THE ARCTIC AS A PROBLEM AREA

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Abstract: In this overview of the present socio-economic situation in the Arctic the author specifically confines his attention to the Arctic *per se*, using the treeline (on land) and the maximum extent of sea ice as the southern boundary. A brief review of resource potential emphasizes the low phytomass production and the vast seasonal variations in nutrient supply between summer and winter in terms of both terrestrial and marine resources. A survey of "traditional" economic activities of the various indigenous groups in the Arctic differentiates between the pre-European activities and the various modifications made to those activities through the impact of early adjustments to external economic influences, e.g., whaling, trapping, etc. Trends in population and settlement patterns are then examined, with particular emphasis on the recent concentration of population into settlements, which has affected almost every aspect of the Arctic. Discussion of positive and negative impacts of various development projects, e.g., mining, on the indigenous population is followed by an analysis of the related topic of environmental aspects of development projects. Fluctuations in the fortunes of the various types of exploitation of renewable resources are analyzed. And finally the widespread movement toward self-determination among the indigenous peoples is assessed and the conclusion is reached that many of the recent land-claims settlements are far from being as satisfactory (from the point of view of the indigenous people) as they might at first appear, and may need to be renegotiated. The concluding argument is that in view of the drastic increases in the indigenous populations the various market-oriented branches of the economy cannot hope to provide the answers to all the problems of the Arctic and that expansion and intensification of traditional activities (possibly in association with renegotiation of land claims) will definitely be necessary in the future.

1. THE ARCTIC AS A PROBLEM AREA

When the American ethnologist V. Stefansson applied the extremely optimistic title "The friendly Arctic" to his report on his 5-year sojourn in the Canadian Western Arctic in 1921 he may have had the intention of correcting the image of the inhospitability of this area, which had been repeatedly stressed in innumerable expeditionary and travel accounts. But when the German translator rendered this "Lands of the future" in 1923, on the basis of the state of knowledge at the time

this was undoubtedly an erroneous assessment, and that is still the case. Admittedly during scarcely more than two decades the status of the potential of the Arctic has been hurled into the spotlight since the discovery and exploitation of the first occurrences of oil and natural gas in the arctic regions of Siberia and Alaska, as a result of increased efforts to ensure our supplies of energy and raw materials. Nonetheless, it is and remains exclusively a resource supply area for the consuming centers in the south.

But in view of the economic exploitation which can be observed one can easily overlook the fact that this is certainly not occurring in a largely uninhabited and unutilized area, as is suggested by our biased orientation to the isolated settlements of the aboriginal population, almost lost in the wide expanses of the area. Recent mapping projects implemented in various arctic areas reveal rather a utilization as hunting, trapping, and grazing lands which is extremely variable in intensity but which in total today embraces practically the entire area. As a result of industrial developments, spatial overlaps and conflicts in terms of utilization, which are inevitably becoming steadily aggravated, are emerging conspicuously and are resulting in a curtailment or displacement of the economic activity previously pursued. And for the moment there is no prospect of these traditional activities being replaced by intensified participation in the new developments. This affects an aboriginal population which due to high rates of population increase and to unfavorable natural conditions for production, in connection with minimal alternative sources of income, has at its disposal only a very narrow and nonsustaining income base. In addition, there is the aspect that for this portion of the population, which so far has become an ethnic minority in its territories only in the Soviet Union (Table 1), hunting, trapping, and grazing represent not only forms of livelihood, but are seen as integral components of their culture, abandonment of which would call in question their ethnic identity. Thus their efforts to secure these traditional areas of activity as far as possible for their own purposes and to determine themselves the manner and scale of exploitation of their environment is understandable. Understandably, too, the scope for involvement and decision-making permitted them by the ethnic majority in their respective political units—the Soviet Union, USA, Canada, and Denmark—varies widely.

In view of the problems alluded to, it seems justified to focus our study less on the state of tension between the consuming areas of the south and the tributary periphery as expressed in the well-known English conceptual couplet "heartland—hinterland" and more on the contrast, admittedly inseparably linked with the above-mentioned couplet, between the "hinterland" and the "homeland" of the aboriginal population. In this connection our discussion, which consciously avoids a comprehensive representation of the geo-ecological backdrop, must be limited to a few aspects thath seem appropriately to contribute to highlighting in particular the economic problems of the area. If the arctic regions of the Soviet Union are not dealt with in the detail which might seem desirable in view of their development under a totally differently organized economic and social system, this decision is based on the extremely limited availability of suitable information.

