Problems in Arctic conservation

MAGNAR NORDERHAUG

(Med et dansk resumé: Problemer i arktisk naturfredning)

Dedicated to Dr. phil. Finn Salomonsen on the occasion of his seventieth birthday, 31st January 1979

INTRODUCTION

Man's role in Arctic ecosystems can roughly be splitted up in three phases:

1) The first phase started when the vast ice-cap slowly melted and the first hunting tribes moved northwards and in general adapted their life-styles to this harsh and extreme environment. Their cultures became more or less integrated parts of the Arctic ecosystem.
2) The next phase started in the 16th and 17th century with increasing need for various animal resources and products in Europe's coastal nations. An epoch of exploitation and plundering of economically valuable mammal populations of the high North started. Various populations of whales, seals, walrus, reindeer and other animals were hunted, and nearly without exception, overexploited. This phase slowly came to an end in the 1950's due to overharvesting, reduced economic output, new, alternative resources and alternative job opportunities.
3) At the beginning of this century, the third phase of Man's activities in the North started. The various populations of living resources were no longer the primary goal for his continued exploitation.New resources of other types became far more attractive: coal, minerals and not least gas and oil.

   Development of new efficient vehicles and technically advanced methods for exploration and exploitation gave rise to this new era, which would not have been imagined a few years earlier. This third phase with increasing technological/economic pressure is today dominating Man's presence in nearly all parts of the Arctic.

Man's activities and life-style in the North are no longer in harmony with the biological systems and the basic ecological laws. The consequences are increasing conservation problems.

The negative influences of modern Man in the Arctic are increased by two factors (Norderhaug 1970).

Firstly, the main part of human activity is concentrated to the restricted, snow- and ice-free parts of the Arctic land area. These are roughly spoken the same areas where nearly all biological production takes place in the terrestrial ecosystems. Of Greenland's total land area, about 15 % are icefree (Bartonek *et al.* 1971). Of Svalbard's total land area (62 000 km^2) only 8200 km^2 (about 13 %) are of direct importance for biological production. Nearly the same situation is found in other high Arctic land areas.

Secondly, another factor which increases the negative impact of technological/economic activities in the Arctic is Man's tendency to concentrate (not surprisingly) the main part of his activity to the summer season, e.g. the short biologically productive season. In high Arctic areas this productive season is roughly restricted to a period of 40–70 days.

The pressure on these restricted and biologically vital parts of the Arctic will most certainly increase further in the next decades, due to increasing need of oil, gas and mineral resources. (The annual increase in Europe's and North America's energy demand has been 4–7 % in recent years). However, with these trends, and Man's technological success in the Arctic in recent years, there is also clearly a danger that fundamental ecological considerations can be neglected. In the long run such a neglection may undermine basic functions in the Arctic ecosystem and its biological productivity.

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Here, Man clearly faces a vital dilemma: Will he undermine an ecological system 10 000–20 000 years of age to support his recently developed technological systems with natural resources in a period of 50–100 years? From an ecological point of view, the present exploitation phase in the Arctic is most certainly a relatively shortlived phenomenon. From such a viewpoint there is an urgent need to lead the present technological/economic activities in Arctic along such lines that the environment and the biological systems are maintained. This must be a basic goal for every sound resource policy in the North. If resource policy is based only on short-sighted (10–30 years) considerations, it will be more or less impossible to maintain and utilize the biological potential of the Arctic and the cultural, scientific and esthetic resources, when times come and the main part of the non-renewable resources has been exploited.

In this connection, however, it is important to note the increasing concern for this type of considerations in all Arctic nations. This concern is vital and of fundamental importance for the future of the Arctic, and our willingness and ability to take far-sighted decisions when options are still open.

The environmental problems resulting from Man's present activities in the North are numerous. Accordingly, there are no general solutions to these problems, and each of them needs specific attention. The following brief summary of some of the main (or potential) problems, will illustrate the situation.

Erosion

In general, a main part of Man's present activities in the Arctic terrestrial ecosystems seems to have negative impact on the vegetative layer and its insulatory functions on the permafrost. This impact is often increased due to the above mentioned fact that the main part of Man's activities takes place during the summer when the ground is not frozen.

