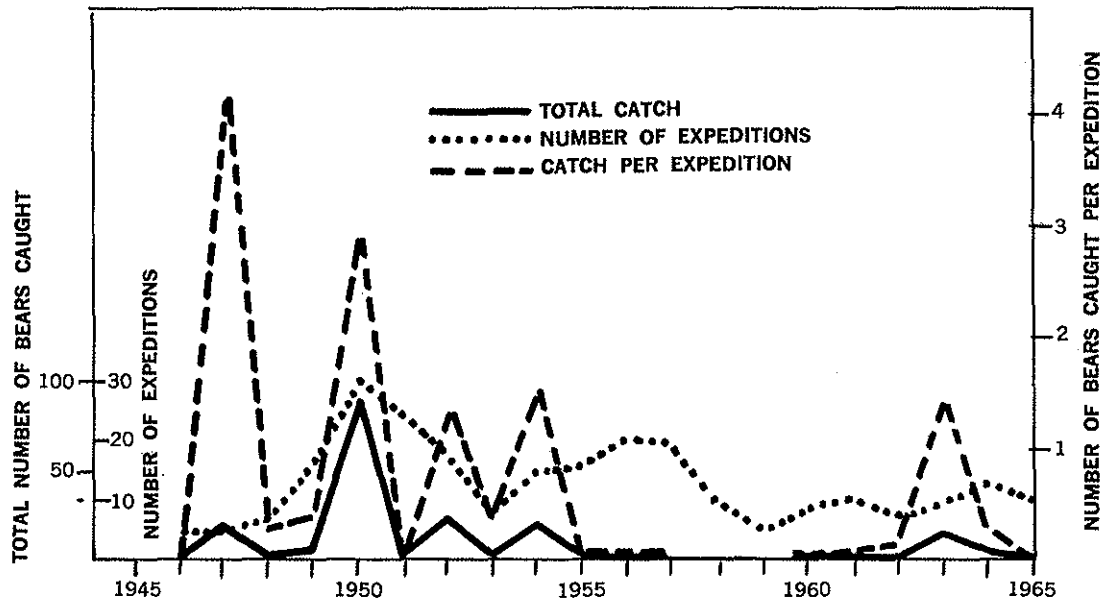


Figure 4.—CATCH OF POLAR BEARS BY NORWEGIAN SEALING VESSELS IN BARENTS SEA (ØSTISEN) 1946–1965.

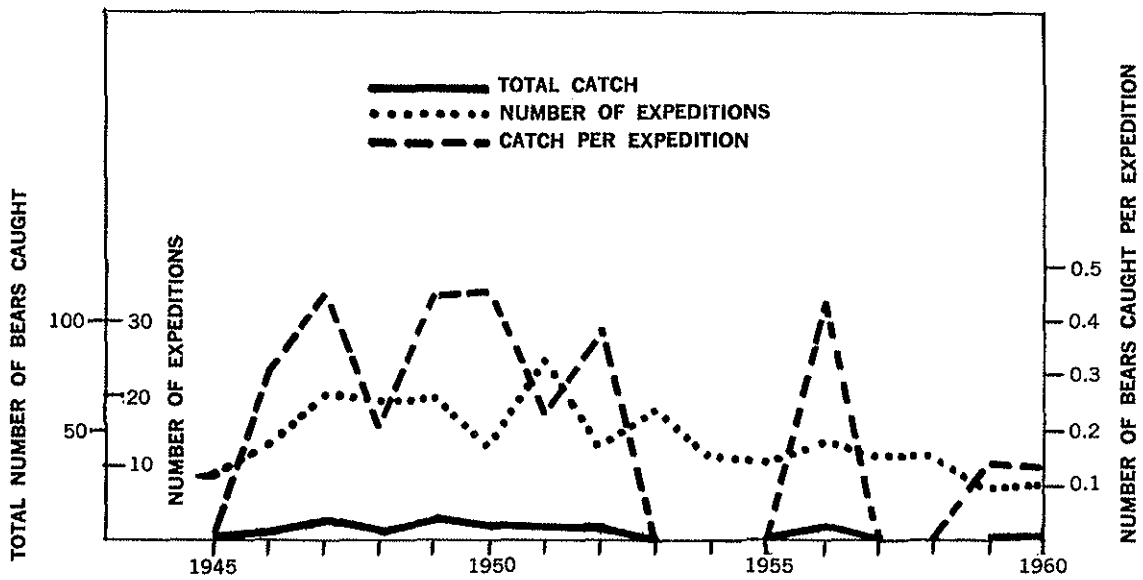


Figure 5.—CATCH OF POLAR BEARS BY NORWEGIAN SEALING VESSELS IN DENMARK STRAIT 1945–1960.