TABLE 1

Aboriginal Population as a Component of Total Arctic Population Around 1986 (partly estimated)

	Aboriginal pop.		Others		Total abs.
	abs.	%	abs.	%	
Soviet Union	97,000	18	428,000	82	525,000
Alaska	35,200	84	6,500	16	41,700
Canada	25,500	76	7,300	24	29,800
Greenland	45,600	83	9,600	17	55,200
Svalbard/Jan Mayen	—	—	3,600	100	3,600
Total Arctic	200,300	31	455,000	69	655,300

2. OUTER LIMITS AND INNER DIFFERENTIATIONS

Even if the area termed the Arctic is definitely seen as a unit on the basis of the parameters which characterize it in the popular imagination (high latitude, arctic night and midnight sun, cold, permafrost, treelessness, sea ice cover, etc.), on closer examination its delimitation becomes problematical. It turns out that although the criteria cited definitely are associated in a relatively narrowly circumscribed core area, in the peripheral areas, which in the customary view also belong to the Arctic, only some of these criteria occur.

In the literature "Arctic" is frequently equated with "the north polar region"; but this is little help, since the latter is bounded by the Arctic Circle (66° 32′51″N, Fig. 1). At this mathematically exactly delimited line, due to the obliquity of the ecliptic, over the course of the year the sun remains for one day either above or below the horizon; northward from here the length of day and night increases until at the Pole itself the arctic day (midnight sun) and the arctic night each last for six months. Thereby, at least theoretically, the Arctic Circle separates a northern cold zone from a more southerly temperate zone on the basis of differential intensity and duration of radiation. But, in fact, this line is of little practical significance because this solar-conditioned temperature distribution is strongly modified regionally and locally particularly by airmass currents and ocean currents, which attempt to equalize the radiation losses from the high latitudes. The Arctic Circle traverses both the Greenland Ice Cap and the incontestably nonarctic dairy-farming areas of northern Scandinavia.

In similar fashion the distribution of continual permafrost, i.e., perennially frozen ground, above which a shallow surficial layer thaws out in summer, turns out to be unsuitable for delimiting the Arctic. Attempts have been made to link its occurrence to mean temperature values; according to this its southern boundary approximates the mean annual isotherm of −6 to −8° C. In the markedly continental areas of Siberia relatively high summer temperatures are associated with extreme winter temperatures and shallow snow depths, and make possible a