From local situations, this negative impact on vegetation and the stability of the permafrost is well known. In many such cases, erosion is a result of Man's interference with a dynamic and fairly stable equilibrium, established during thousands of years. The regional and long term effects of this ongoing process are still not satisfactorily known.

Oil exploration

In the last 10–12 years a number of side effects of oil exploration in tundra areas have been studied and debated. Considerable efforts have also been made by the oil companies to eliminate or reduce risks for environmental side effects. In some cases, these have also been successful. An example is the oil exploration on Edgeøya, Svalbard, in the beginning of the 1970's, where operations were performed with neglible environmental impact. However, these test drilling operations gave negative results, and quite other problems would have appeared if oil had been found.

Environmental problems related to oil exploration on tundra are numerous and include: Erosion problems, risks for oil spill, pollution of fresh water communities, air pollution, damage to wildlife, destruction of esthetic values etc.

Impact of oil spill on the tundra may certainly have detrimental effects. A recent study (1978) by the Norwegian Central Institute for Technical Research (SINTEF) in Svalbard indicates that the effect of even small oil spills on the tundra may last for 75 years.

Oil exploration in Arctic waters

The main part of our knowledge about impact of oil spills on marine ecosystems refers to temperate waters. The knowledge of impact on Arctic ecosystems is very restricted. In general, the ecological impact can be of at least four types (Blumer 1970):

1) Mortality through direct contact with oil or fractions of oil in water (Larvae of various species are sensitive).
2) Destruction of feeding grounds for species further up in food chains (by possible long term effects from low level pollution on various planctonic organisms).
3) Mortality due to deteriorated physical conditions (seabird mortality).
4) Effects of carcinogenic and (possibly) mutagenic components.

It seems today impossible to decide whether or not the impact of oil on marine ecosystems is under- or overestimated. Drilling operations in high Arctic seas are still only in its beginning. Within a few years, we may foresee extensive operations in these seas. This applies among others to the Barents Sea, one of the biologically richest seas on the Northern

Fig. 1. Today, modern Man faces a vital dilemma in the Arctic: Will he undermine an ecological system 10,000–20,000 years of age to support his recently developed technological systems with natural resources for 50–100 years? Photo M. Norderhaug.
I dag står det moderne menneske over for det dilemma, at han kan risikere at ødelægge en 10.000–20.000 årig økologisk balance for at udnytte naturens ressourcer, der måske kan holde 50–100 år.

hemisphere. Experience from temperate waters shows that accidents are likely to occur, in spite of advanced technology and the best control devices. Risks on Arctic waters are furthermore increased by extreme wind conditions, long periods of darkness and ice conditions.

Air pollution

Problems of air pollution in the Arctic are primarily related to possible effects of SO_2 on vegetation, partly from local sources, partly from long range air transport. In this connection special attention has been paid to lichens. Lichens have no true root systems and absorb nutrients and water directly from the atmosphere. Lichens' vulnerability to air pollution are documented from various Scandinavian studies. Air pollution from SO_2 in concentrations as low as 0.05 ppm can have detrimental effects on certain *Cladonia* species (Skye 1958). Scandinavian studies show increased lowering of pH in precipitation due to SO_2 pollution from Middle Europe, transported towards north and northeast (Oden 1971). On the average, pH in Scandinavian precipitation was above 6.0 before 1956. At the end of the 1960's it had been reduced to below 5.5, and large parts of southern Scandinavia had values between 4.5 and 4.0. This serious trend has continued in the 1970's. How the situation is in high Arctic areas is not satisfactorily known. We may, however, fear that a negative impact on the vegetation in the North may occur, if the present trends continue.

Effects of acid precipitation in soil and fresh water depend on the buffering capacity. In this respect, Arctic ecosystems are likely to be vulnerable due to the generally soft water.

Pesticides

It is a well known fact today that recidues of pesticides, heavy metals etc. are found in nearly all parts of Arctic ecosystems. In particular, DDT and its metabolites are widespread in the

Arctic (insects in Brooks Range, Alaska, zooplancton in the North Atlantic, seabirds in the Barents Sea, polar bears in the Bering Strait etc.).