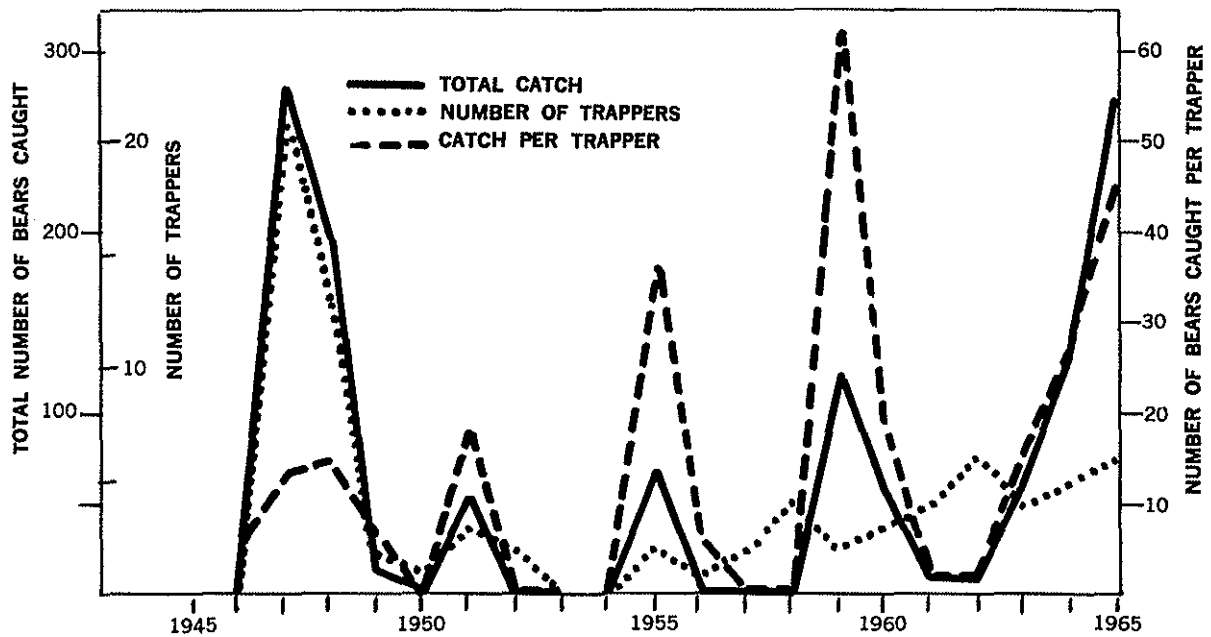


Figure 6.—CATCH OF POLAR BEARS BY TRAPPERS IN SVALBARD 1946–1965. DATA FOR 1946–1963, FROM LØNØ 1965.

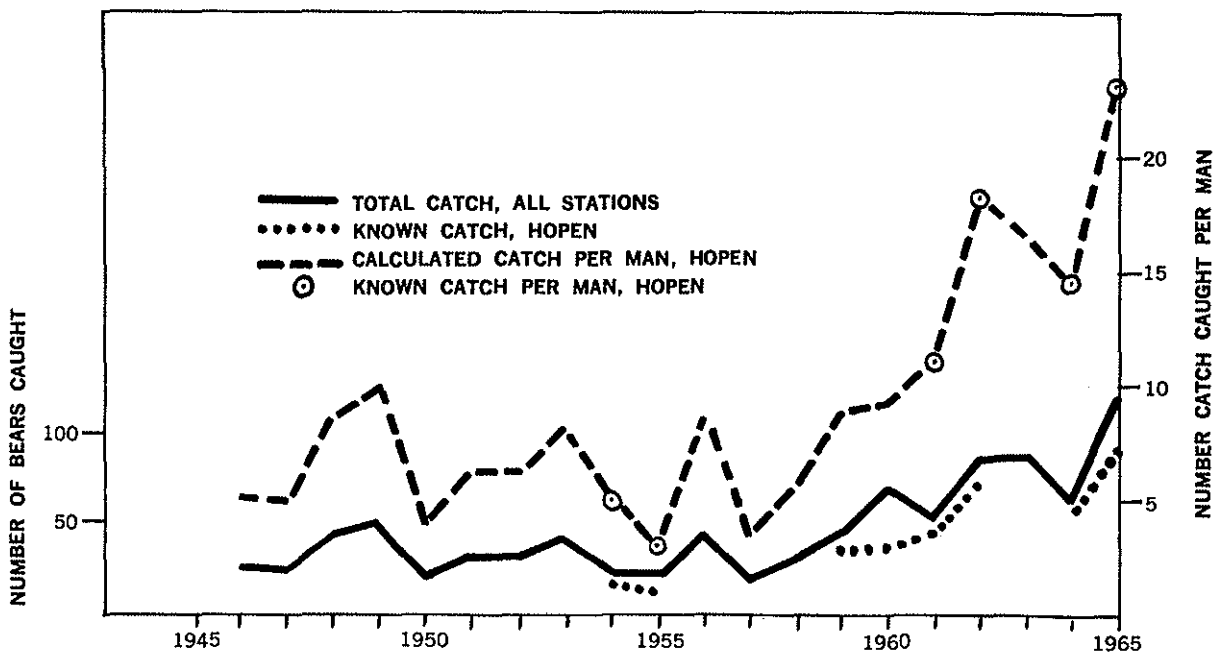


Figure 7.—CATCH OF POLAR BEARS ON NORWEGIAN METEOROLOGICAL STATIONS 1946–1965. DATA FOR TOTAL CATCH 1946–1963, FROM LØNØ 1965.

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

by *Norsk Polarinstitut*

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 Polarinstitut has been established.

Norsk Polarinstitut 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 Are 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

technique of aerial surveying of denning places needs further study.

The world's total polar bear population has decreased sharply over the past 50 or 60 years. This in our view has been a result of economic penetration of the North, an increase in harvesting, and the warming up of the Arctic. The spreading of diseases (including trichinosis) has apparently contributed to the decline.

It is important to note that the reduction of numbers has been observed equally in all arctic regions, without exception. The species reached its most serious decline in the midfifties.