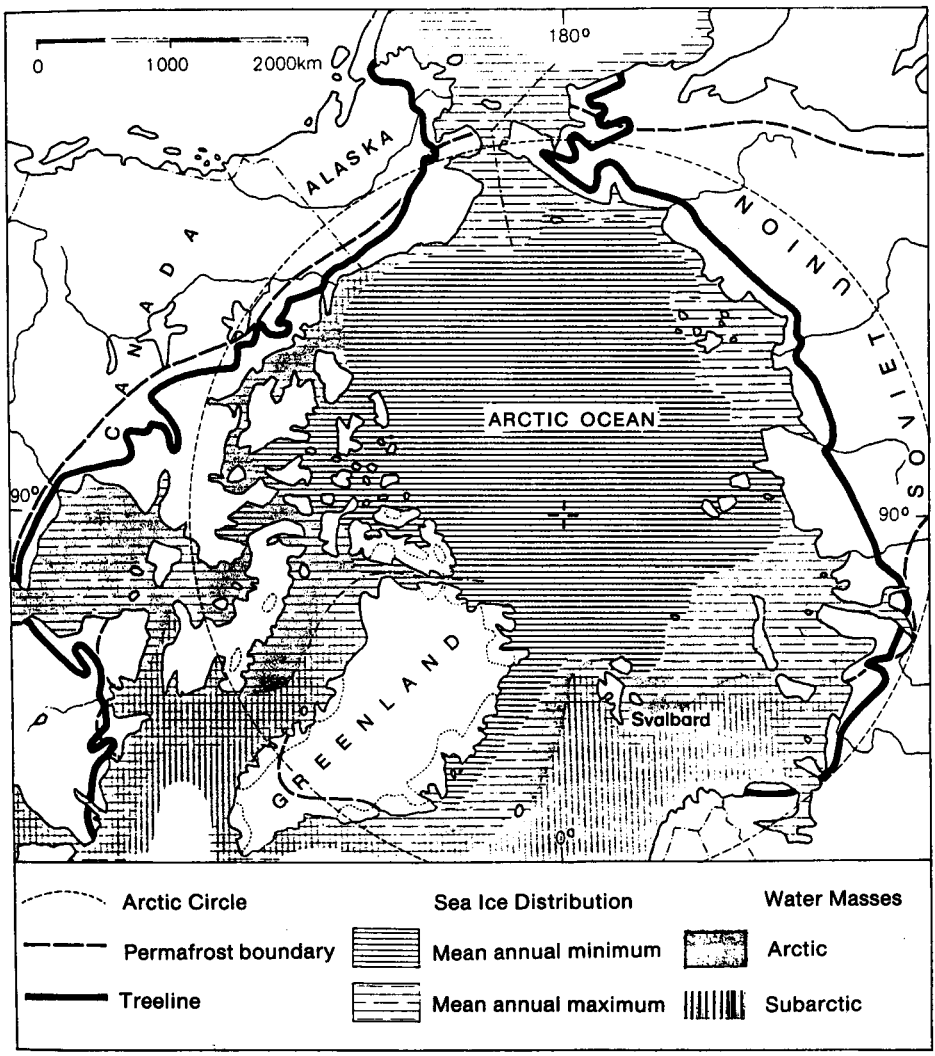

Fig. 1. Possible boundaries of the Arctic (after various authors).

vigorous growth of vegetation. The insulating effect of this plant cover leads to a southward expansion of continuous permafrost far south into the boreal coniferous forest.

On the other hand, if one concedes to vegetation conditions a significant role in truly characterizing an area, the treeline (Fig. 1), i.e., the imaginary line connecting the most northerly individual trees whose trunks protrude above the snow in winter, provides a very prominent arctic boundary. At the same time it offers the advantage that both on the ground and on aerial photos it is relatively easy to identify. This northern treeline, or the southern boundary of the treeless tundra, which is identical with it, should, however, not be confused with the forest boun-

dary, i.e., the northern boundary of closed stands of trees. Between the treeline and the forest boundary there lies the transitional zone of the forest tundra, which in North America is several hundred kilometers wide, but in Eurasia is relatively narrow. In its southern part forest elements predominate; toward the north tundra elements increasingly predominate. This treeline is interpreted as a boundary dictated by lack of heat, but despite numerous attempts no relationship between it and mean, threshold, or accumulated temperature values or any other climatic factors has thus far conclusively been identified. The commonly cited correspondence with the 10° C isotherm of the warmest month, based on an appropriately large-scale view, is overgeneralized and explanations of its deviations in terms of continental or oceanic climate influences are possible only to a limited degree. Rather, terrestrial climatic conditions, especially the cooling and desiccating effect of the wind, may be of critical influence on the smaller scale; hence the alignment of the treeline must ultimately be interpreted as the outcome of an entire array of climatic parameters. Geological/morphological or pedological factors on the other hand might play a relatively insignificant role. If treelessness is cited as a decisive characteristic of the Arctic, it should be pointed out, as a restrictive parameter, that the absence of trees is certainly a necessary prerequisite but is not in every case a sufficient reason for assigning a high-latitude area to the Arctic. It would be more correct, even if it were unusual in terms of normal usage, to speak of "the southern dwarf-shrub-tundra boundary" instead of "northern treeline." This would provide an explanation for the exclusion of extremely oceanic islands such as Iceland and the Aleutians with their treeless or at least tree-poor grassy heaths, which are assigned by many authors to the forest tundra.

The segregation of these islands is taken into account in the climatic classification proposed by Troll and Paffen, which is aligned along the lines of vegetation formations, to the extent that a special subpolar-oceanic grassland climate type (No. 14) is devised for them within the four-part "polar and subpolar zones." The clearly more continental variant of this subpolar climate, and one which is of greater interest here, namely a "subarctic" tundra climate (No. 13) with cool summers (warmest month +6 to +19° C) and severe winter cold (coldest month below -8° C), embraces the northern fringe of the continents as well as the coast of south and west Greenland. To the north an area with a polar climate (No. 12) adjoins the Canadian Archipelago and Greenland, in which the mean temperature of the warmest month remains below +6° C while a High Arctic ice climate (No. 11) occurs over ice-covered land areas such as the Greenland Ice Cap.