It is also fairly well documented that this is due to long range transport through atmosphere and sea currents (Lundholm 1970, Woodwell 1970, Cox 1971). Various factors contribute to an irregular distribution of pesticides. Surprisingly, larger recidues have been found in the north than further south. Studies in Sweden of distribution of DDT and lindan showed increasing concentrations (ground level) from south (54°N) to north (68°N). A similar trend was found in eggs of Eider Ducks from North Norway (70°N) and Svalbard (78°N) in 1969. Eggs from North Norway contained DDE recidues from 0 to 0.1 ppm. Eggs from Svalbard contained DDE recidues from 0.1 to 0.4 ppm. These trends, and the relatively simple structures in Arctic ecosystems, illustrate the need for permanent monitoring programmes of accumulation trends in the Arctic.

WILDERNESS – A DIMINISHING RESOURCE

Today, the world's last wilderness areas are rapidly shrinking due to increasing population pressure and rapidly expanding human activities. Some conservationists estimate that remaining areas of unspoiled nature will disappear before 2000, except where reserves and national parks are established. From such a viewpoint, Arctic still has a large and very important conservation potential. This is also one of the most important tasks in Arctic conservation today: To ensure effective protection of the most valuable parts of unspoiled Arctic nature. Considerable results have been achieved in recent years, but much remains to be done.

Tourism

Basically, tourism in the Arctic can be considered a positive element. The tourist potential is also considerable in various parts of the Arctic. The problem in many areas is, however, that improved communications have made it possible for more or less uncontrolled tourism to expand into vulnerable biological areas in the critical summer months. In extreme cases, such tourism may lead to nearly total destruction of egg production of Eiders and geese.

In general, the degree of disturbance is less obvious, but may in the long term lead to deterioration of both plant and animal life in the most sensitive areas.

Improved communications and increasing interests in visiting unspoiled and distant places will most certainly lead to increasing pressure on attractive parts of the Arctic also in the years to come.

The situation in the Canadian North West Territories (Hodgson 1967, 1969, 1970, 1971) may illustrate the trends also in other parts of the Arctic. In 1959, 600 tourists were registered in the NW Territories. In 1971, the number had passed 17 500. Today, Arctic tourism has to be accepted as part of modern Man's activities in the North. But clearly also, there is in many parts an urgent need to control this activity far better and to lead it along acceptable pathways. In most cases,this should be the responsibility of the governments or local authorities and not be left in the hands of free enterprises.

Vulnerable flora

Obviously, protection of high Arctic plant communities is best ensured through the establishment of nature reserves and national parks. The degree of flora protection in various regions is accordingly also best considered in relation to the number and size of parks and reserves established. A more specific problem relates to the protection of endemic Arctic plants with a restricted distribution. Of 892 Arctic vascular plants, 11 species may be considered in need of specific conservation measures (Polunin 1970):

Alaska	*Carex jacobi-peteri*
Baffin Island	*Poa nascopieana*
Victoria Island	*Mertensia drummondii*
Greenland	*Puccinella groenlandica*
	Puccinella porsildii
	Sisyrinchium groenlandicum
	Saxifraga nathorstii
Svalbard	*Ranunculus spitsbergensis*
	Puccinella svalbardensis
Kolguev	*Koeleria pohleana*
Novaja Semlja	*Puccinella palibinii*