Subsequently, the numbers of polar bears have become somewhat stabilized. Apparently, there has even been some increase (as indicated by a number of scientists).

In our view, this is primarily a result of polar bear conservation measures effected by the U.S.S.R.

Polar bear conservation in the U.S.S.R. has a long history. As far back as 1938 a decree issued by the Main Administration of the Northern Seas Route (Glavsevmorput) prohibited hunting bears from vessels and, except in cases of acute emergency, from arctic stations.

Beginning in the late forties and early fifties, hunting polar bears was outlawed in a number of regions. In 1955 the Council of Ministers of RSFSR issued a special act entitled "Measures of Arctic Animals Conservation," which prohibits polar bear hunting anywhere. This act provides that henceforth the only legal form of economic exploitation of the species in the U.S.S.R. shall be the capture of live cubs (by special licenses to be issued by the Main Administration of Game and Sanctuaries of the R.S.F.S.R.) for zoological parks.

Other measures of restoring polar bear stocks in the U.S.S.R. include the dispatch of several research expeditions and the establishment of a permanent sanctuary for polar bears on Vrangell Island, their main "maternity settlement" in the Soviet Arctic.

The efforts undertaken in the U.S.S.R., however, are far less effective than could be expected. This is due to the continued harvesting of bears in other Arctic regions. There is, in fact, no complete certainty that the status of polar bears in the world is satisfactory. Their fate remains a matter of concern, and the deletion of this species, in 1961, from the I.U.C.N. list of animals that are in danger of extinction seems to us premature.

There have been numerous attempts to estimate the present size of the population. Scott and others

(1959), on the basis of air surveys, estimated the total world population of polar bears at several thousand. Tentative estimates of our scientists (Uspenskiy, 1962, 1965), based on data on female denning places in the Soviet Arctic (about 500) and considering the ratio of pregnant sows to total number of bears (20 percent), place the world's polar bear numbers including all age and sex groups at not more than 8,000 individuals in the spring. By fall, because of the loss of cubs, the population is reduced. Considering the low fertility of the species, it is hardly possible to expect a speedy restoration of polar bear stocks under such circumstances.

The fate of the polar bear must be determined by all countries having possessions in the Arctic, and international efforts are needed for its effective conservation, complete prohibition, or at least a sharp limitation of bear harvesting over the entire range of the animal.

It is obviously necessary to expand research of the species over its entire range (conducted by each nation having possessions in the Arctic on its own territory), to coordinate these studies and to establish a regular exchange of comprehensive information on research results.

One of the main objectives of this international meeting is in our view the development of a specific program of work directed to this end.

On our part, we propose the following:

1. In view of the fact that the polar bear is found on the territory of several countries, and that its members 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, to prohibit the harvesting of this species for a period of 5 years, beginning January 1966, and subsequently to limit it.
2. 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.
3. 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.

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	1	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 purposes 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 cubs 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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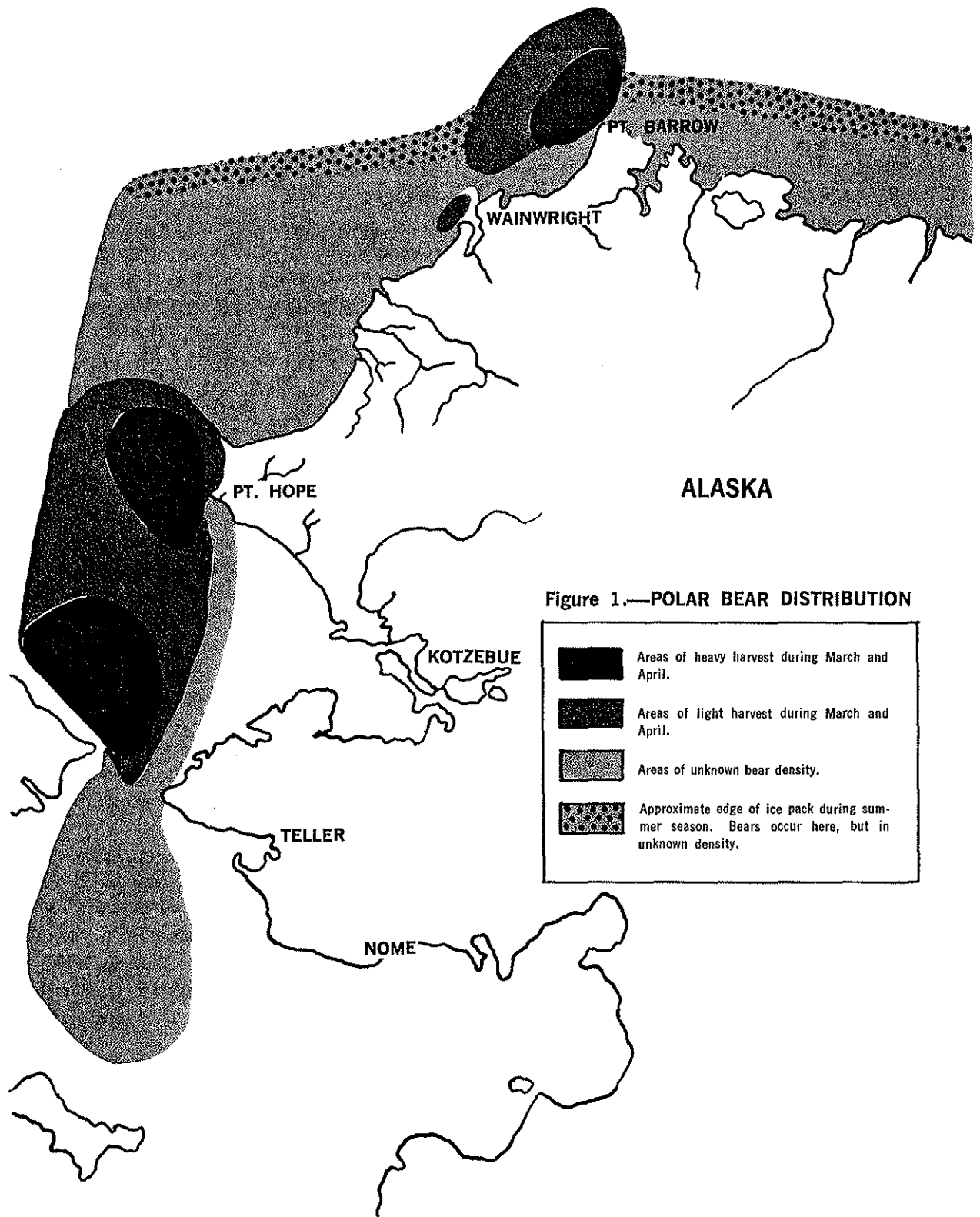
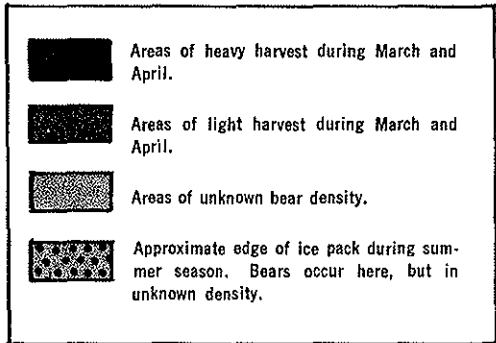