Thus subdivision into subarctic tundra climates and polar climate is confusing in terms of conceptualization and is not very convincing since an arbitrarily selected isotherm is identified as the demarcation line; even the frost-shattered talus zone, which is promoted as characteristic of the polar climates is not exactly felicitously chosen, since an impression of total lack of vegetation and ultimately total sterility is associated with it. In fact lichen tundra extends to drier sites and moss tundra to moister sites that are interspersed spatially through the dwarf shrub tundra occurring north of the treeline, quite apart from extensive bogs and peat fens; at least in a patchy distribution these lichen and moss tundra even

extend to the immediate vicinity of ice caps and individual glaciers. In their attempts at an internal differentiation of the Arctic according to the degree of plant cover botanists nowadays distinguish between the High Arctic (6–25% coverage), Middle Arctic (25–50%) and Low Arctic (50–100% coverage), and thereby, in my opinion, do the situation greater justice. The shortness of the vegetative period, the absence of mature soils or at least of soil-like formations and the shallow winter snow depths as a result of wind transport represent the factors that limit the vegetation. The low annual precipitations typical of large parts of the Arctic (commonly less than 100 mm) are rather of subordinate significance; due to the low temperatures evaporation is extremely low and the underlying permafrost prevents any downward percolation in summer, and hence it is only in a very few isolated valley areas that water is totally absent. Only these isolated areas possess a desert-like character with scattered occurrences of salt efflorescences at the surface and are almost devoid of vegetation (less than 5% coverage); the term "polar deserts" should be confined to them.

If one uses the treeline as the terrestrial boundary, the Arctic embraces an area of approximately 7.7 million km^2 (5.7 million km^2 of tundra, 2.0 million km^2 of ice cap and glaciers, Table 2), consisting of a narrow strip along the nothern edges of the continents and the offlying islands including Greenland and Svalbard. The fact that it deviates from any alignment with parallels of latitude, especially in the North Atlantic region, is striking; whereas the Gulf Stream transports relatively warm water to northern latitudes on the east side of that ocean, on the west side the Labrador Current, which is ice-covered for large portions of the year, as the main outlet from the Arctic Ocean carries cold water masses southward, depressing the summer temperatures of the adjacent land areas. This situation, created by the Coriolis Force, repeats itself, although it is significantly less marked, in the Bering Sea, which in total is a cold water body; comparatively warm water masses flow northward along the Alaskan coast, while colder water masses head south along the opposing Siberian coast. The example of Hudson Bay, which by late winter is totally ice-covered, reveals to what extent the sea ice, quite apart from its relatively high albedo resulting from its light surface, cools the coastal land areas until well into the summer; as it melts it abstracts from the air the energy required for intense warming, and it also operates directly through the low air tempera-

TABLE 2

Land Area of the Arctic, km^2 (after various sources)

	Tundra	Glacier ice	Total
Soviet Union	2,352,500	55,500	2,408,000
Alaska	431,000	—	431,000
Canada	2,508,900	151,100	2,660,000
Greenland	386,600	1,799,400	2,186,000
Svalbard/Jan Mayen	25,200	37,800	63,000
Total Arctic	5,704,200	2,043,800	7,748,000

tures, onshore winds, and fog and cloud formation. On the other hand, the heat absorbed by the water, although minimal, suffices to prevent early freeze-up.

For marine areas the outermost limit of sea ice cover provides a somewhat comparable arctic boundary, i.e., one which is visually equally easily identifiable. At its maximum extent (although this varies from year to year) the pack or drift ice extends south in February/March to the Gulf of St. Lawrence or the Sea of Okhotsk, whose coasts can scarcely be designated as arctic; on the other hand, coastal areas in southwest Greenland as a rule remain ice-free all year round. The minimal, i.e., perennial, ice cover is confined to the Arctic Ocean and to small areas of its peripheral seas. Thus the location of these ice boundaries (and similarly the southern boundary of arctic water masses, determined on the basis of temperature and salinity, which in any case can be delimited precisely only with great difficulty, Fig. 1) provides no possibility of tying them in with the treeline where it emerges at the coastline. This means that any association of marine areas with the flanks of the continents, which goes beyond the waters immediately bounding the arctic coasts, can thus scarcely be more than an arbitrary joining up of coastal points.