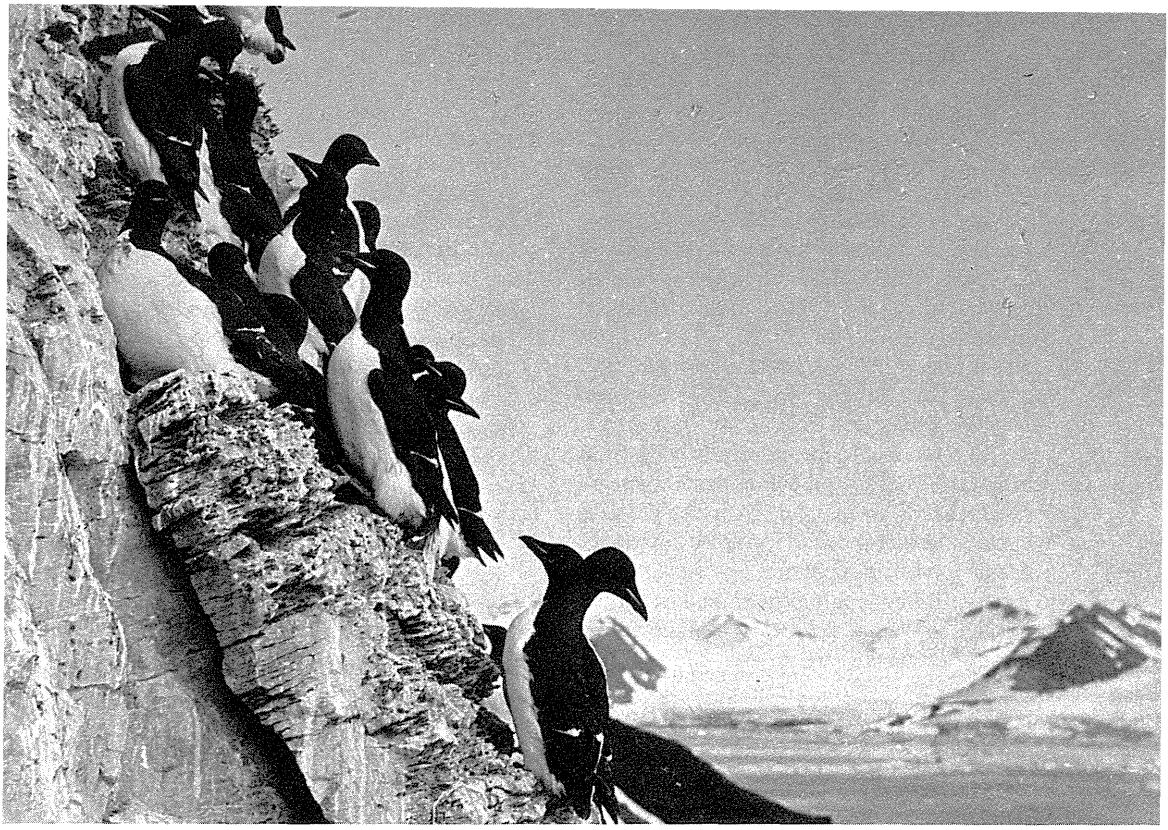

Fig. 2. The alcids seem today to face a generally decreasing trend over most of the Northern hemisphere (here Brünnich's Guillemots *Uria lomvia*). Photo M. Norderhaug.
Alkefuglene ser ud til at være i tilbagegang overalt på den nordlige halvkugle (her en flok Kortnæbbede Lomvier).

Vulnerable birds

A main part of Arctic birds may today be in a more or less vulnerable situation, belonging to one or more of the following categories:

1) Formerly overexploited species with a present population size below its original level.
2) Species under negative impact due to human activities (including hunting) in the breeding area, along migration routes or in the wintering areas.
3) Species with very restricted populations and breeding areas, not under immediate threats, but vulnerable in case of increasing technical/economic activities.
4) Species with a formerly wider distribution and breeding area on the Northern hemisphere, today more or less restricted to Arctic areas due to habitat degradation, human disturbance etc. farther south.

Significant results have been achieved in Arctic bird conservation. It is, however, clear from the complex of negative factors having impact on Arctic birds today, that increased research and efforts for Arctic bird conservation are more urgent today than ever.

Today, at least 31 Arctic species or subspecies of birds may be considered in a vulnerable position. However, these do not include rather numerous species like the alcids, which also face serious and probably increasing problems today.

Problems related to Arctic seabirds

Some seabirds show marked increase in recent years, including *Rissa tridactyla, Sula bassana, Fulmarus glacialis* etc. Such species have most probably been favoured by modern fisheries and increased amount of available food.

In the same period, however, data are available from various parts of the northern regions showing serious declines in other populations.

The population of *Uria aalge* in North Norway decreased on an average 5% per year during 1964–1975 from an estimated population of 154,000 pairs (Norderhaug *et al.* 1977).

Apparently the same trend was observed by Russian scientists on the Kola peninsula (Gerasimova 1962, Skokova 1962). *Uria lomvia* apparently shows the same trend. The same appears in the North Norwegian population of *Alca torda,* in which an average annual decrease of 2.6% has been observed (Norderhaug *et al.* 1977).