Figure 1.—POLAR BEAR DISTRIBUTION



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

Denmark relating to the need for studies of all Arctic birds and mammals in relation to climatic factors.

Norway.—The delegates of the United States endorse the recommendations of the delegates of Norway with respect to the need for research and management of this valuable resource.

U.S.S.R.—The delegates of the United States greatly appreciate the data presented by the delegates from the U.S.S.R. and would be happy to organize a national group within the United States for a cooperative study of the polar bear.

The delegates of the United States appreciate the recommendations of the U.S.S.R. that there be a

5-year worldwide closure on the harvest of the polar bear and that there also be a limit established on polar bear harvests each year from 1971 on—such limits to include the live catch. The delegates of the United States will be happy to refer this request to their Government for its consideration. On the basis of present scientific information it appears unnecessary to sustain a closure for a specified number of years. If data obtained through the recommended research program should indicate a need for such a closure, this matter would be brought to the attention of our Government at once and referred to the international committee. Until such time, the harvest should be conservative.

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.

A PROPOSAL FOR RESEARCH ON THE ECOLOGY OF THE POLAR BEAR

by the Arctic Institute of North America

SUMMARY

The Arctic Institute of North America, a private scientific organization, has been concerned for the past 20 years with research in the Arctic and the dissemination of scientific information concerning the Arctic. For several years methods for international circumpolar studies of the polar bear have been under discussion and the proposal submitted is the result of these discussions. The purpose of presenting it is to provide a basis for discussion and to inform all delegates that the Arctic Institute is interested in accepting a role of international coordination, dissemination of information, and participation in certain circumpolar aspects of the research work.

The proposal suggests that teams of biologists be sent to the Arctic by each country to mark bears with ear tags or other appropriate permanent markings. Bears would also be marked with dye to permit local observation. It is hoped that about 500 bears could be marked over a period of 3 or 4 years. The data from these marked bears should be collected from reports of hunters and could be used to determine the polar bears' movements throughout the Arctic.

Recent developments in telemetry indicate that it might be possible to attach a radio transmitter to a number of bears in each country and to follow the movement by readouts from a polar orbiting satellite. This would give a continuous surveillance of up to 40 bears over the entire Arctic Basin.

Since this program would require the capture of a large number of bears on a circumpolar basis, every effort should be made to learn as much about the bears as possible. Complete information should be taken on each bear, including blood samples. Each bear should be studied locally as long as it remains within range.

A study of the size and complexity of this one is beyond the capability of any one group. It is suggested that the Arctic Institute of North America be active in the overall coordination of the project. Dr. Vagn Flyger and Dr. Martin Schein are interested in engaging in the project. In addition to the coordination activities, they could develop capture and marking techniques which might be used by biologists from other countries.

It is hoped that this project would provide opportunities for many graduate students to work on advanced degrees. Frequent exchange of scientists would be desirable.

By using an extensive and multidisciplinary approach such as this plan envisages, it will be possible to learn not only much worthwhile information about the physiology, pathology, and behavior of polar bears but to gain appreciable insight into their movement patterns and life cycle as well. On the basis of this latter information, it would then be possible to establish sound wildlife management procedures to ensure a continuing healthy population of the animals.

A PROPOSAL FOR RESEARCH ON THE ECOLOGY OF THE POLAR BEAR

The Arctic Institute over the past 20 years has dedicated its energies and resources to increase man's knowledge of the Arctic and sub-Arctic regions of North America through the sponsorship of research and the dissemination of scientific information. The Institute is active in Canada and the United States and maintains close contact with Greenland. Contact is maintained with Arctic institutes of all countries.