3. NATURAL RESOURCE POTENTIAL

Large areas of the Arctic thus delimited were and are the territory and area of exploitation of an aboriginal population, in whose economy utilization of biotic resources plays and will play a significant role in terms of meeting its own needs and of supplying the market, despite all the structural changes in the past. But the natural preconditions for substantial production and thus for the type and scale of this available biotic, i.e., renewable resource, potential are comparatively unfavorable in the Arctic, as is revealed by the relatively low values for the phytomass produced annually by photosynthesis in the tundra vegetation (Table 3). In terms of the order of magnitude per unit area, the annual growth rate of marine phytoplankton certainly corresponds approximately to that of net primary production on the tundra, but in connection with this it should not be overlooked that the relevant volume of ocean involved in marine production exceeds that of the soil involved in terrestrial production many times; on land the formation of vegetative matter from the leaf tips of dwarf shrubs to the ends of their rootlets occurs within a vertical range of 1 m; in the sea, by contrast, the same process occurs to the maximum depth of light penetration, i.e., to a depth of about 200 m. For reasons which have still to be explained only a few northern peripheral seas of the North Atlantic and the North Pacific with above-average values of >750 g dry mass/m^2/yr are more productive. What factors ultimately control this low plant growth have not yet definitely been elucidated: either temperature conditions in connection with the period of insolation, light intensity and heat input from outside, or perhaps more so the substantial seasonal fluctuations in the availability of inorganic nutrients, especially nitrates and phosphates which are absorbed in the terrestrial milieu from the soil, and in the marine milieu from upwelling deep-sea waters. One should not overlook the fact that apart from their direct influence on the general photosynthesis process and its duration, to quite a considerable degree

TABLE 3

Net Primary Production, g dry weight per m^2 per year (after Treude, 1982)

Tundra	4–220
Forest-tundra	350–500
Boreal coniferous forest	600–750
Temperate grasslands	150–1500
Temperate forests	600–2500
Tropical forests	1000–5000

the temperature conditions also play a role indirectly in making nutrients available. On the one hand, the correspondingly low temperatures in the protractedly frozen soil lead to a slowing of all chemical processes and to the cessation or at least reduction in bacterial decomposition and remineralization of dead organic material; on the other hand, the sea ice, which forms due to low temperatures, reduces further the incidence of light, which is already comparatively low in these higher latitudes, and during the spring melt leads to a protracted vertical stability within a relatively shallow water layer close to the surface; this stability eliminates any upwelling of water from depth. In contrast, the areas of high marine primary production mentioned earlier, i.e., parts of the Irminger Sea, the Labrador Sea, and Davis Strait, as well as the Bering Sea, are distinguished by a strong vertical circulation, caused by the mixing of cold water emerging from the Arctic Ocean with warmer currents moving in the opposite direction in the upper 200–300 m; this mixing tends toward a homogenization of the density throughout the entire water column and thereby leads to vertical movements that bring nutrient-rich bottom water to the surface, especially over the shallow continental shelf which prevents the sinking of the organic matter to greater depths.

Utilization of the nutrient energy thus made available proceeds via nutrient chains of varying lengths, commonly ending with man. During the energy transfers from one link to another, as a result of characteristic consumption a large part (80–90%) of the potential energy goes missing, i.e., the longer one of these chains, the smaller the available amount reaching the final link. The predominantly low primary plant production limits the secondary production, i.e., the conversion of plant nutrients by herbivores into animal matter, even further. At this second level, too, the temperature conditions again play a significant role, in that as compared to the temperate latitudes (and a similar thing applies correspondingly for the carnivores at the next higher level), in the Arctic, due to the lack of heat, a larger part of the energy available from food is required for processes of metabolism, and hence only a comparatively small remainder is available for growth and reproduction. This dictates that arctic animals display correspondingly low annual growth rates and at the same time contributes to the fact that they reach sexual maturity relatively late, and, moreover, do not reproduce every year thereafter. A further limiting factor is the reduction or total interruption of the availability of nutrients caused by the snow and ice cover,

which persists for many months; individual species of whales, seals, and caribou react to this with seasonal migrations to areas with more favorable nutrition outside the Arctic. True hibernation, with a drop in body temperature and slowing of metabolism, can be observed only in the ground squirrel.