In summary, the present trend now seems to take place (Norderhaug *et al.* 1977): Decrease in coastal species like *Uria aalge, Uria lomvia* and *Alca torda* due to increased mortality from fishing nets, hunting, oil pollution etc. Increase in species like *Sula bassana, Fulmarus glacialis* and *Rissa tridactyla* due to increased amount of available food from fisheries, less vulnerability to modern fishery equipment and oil pollution.

Today, especially the alcids seem to face a generally decreasing trend over most of the Northern hemisphere. This group illustrates well the need for more conservation-oriented research, increased conservation measures and a more extensive international cooperation among the Arctic nations in the field of conservation.

Vulnerable mammals

Since the 16th century various species and populations of Arctic mammals have been exploited for commercial purposes. The general pattern in these enterprises were:

- discovery
- development of effective hunting methods
- extensive utilization
- overexploitation and finally collapse of the resource base.

Also terristrial mammals suffered from the 'civilized' Man's short-sighted resource philosophy. The North American Barren Ground caribou originally numbered 2–3 millions. In 1955, the herd was reduced to about 280,000 animals (Holloway 1970). The Svalbard reindeer numbered probably 10,000–14,000 animals before this archipelago was discovered in 1596. In 1925 probably less than 500 were left (Norderhaug 1970b). Nearly the same happened to the Novaja Semlja reindeer.

For most species of Arctic mammals, the management situation has been significantly improved since 1945. However, various species and populations are still vulnerable. These species may belong to one or more of the following categories:

1) Species/populations formerly overexploited and with a present population level far below the original population size.
2) Species/populations with original low numbers or restricted distribution, which directly or indirectly may be threatened by increasing technical/economic activities.
3) Species/populations in possible risk due to ongoing exploitation.
4) Species/population in risk of decrease in the future due to human overexploitation of their food base.

THE PRESENT STATUS IN ARCTIC CONSERVATION

One way to consider the present status of Arctic conservation is to study the number and size of protected areas within the region.

A total of $7{,}763 \times 10^4$ ha of protected area falls (1976) within the tundra biome. This is 38% of the world's protected areas and 0.5% of the terrestrial globe (UNEP 1976). A large proportion is contributed by the North-east Greenland National Park ($7{,}000 \times 10^4$ ha), which is in fact the largest national park in the world.

In spite of the large proportion of the world's protected areas located in the tundra biome, the present number and sizes of existing reserves and national parks are far from satisfactory. At least 90% of the protected areas are under permanent ice cover, and a more realistic assessment of the proportion of reserves within this biome would be 3% of the total protected area of the world. This occurs in about 20 protected areas, 72% of which are within the palearctic region, representing only 0.09% of the total extent of that region (UNEP 1976).

The most important protected areas within each of the Arctic nations are as follows (IUCN 1978a, b):

USA (Alaska): Only one reserve excists in the area. That is the Arctic National Wildlife Range established in 1960 (36,016 km^2).

Canada: There is a national park in Baffin Island (21,448 km^2). A Number of bird sanctuaries are furthermore located from Baffin Island in the east to Banks Island in the west. Furthermore, the Thelon Game Sanctuary (Keewatin District) provides protection for a herd of muskoxen.

If governmental plans are approved (1978),

Canada will establish 6 more national parks in the Arctic. These are located in Northern Yukon, Tuktoyaktuk, Banks Island, Bathurst Inlet, Wager Bay and Ellesmere Island.

Denmark (Greenland): The newly established North-eastern Greenland National Park of about 70 million ha is the largest protected area in the world. Furthermore, Disko Island was established as a plant reserve in 1912.

Norway (Svalbard): Three national parks, two nature reserves and 15 (small) bird sanctuaries were established in 1973. Their total area covers more than 30,000 km^2, or about 50% of the total land area of the archipelago.

On the Norwegian mainland, in the county of Finmark, there are furthermore 3 national parks totalling 1,549 km^2, and three smaller reserves.