It is appropriate that the Arctic Institute take an interest in the future of the polar bear. For several years, consideration has been given to methods for conducting a circumpolar study of the polar bear. A modest beginning was made in the spring of 1965 when Professor Martin Schein of the Pennsylvania State University and Mr. Theo Larsen, University of Oslo, went to the Arctic Research Laboratory at Point Barrow to test capture techniques. This study was made possible by a contractual arrangement with the Office of Naval Research.

The suggestions contained in this proposal are submitted as a basis for discussion. The Arctic Institute might appropriately be given a role in the international studies in helping with the coordination of plans, assisting in making arrangements for exchange of scientists, and disseminating results of research.

Polar bears, the world's largest carnivores, move about over the frozen Arctic Ocean and its adjacent land areas. Because they wander over the ice and the open sea in a habitat which is inhospitable to man, they have escaped intensive hunting and study until quite recently. In the past few years, the harvesting of polar bears has increased markedly because of the improved means of access to the Arctic, and the possibility has developed that the species could be exterminated by this increased harvest. Without a knowledge of polar bear population dynamics and movements, these animals cannot be effectively managed and their numbers maintained.

The Arctic regions of the world present but a slight barrier to modern systems of travel and communication. Sportsmen are able to reach the Arctic in a short time in relative comfort. Such sportsmen fly out from Alaska in small planes and hunt polar bears on the Arctic sea ice. Other

hunters sail from Norway to the area around Spitsbergen and hunt the bears from the decks of ships. In addition, modern firearms in the hands of Eskimos, Indians, and visitors to the Arctic now make it easier to shoot the bears than was possible in the past. Polar bears have become, therefore, easily hunted animals, yet we know little about their ecology. It is conceivable that the species could be exterminated if the animal kill should exceed the reproductive rate.

Polar bears appear to occur throughout the Arctic and move about without regard to national boundaries. However, we do not know if they have a definite home range, as do other mammals, or whether they move at random throughout the region. An understanding of the movement patterns of polar bears is essential to the proper management of the species. Ten years ago it would have been difficult to study their movement patterns, but modern techniques and equipment make it possible to study and learn, with relative ease, how the bears move about over their range.

No study of the movement of polar bears could be undertaken without the cooperation of all the countries bordering the Arctic. The Antarctic Treaty has already demonstrated that countries can work together for scientific purposes and perhaps this spirit of cooperation can be demonstrated in the Arctic also.

It is suggested that teams of four men each be sent to Arctic areas which are known to have concentrations of polar bears. The purpose of these teams would be to mark a large number of bears with ear tags and possibly tattoos. Some of the bears could also be marked with dyes so that their movements could be followed more closely. The teams might be deployed as follows:

Team No. 1—To work out of Kotzebue and Point Barrow, Alaska.

Team No. 2—To work along the shore of Hudson Bay and inland.

Team No. 3—To work in the Canadian archipelago.

Team No. 4—To work in Greenland.

Team No. 5—To work in Spitsbergen.

Team No. 6—To work in Franz Josef Land.

Team No. 7—To work in Wrangel Island.

Each team should consist of biologists and technicians. They would work mostly during the

summer months but, for some aspects of this study, an effort might be made to capture bears during the winter near the denning areas. The biologists should be men with training and experience in working with large mammals. It is hoped that there would be a significant interchange between the teams so that personnel from several countries could work together and exchange information. The polar bears might be located from airplanes and, in the case of Spitsbergen, from ships. When a bear has been spotted, it could be approached by one of the biologists, carrying a drug-filled syringe gun, who could shoot the bear and immobilize it. The technician would serve to guard the man with the syringe gun against an attack by the bear and, after the bear has been immobilized, both men would work together to mark the animal, make measurements, and collect blood specimens.

Each team should be furnished with two syringe guns and syringes with drugs, plus four rifles. In this way each team could split into two units and hunt bears separately when the local logistic capability permits. The teams would require transportation, either boat or airplane, to get close to the polar bears. Those men using airplanes should work from a combination laboratory and office where they can work on notes and data, mix drugs, handle specimens, repair and assemble equipment, and store gear. Those men working from ships could do all this in a cabin. Sleeping and eating facilities would also be required and the men wintering-over would need motorized snow sleds for getting themselves and the equipment out to the bears.

Bears that are captured should be marked with a numbered ear tag and some of them also might be marked on the hindquarters with a dye, Nyanzol A (Flyger, 1959). In addition, measurements of length, size of paw, length of ear, girth, and condition of teeth could be made. When possible the entire animal should be weighed. Blood samples should be taken for measurement of iron 55. A few animals would be killed unintentionally by an overdose of drugs or in self-defense. These animals should not be wasted but might be utilized for intensive studies on parasitism, reproduction, content of strontium 90 in bones, and the presence of DDT and viral diseases. Instructions on the ear tags could tell whoever finds the bear at a later date (a hunter or trapper) to send the tag to the Polar Institute of his country. The instructions should be printed in English, Russian, and Norwegian and offer a reward to the finder. Upon

receipt of the tag, the Institute should contact the sender and ask for data on where and when the animal was shot. These data should all be forwarded to one of the Arctic institutes and copies should be exchanged with all the other Arctic institutes. Those bears marked with dye might be followed by ships or airplanes in order to keep track of their movements from day to day.