In this connection one may identify as a further characteristic of arctic plant and animal stocks the striking connection between the low number of species and the simultaneous vast numbers of individuals. In explaining this the young age of the arctic ecosystem, i.e., since the end of the last glaciation, is generally enlisted; in that thus far it has permitted the development of differentially structured habitats or ecological niches only to a limited extent, so that relatively uniform living conditions prevail. In the terrestrial animal sphere this phenomenon is evident in the marked cyclical fluctuation in stocks; admittedly these are not limited to the Arctic, but they occur here in particularly striking manifestations. Explosions in the population of the lemming, a herbivorous primary consumer, are regularly followed by inevitable population crashes (with a marked 3–4-year rhythm) in the stocks of the arctic fox, a carnivorous secondary consumer; the lemming is the latter's most important prey-species. As a result of the enhanced nutrient supply the fox population also rises but then as a result of the poverty of species it can find no alternate food source. (Incidentally the fox is also the most important fur-bearing species.) Two opposing views are proposed as to the explanation of the crashes: one invokes external food shortages, predation, and disease, the other the crowding factor as an intrinsic phenomenon whereby high population pressures lead to psychological stress. It is occasionally suggested that the caribou is also subject to natural variations in stocks of this type, with a cycle of several decades, but so far this has not been proved.

Hence it is important not to confuse the biomass available at a particular point in time with productivity, and to realize that the temporarily low population densities of individual arctic plant and animal species must be seen against the background of low annual growth rates and general longevity, i.e., they must be interpreted as the result of annual production over 20 years or more. With any utilization of these stocks, however it is composed, one must bear in mind that they are not in a position to provide a steady yield over the long term and generally are very susceptible to the risk of overgrazing, overhunting, or overfishing, from which they will recover only correspondingly slowly.

Although at present the mineral resource potential of the Arctic has been hitting the headlines, more and more often in evaluating it too, sober caution is advisable. That occurrences of minerals exist in the form of numerous economically very interesting deposits in variable spatial concentrations has long been demonstrated, or may be anticipated on the basis of the existing geological structural units. Three major geological/tectonic units extend northward into the Arctic: the Precambrian crystalline shields, the sedimentary complexes of the table-lands that surround them and in part overlie their margins, and the marginally located mountain belts of the Caledonian, Variscan, and Alpine orogenic cycles. We will forego a description of their occurrence as known at present on the basis of the close

relationship between their position and the controlling geological-tectonic processes and structures; it should suffice to point out in particular the enormous extent of the sedimentary basins (cf. Fig. 6) whose oil and gas potential is currently being explored in many places.

Any attempt at estimating, with even some slight degree of accuracy, the magnitude of arctic mineral resource reserves has to take into consideration the fact that both economic and technological developments dictate their possible exploitability and hence their categorization; price increases provoked by natural or even artificial shortages suddenly make mineral occurrences economically interesting and means of exploitation usable which previously had remained unconsidered as being nonviable. Thus, for example, one may deduce that the development of the oil occurrences at Prudhoe Bay, Alaska, would not have been successful without the oil crisis of the early 1970s. This point of view is precisely of significance to the Arctic in that here, due to the comparatively extreme natural conditions and the widespread lack of any infrastructural facilities, the costs of developing, extraction, and transport attain levels that appear tolerable only at corresponding world market prices; hence resource development in the Arctic occasionally may acquire a speculative character. Nowadays the view is generally held that the present prominent development of the energy and mineral resources of the Arctic, including the building of the necessary transport systems, will be considerably strengthened in the near future.

4. TRADITIONAL LIFESTYLES AND ECONOMIC ACTIVITIES

If one accepts the equating of "traditional" with "pre-European" as is commonly used in the literature, one creates the false impression that prior to the first encounter with or prior to the first impact of European or Euro-American cultures, the indigenous cultures involved relatively static systems optimally adapted and adjusted to arctic environmental conditions, yet at the same time one overestimates the results of the first contacts. In fact, if one makes this equation, one can easily overlook the fact that the indigenous cultures were already harnessed in a network of both ecological and socio-cultural forces, originating both internally and externally, which produced a continuous transformation. This process undoubtedly experienced a strengthening from the earliest beginnings of the involvement of the indigenous economy with world economic systems, but it did not attain its culmination until after the Second World War.