USSR: Rather few areas of Arctic tundra are under protection, and only three state reserves excist (UNEP 1976).These are the Kandalaksha Nature Reserve (220 km^2), the Lappland Nature Reserve (1,548 km^2), and a reserve of 12,000 km^2 recently (1975) established on the Taimyr peninsula (including the breeding area of about 80% of the world's population of *Branta ruficollis*). In 1960 Wrangel Island was declared a reserve for Polar Bears.

Further plans are under consideration in various parts of the Arctic (UNEP 1976), including:

- Proposals for the establishment of an Arctic International Wildlife Range, covering some 36,421 km^2 in Canada, immediately adjacent to the existing Arctic National Wildlife Range in Alaska.
- Some 32,300 km^2 are considered for new national parks in Alaska.

Fig. 3. Hopefully, the acceptance of the basic principle of joint responsibility for the Polar Bear in the International Agreement on the Conservation of the Polar Bear, may also encourage and stimulate a wider cooperation in Arctic conservation. Photo M. Norderhaug.
Forhåbentlig kan de principper, der blev anvendt i den internationale aftale om fredning af isbjørnen, virke inspirerende på andre områder af fredning i arktiske områder.

- In USSR the establishment of other reserves is believed to be under discussion in various parts of the Soviet Arctic.

FINAL REMARKS

It is fair to say that significant improvements have been achieved in Arctic conservation in the last 10–15 years. However, much remains to be done:

- Larger and more representative parts of terrestrial Arctic ecosystems need protection.
- Increasing human activity, including expanding tourism, needs better control from the responsible governments.
- Various types of technical/economic activities, including possible overexploitation from modern fisheries and oil exploration, may threaten the food base and the environment of various species of birds and mammals.
- Several populations of marine mammals have still not recovered from former overexploitation.
- Various populations of birds are probably facing increasing problems during their regular winter migration.
- Pollutants through ocean and atmosphere may on a long term basis cause new environmental problems in the Arctic.

The need for increased conservation oriented research in the Arctic and a more future oriented conservation policy in the Arctic nations are of vital importance. Quite clearly, there is also a need for more close international cooperation to deal with the conservation problems within this region.

Hopefully, the acceptance of the basic principles of joint responsibility for the Polar Bear and its future in the International Agreement on the Conservation of the Polar Bear may also encourage a wider cooperation in Arctic conservation. Much still remains to be done, and time is not on our side.

DANSK RESUMÉ

Problemer i arktisk naturfredning

Menneskets rolle i atktis kan groft set deles op i tre faser: Første fase startede efter sidste istid, da den smeltede is frilagde nogle landområder, hvortil forskellige jægerstammer flyttede, og trods de ekstreme livsvilkår tilpassede mennesket sig til at leve i arktis, men helt på naturens betingelser. Menneskene var en del af det arktiske økosystem.

Anden fase startede i det 16. og 17. århundrede med de europæiske kyststaters fangstekspeditioner efter kødressourcerne, først og fremmest hvaler, hvalros og rensdyr. Efterstræbelsen var fuldkommen hæmningsløs, og flere arter blev bragt til randen af udryddelse. Efterhånden som byttedyrene blev sjældnere, kunne jagten dårligt nok betale sig, og perioden kan siges at slutte omkring midten af vort århundrede.

Tredie fase startede i begyndelsen af det 20. århundrede, da man opdagede, at arktis indeholdt mineralrigdomme, som der i vor tidsalder er brug for i stigende omfang. Det drejer sig om kul og forskellige malme men først og fremmest olie og gas.

I vor tid er menneskets færden i arktis ikke længere i harmoni med de økologiske love, og det skyldes hovedsageligt to faktorer. For det første er de menneskelige aktiviteter koncentreret til de isfri områder, hvor også næsten al biologisk produktion foregår. For det andet er de menneskelige aktiviteter i tid koncentreret til den korte sommertid, omkring 40–70 dage årligt, og det er igen sammenfaldende med den biologiske produktionstid.