It is hoped that about 500 bears could be marked over a period of 3 or 4 years. The data from these marked bears could be used to determine the movements of polar bears throughout the Arctic and should demonstrate whether or not there are discrete populations of these bears. There is evidence, for example, that a discrete population of bears may exist along the shores of Hudson Bay. The data could also be used to determine the age composition of the polar bear population as well as a trap-recapture ratio for the estimation of bear numbers.

Recent developments in animal telemetry have permitted biologists to learn much about wild animals. Small radio transmitters attached to mammals can be tracked from receiving stations and be used to study the movements of these animals. This would be an ideal way to study the movements of polar bears, but radio transmitters do not transmit data very far beyond the horizon. Furthermore, in order to keep track of constantly moving bears, it would be necessary to have a man constantly following a bear. This would be impossible, but the bears could still be tracked if the signals from the transmitter were sent to a polar orbiting satellite. Such a satellite, when equipped with a 2-pound receiver, could receive and relay signals from polar bears every time the satellite passes over the area above the polar ice pack. Such a receiver could keep track of 40 polar bears and would transmit data every 110 minutes, the time required for it to orbit the earth. The data received via a polar orbiting satellite would make it possible to pinpoint the location of bears to within half a mile of its exact location on the face of the earth, and would give details on the movements of the bears throughout the year. It would also permit determination of when the bear was not moving, how far it went, how rapidly it travels, and where it goes. In order to obtain maximum efficiency from this aspect of the program, the polar bears should be marked at scattered locations throughout the Arctic, and all of them should be harnessed with radio transmitters at about the same time. The radio transmitters could be

attached to the bear by a harness over the neck and around the shoulders of the animal, with a trailing antenna down the back of the bear. Batteries are available which operate in the coldest weather and yet have a life of over 1 year. International cooperation is absolutely necessary for this phase of the study because the bears would have to be marked within all sectors of the Arctic and the radio transmitters used would all have to transmit on the signals recognizable by the satellite.

Since this program would offer a unique opportunity to handle a great number of bears on a worldwide basis, every effort should be made to learn as much about the bears as possible. Blood samples should be collected to be examined for viral diseases, and radionuclides and tissues should be collected from some animals, using biopsy methods, for determination of prevalence of trichinosis. Any bears killed accidentally and some killed by hunters should be examined for pathological conditions, including diseases, parasites, and accidental injuries. Reproductive tracts should be collected, from trappers and hunters, and used to determine breeding seasons, ovulation rates, intrauterine losses, fetal growth rate, and the age at sexual maturity. The lipid content of blood should be determined from some blood samples, as well as some other blood constituents, because there is some evidence that the blood of Arctic mammals differs somewhat in lipid content from animals in warmer climates. Bones should be collected from some bears and used for determination of the amount of radioactive strontium and cesium. Arctic mammals, such as caribou, which feed on lichens are found to have a very high accumulation of radioactive isotopes resulting from fallout following nuclear explosions. Polar bears have an entirely different food cycle than the caribou and it would be highly informative if we could determine the amount of such radioactive materials in this animal.

Wherever possible, weights and measurements should be taken from live bears in the immobilized condition so that we could obtain growth rates of bears which are captured again. Young bears which are marked would prove very valuable because, as they are collected during the later stages of their life, they would provide known age material from wild animals which can be used for future determination of the age structure of polar bear population.

Animal navigation has become a popular subject for research during the past 20 years. Studies by

Kramer (1956), Penney and Emlen (1964), and others have demonstrated that birds are able to navigate by their ability to measure time and the position of the sun or the stars. Polar bears, however, live in an area where the sun is often below the horizon for many months and is not available for accurate fixes. Possibly they navigate by the stars. Perhaps they possess some other system than do birds for the determination of their position. If so, it would be most interesting to know how they do navigate, if they do.

In addition to observations on captured animals, an intensive study of the bear's ethology could be made in the wild and in captivity. Individually recognizable polar bears (marked distinctively with a dye) should be followed closely and watched with the aid of binoculars or telescopes to determine feeding habits, frequency of feeding, types of responses of one bear to another, family relationships, and general activities. This idea is similar to the study conducted by Frazier Darling on the red deer in Scotland.

Several of these individually marked bears should be furnished with devices for measuring heart beat, blood pressure, and leg movements. Such devices could be hooked to a radio transmitter which would relay the information to a receiving station so that a study could be made of the relationship between activity of the animal, the weather, and his physiological responses. This receiving station would be only a mile or so from the bear so that direct transmission could be made while the observer keeps the animal within sight.

It is often difficult to measure the factors which limit the population density of a mammal because most of them live in such complicated communities that a great number of interrelated factors have an effect. The polar bear, however, lives in a relatively simple environment and feeds primarily on only one food source, the seal. Therefore, an understanding of the population dynamics of the polar bear would be an important contribution to our understanding of population dynamics in general. Even so, it would be no easy task to measure the factors which have an effect on polar bear numbers, but every effort should be made to measure these factors.

One possibly serious mortality factor for polar bears might be for them to get lost and move away from their food supply. It is entirely conceivable that polar bears could get washed far out to sea on ice floes and be unable to swim back to the pack ice.

Other bears may wander far inland or far up toward the Pole on the pack ice and starve to death. There is some evidence of this because an average of 10 polar bears reach Iceland every year. Bears have been seen far at sea, on ice floes, and they have been encountered on ice islands, and by the Fram expedition far into the polar pack. Other bears have wandered overland almost as far south as Ottawa and Montreal.