Menneskets aktivitet kan have flere negative følger. Plantesamfund i arktis er f.eks. sårbare over for nedtrampning af enten fødder eller køretøjer, som derfor forårsager *erosion*. De nyligt påbegyndte *olieboringer* er betydeligt mere problematiske i arktis end andre steder, og evt. oliespild vil kunne få uoverskuelige konsekvenser på arktiske miljøer, der kun uhyre langsomt regenererer efter ødelæggelser. Det skønnes, efter undersøgelser af det norske institut SINTEF, at en naturødelæggelse p. g. a. en oliekatastrofe i et tundraområde, ikke vil kunne genoprettes før 75 år efter ulykken. Den *luftforurening,* der bl.a. kommer fra sydlige industriområder, har alvorlig indvirkning på arktiske plantesamfund, især laver, der har vist sig sårbare over for svovlsyre i nedbøren. Det er efterhånden velkendt, at *pesticider* er fundet i næsten alle arktiske økosystemer især DDT og dets nedbrydningsstoffer.

Det er vigtigt, at vi snart begynder at tænke på, hvordan vi kan udnytte de arktiske områder uden at ødelægge. Disse nordlige lande har f.eks. et stort potentiel som turistområder, men turismen må planlægges. I Canadas Nordvest Territorier steg antallet af turister fra 600 i 1959 til 17.500 i 1971. En uhæmmet stigning i turismen kan ikke undgå at få negative følger for den arktiske natur.

Af hensyn til en del sjældne planter, fugle og dyr er det nødvendigt med fredning af visse områder og arter. Forf. foreslår fredning af ialt 11 plantearter. Også nogle fugle er truede i arktis, og de kan tilhøre

en af fire kategorier. 1) Arter der tidligere har været for stærkt efterstræbt og derfor nu er fåtallige. 2) Arter der trues af menneskelig aktivitet i yngleområdet, under trækket eller i vinterkvarteret. 3) Arter som måske ikke umiddelbart er truede men har en meget begrænset udbredelse og derfor er sårbare. 4) Arter som tidligere havde en større udbredelse på den nordlige halvkugle men nu er begrænset til visse områder i arktis, ofte p. g. a. forstyrrelser længere mod syd. De fire ovennævnte kategorier indeholder i dag mindst 31 arter eller underarter.

Nogle søfugle har vist markant fremgang de senere år, f.eks. Mallemuk, Sule og Ride, alle utvivlsomt p. g. a. det stærkt øgede fiskeri. Samtidig har mange bestande af alkefugle vist nedgang, f.eks. Lomvie i Norge, hvor man regner med en årlig nedgang på 5% i perioden 1964 (154.000 par) til 1975. Russerne har bemærket en lignende nedgang på Kola halvøen. Kortnæbbet Lomvie, der yngler nord for Lomvien, er tilsyneladende ude for det samme. De norske Alke viste i samme periode en nedgang på 2,6% årligt.

Pattedyrene er den dyregruppe, der har betalt hårdest for menneskets indtrængen i arktis. Mønsteret har gennemgående været følgende: Opdagelse, udvikling af effektive jagtmetoder, udnyttelse, overudnyttelse med efterfølgende kollaps af bestanden. Det nordamerikanske rensdyr talte oprindeligt 2–3 millioner, men i 1955 var der 280.000 tilbage. På Svalbard var der formentlig 10.000–14.000 rensdyr da øerne blev opdaget i 1596, men i 1926 var der mindre end 500 tilbage; den samme udvikling skete på Novaja Zemlja. Efter 1945 er det lykkedes at vende disse tilbagegange til fremgang p. g. a. fredninger.

Forf. giver en oversigt over natioalparker og fredede områder i arktis. Den nordøstgrønlandske nationalpark, som blev oprettet for få år siden, er på 70 millioner ha. og er verdens største nationalpark (langt størstedelen er dog indlandsis).

Til slut nævnes nogle punkter af vigtighed for fremtidens naturfredning i arktiske områder: Større og mere repræsentative arealer af terrestriske arktiske økosystemer bør fredes. Den stigende menneskelige aktivitet, herunder turismen, kræver bedre planlægning. Adskillige dyre- og plantesamfund er truet af den stigende teknisk/økonomiske aktivitet. Flere af havpattedyrene er endnu ikke kommet på fode efter tidligere efterstræbelser. Adskillige fuglebestande står over for stigende trusler i deres vinterkvarter. Vand- og luftforurening er langt fra at være under kontrol og vil utvivlsomt skabe problemer i arktis.