Another aspect to be studied might be the bioenergetics of polar bears. Estimates could be made of the energy exchange between the bears and the seals, of the stored energy of the bears and the maintenance energy (which would make possible the estimation of the length of time that bears could survive without feeding) and of the population density of seals necessary to maintain a particular population level of bears. Estimates could be made of the stored energy of fat, energy content of the milk, and energy requirements of polar bear cubs, which would allow an evaluation of energy requirements necessary for pregnant female bears to survive during the period of confinement and when the cubs are being reared. Such data may give clues to factors governing the population dynamics of this species and possibly relate the factors governing the density of bear populations.

Measurements of physical insulation of the skin and fat layer of the bear would allow estimation of the critical temperature of the animal. Samples of fat from various fat depots of the bears and the seals could be analyzed. The total weight composition of depot fat should be determined and the caloric content calculated. Physical insulation of the bear's skin and fat should be determined as well.

A program such as this is beyond the capabilities of any one man or group and would be dependent upon specialists in various aspects of the study. It is hoped that Dr. Vagn Flyger would serve as project leader and work actively on the capture of the bears and the study of their behavior. Dr. Martin Schein is available for work as a coinvestigator, also specializing in the behavior of the bears. Both Dr. Flyger and Dr. Schein are interested in working on the portion of the project dealing with population dynamics and movements of the bears.

Dr. Dwain Warner from the University of Minnesota has expressed an interest in the portion of the project dealing with the study of the bear's move-

ment as determined by the use of radio transmitters and polar orbiting satellite.

Dr. A. W. Erickson from the University of Minnesota is interested in working up material pertaining to the reproduction of polar bears. Dr. Erickson also has an interest in seasonal variation in hematology and physiology of the bears.

Dr. R. L. Rausch from the U.S. Public Health Service in Alaska might want to analyze material pertaining to parasites of polar bears.

Dr. W. G. Whitford from the University of Rhode Island is interested in the physiological studies of the bears.

Dr. Charles Wilbur from the University of Delaware has expressed interest in analysis of blood samples from polar bears.

The Arctic Institute of North America is interested in assisting in coordination of the project. The Institute personnel could act as advisors and instructors to teams from the various countries going out to capture polar bears and could also furnish the ear tags. It might furnish the two U.S. teams to work from universities within the United States and outfit them with supplies and equipment, obtain the space on the polar orbiting satellite, and provide radio transmitters to be installed by the United States teams.

The Arctic institutes and universities in other countries would probably wish to be responsible for outfitting their polar bear capturing teams, furnishing the transmitters for the bears, outfitting their personnel, providing transportation, equipment, and supplies, and serving as clearinghouses for data on tag returns.

Each Arctic institute, including the Arctic Institute of North America, should supply copies of all the data to the other institutes. It is hoped that there would be frequent interchange of personnel and a yearly meeting for discussion and exchange of ideas and information.

It is hoped that by using an extensive and multi-disciplined approach, such as the one set forth above, it will be possible not only to learn much worthwhile information about the physiology, pathology, and behavior of polar bears but to gain appreciable insight into their movement patterns and life cycle as well. On the basis of this latter information it would then be possible to establish sound wildlife management procedures to ensure a continuing healthy population of the animals.

AMERICAN COMMITTEE FOR INTERNATIONAL WILDLIFE PROTECTION SUBMISSION

The First International Scientific Meeting on the Polar Bear has accomplished a highly important purpose in summarizing existing knowledge concerning the species. The delegates from all countries are agreed that among the most vital points in a program of research are data on populations and population trends. This information is of course essential for future management of the resource and for perpetuation of the species. The American Committee for International Wildlife Protection desires to suggest that, until we know the numerical status and trend and until we have assurance that adequate management practices can be applied, it would be wise and proper to proceed conservatively

by reducing the only mortality factor within man's power to regulate—the hunting kill. The American Committee offers the suggestion that the delegates recommend a 50 percent voluntary reduction in the annual kill of polar bears within the various countries for a period of 5 years, or until agreement is reached on the basis of scientific research that a higher kill will not endanger the species. It would also seem proper to reduce to a minimum the kill of female bears accompanied by cubs. Furthermore, the American Committee hopes that the countries concerned will work toward the evolution of public sentiment against the use of aircraft in the sport hunting of the polar bear.

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 sea ice denning, the regularity with which females return 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.

STATEMENT OF ACCORD

approved by the Delegates

A number of scientists and conservationists of northern nations who feel a responsibility for the preservation of Arctic animals have been concerned about the adequacy of scientific knowledge for the effective management of polar bears. That concern led to the holding of the First International Scientific Meeting on the Polar Bear at Fairbanks, Alaska, September 6 to 10, 1965. The proceedings of this meeting have confirmed that scientific knowledge of the polar bear is far from being sufficient as a foundation for sound management policies.

1. It is the mutual opinion that as polar bears are found not only on lands and seas of nations around the Arctic Ocean but in international waters as well, and that as polar bears move over large areas beyond national waters, polar bears be considered as an international circumpolar resource.

2. It is mutually recognized that each nation, within whose territory polar bears are found, or whose citizens harvest the species in international waters, should take such steps as each country considers necessary to conserve the polar bear adequately until more precise management, based on research findings, can be applied.

3. It is agreed that all cubs, and females accompanied by cubs, require protection throughout the year.

4. It is the mutual opinion that each nation should conduct to the best of its ability a research

program on the polar bear within its territory or adjacent international waters to obtain adequate scientific information for effective management of the species. It is recognized that each nation will determine the character of its research.