Det internationale samarbejde, det lykkedes at etablere for at redde isbjørnen, er et eksempel til efterfølgelse.

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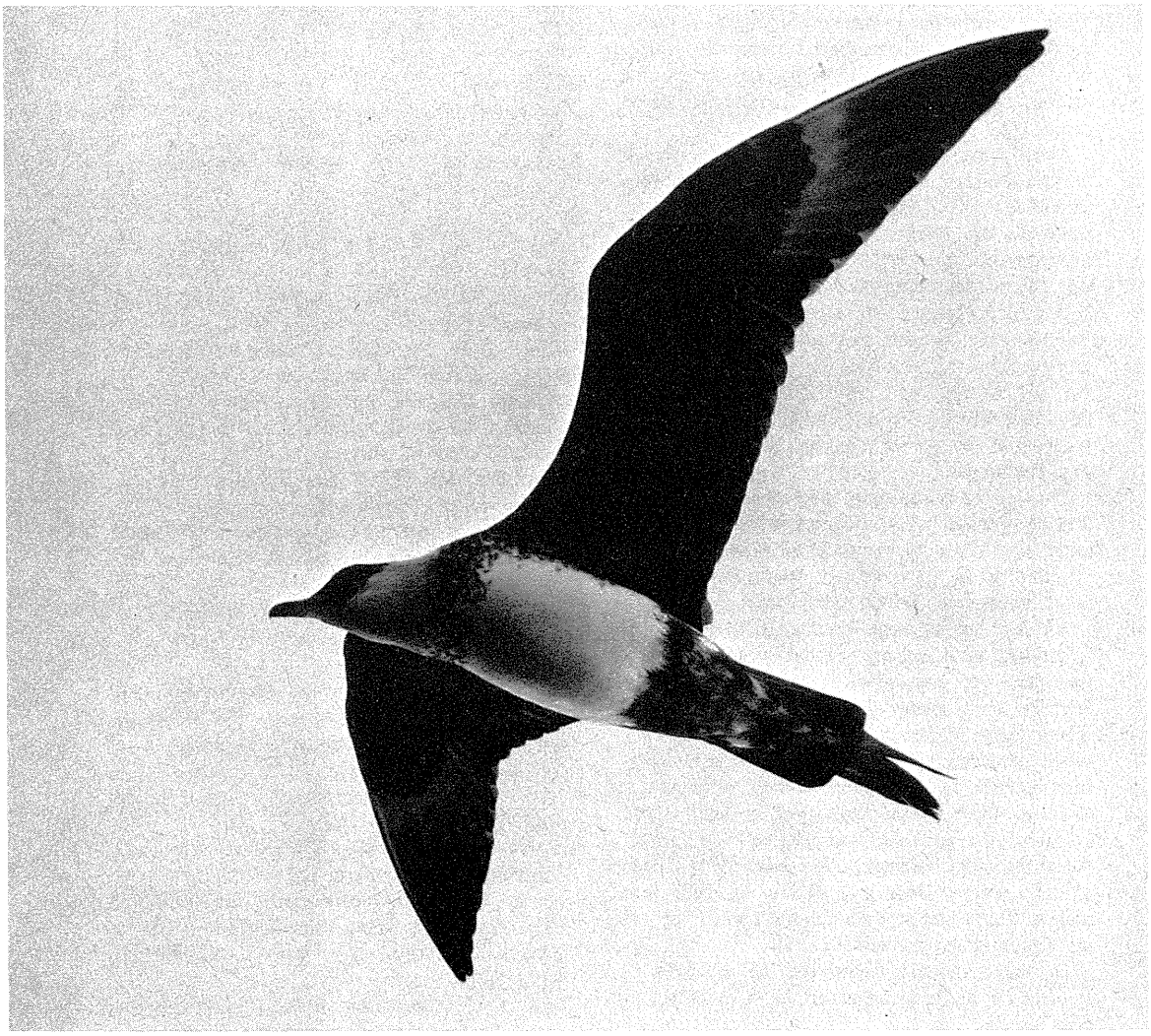

Mellemkjove *Stercorarius pomarinus*, formentlig ca. 1 år gammel. Foto: Frank Wille.