5. Each of the nations participating in this meeting should give consideration to the prompt exchange of research and management information obtained on polar bears. It is suggested that the International Union for the Conservation of Nature and Natural Resources, or similar international organization, be invited to receive and distribute information on polar bears submitted to it. It is therefore desirable that each nation designate an agency or office responsible for receiving and distributing polar bear information both nationally and internationally.

6. It is desirable that future international scientific meetings be called on the polar bear when urgent problems or new scientific information warrants international consideration.

7. The requirements for the completion of matters arising from the First International Scientific Meeting on the Polar Bear suggest that the Office of the Secretary General be continued until final documents have been printed and distributed to participating delegations and until other business directly associated with the conference has been dealt with.

RESOLUTIONS APPROVED BY THE FIRST INTERNATIONAL SCIENTIFIC MEETING ON THE POLAR BEAR UNDER ITEM 12 OF THE AGENDA

RESOLUTION I

Whereas the governments of Canada, Denmark, Norway, the Union of Soviet Socialist Republics, and the United States of America, have shown their interest in the welfare and continued existence of the polar bear, a valuable circumpolar international resource; and

Whereas scientists and conservationists of these governments have met and contributed greatly to the knowledge of the polar bear; and

Whereas problems of mutual concern relating to this resource have been discussed; and

Whereas recommendations for the taking of additional measures to secure needed research and management data have been made;

Now, therefore, *be it resolved* by the delegates thus assembled that they do wish to express their appreciation and thanks to the governments of Canada, Denmark, Norway, the Union of Soviet Socialist Republics, and the United States for having made possible the First International Scientific Meeting on the Polar Bear held at Fairbanks, Alaska, September 6-10, 1965;

Be it further resolved that a copy of this resolution be sent to the governments of the nations concerned.

RESOLUTION II

Whereas Secretary of the Interior Stewart L. Udall and Senator E. L. Bartlett have demonstrated their foresight concerning the future of the polar bear; and

Whereas Stewart L. Udall and Senator E. L. Bartlett did jointly announce on July 8, 1965 that they were calling an international conference of Arctic Nations to pool scientific knowledge on the polar bear and to develop recommendations for future courses of action to benefit this resource of the Arctic region; and

Whereas such a conference was successfully concluded on September 10, 1965, at Fairbanks, Alaska;

Now, therefore, *Be it resolved* that the delegates to this conference do wish to commend and to express their appreciation to Stewart L. Udall and Senator E. L. Bartlett for this action.

RESOLUTION III

Whereas the Honorable William A. Egan, Governor of the State of Alaska has shown keen personal initiative in the convening of the First International Scientific Meeting on the Polar Bear, at Fairbanks, Alaska, September 6-10, 1965; and

Whereas Governor Egan provided invaluable assistance, cooperation and support to the successful conclusion of this conference;

Now, therefore, *Be it resolved* that the delegates to this conference do commend and thank Governor Egan for his invaluable assistance.

RESOLUTION IV

Whereas President William R. Wood, of the University of Alaska and Mrs. Wood and members of President Wood's staff, demonstrated their keen personal initiative in the calling of the First International Scientific Meeting on the Polar Bear; and

Whereas President and Mrs. Wood and staff members did render invaluable assistance, guidance and cooperation; and

Whereas President and Mrs. Wood and staff members, extended warm greetings and hospitality to the delegates to this conference held at Fairbanks, Alaska, September 6-10, 1965;

Now, therefore, *Be it resolved* that the delegates to this conference do wish to express their sincere thanks and appreciation to President and Mrs. Wood and staff members.

RESOLUTION V

Whereas General Andy Lipscomb, Commanding General, Fort Wainwright, Yukon Command, United States Army did show keen personal initiative in the success of the First International Scientific Meeting on the Polar Bear held at Fairbanks, Alaska, September 6-10, 1965; and

Whereas General Lipscomb did extend warm greetings and hospitality to the delegates and guests of the United States;

Now, therefore, *be it resolved* that the delegates to the First International Scientific Meeting on the Polar Bear do wish to express their appreciation and thanks to General Lipscomb.

RESOLUTION VI

Whereas the Alaska Department of Fish and Game demonstrated keen initiative in the convening of the First International Scientific Meeting on the Polar Bear;

Whereas the Alaska Department of Fish and Game provided invaluable assistance and cooperation in making arrangements, providing secretarial assistance and otherwise assisted greatly in the successful conclusion of the conference held at Fairbanks, Alaska, September 6-10, 1965;

Now, therefore, *be it resolved* that the delegates do wish to express their thanks and appreciation to the Alaska Department of Fish and Game.

RESOLUTION VII

Whereas the persons involved, collectively and individually, in preparing and handling documents, in translating and interpreting languages, in secretarial and stenographic work and otherwise providing necessary services to the successful conclusion of the First International Scientific Meeting on the Polar Bear held at Fairbanks, Alaska, September 6-10, 1965; and

Whereas these persons worked long, diligently, cheerfully and efficiently;

Now, therefore, *be it resolved* that the delegates to the First International Scientific Meeting on the Polar Bear do wish to express their thanks and appreciation to these persons.

RESOLUTION VIII

Be it further resolved that copies of the resolutions passed at the First International Scientific Meeting on the Polar Bear be sent to the governments, agencies, and persons to whom they are directed.

FINAL LIST OF PARTICIPANTS

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Technical Secretary—JOHN S. TENER, Canada.
Secretary General—JAMES A. SLATER, United States.

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