The still largely dominant subsistence economy was more than simply a guarantee of survival through exploitation of minimal surpluses: It was synonymous with being tied into a system which rested *inter alia* on the sharing of work and collaboration, kinship links, sharing obligations, and risk minimization based on the principle of insurance based on reciprocity. Even though they have experienced a not-inconsiderable expansion and overimprinting by the addition of occasional market-oriented branches, the lifestyles and economic models of the Arctic thus far still remain, in essence, largely definable as "traditional."

4.1 The initial pre-European situation

Quite commonly, in terms of their economic alignment and spatial arrangement the pre-European cultures displayed a clear bipartite division. In northern Europe and northern Asia, as far as about the mouth of the Kolyma, reindeer nomadism formed a critical element, even if not in every case the most important one, in an extremely widely branching economy. Among the Komi (previously known as Zyryany), the Nentsi (Yurak-Samoyeds), Nganasany (Tavgi-Samoyeds), Yentsy (Yenisey-Samoyeds), Dolgany, Eveny (Lamuty), Yakuts, and Yukagirs, reindeer herding on the tundra and adjacent forest tundra was generally combined with hunting wild reindeer and fishing; among the Nentsi (or at least some of them) it was also combined with sea mammal hunting. This pattern continues among the Reindeer Chukchi and Reindeer Koryaks, with the exception of the immediate coastal area, as far as the extreme northeastern tip of Siberia. In the coastal zone of northeastern Siberia east of the mouth of the Kolyma, as well as in Alaska, northern Canada, and Greenland, sea mammal hunting predominated among the Coastal Chukchi, the Coastal Koraks, and the Eskimo, this too being generally associated with the hunting of wild reindeer (caribou in North America) and fishing. A special position within this region was occupied only by isolated Eskimo groups in northern Alaska and west of the Hudson Bay who displayed an overwhelming inland orientation based on caribou hunting.

This inevitably relatively coarse structural and distributional model, which leaves aside local special forms, but which endured until after World War II and still endures, with certain modifications of subsistence economy activities, is certainly not the result of a centuries-old arctic adaptation but owes its origin to certain ecological and cultural stimuli that occurred just before or simultaneously with the arrival of the first Europeans, but were not produced by them. The nature and extent of these changes, meanwhile, at least in terms of the Eskimo ecumene, can be determined archeologically. Over the course of the 17th century the so-called Thule Culture, which had spread over the area from the mouth of the Kolyma to eastern Greenland as a result of an expansive cultural development, was deprived of its economic basis when the Thule people had to abandon hunting the great whales, i.e., the Greenland or bowhead whale, which is one of the baleen-whales. This collapse of the Thule economy, and with it the disintegration of the Thule Culture, was primarily caused by a climatic deterioration leading to the so-called Little Ice Age (1550–1800) which, as result of a spatial and temporal increase in sea ice cover, constrained the whale migrations and thus the accessibility of the whales to the Eskimo hunters. One must assume that the activities of the European whalers produced a simultaneous reduction in whale stocks. A single whale produced about 8000 kg of meat and edible intestines, as well as 11,000 kg of blubber and hence the abundant yields from whaling had permitted the establishment of large, permanent settlements with semi-subterranean houses. But the switch to the intense use of seal stocks which now became necessary (along with caribou hunting and fishing) and the greater spatial mobility which this required led to a preference for snow houses that could be quickly constructed, in association with the practice of communal hunting of seals at their breathing holes on the sea

ice. The transition was eased by the circumstance that with the stronger ice cover the living conditions for the seals and hence their numbers improved relatively; there emerged the "traditional" Eskimo economy with the combination of winter seal hunting on the coast and summer caribou hunting inland. This Eskimo lifestyle and economic model, with which the first Europeans came in contact, was just a pale reflection of the richer Thule culture.

Whether the identifiable decimation of the stocks of wild reindeer in northern Eurasia was caused by population dynamic effects, climatic changes resulting from the Little Ice Age, or a possibly relatively early introduction of firearms can probably no longer be established. But there is much to suggest that the hunting cultures of this area, which evidently had already been familiar with the use of reindeer as decoys and work animals, switched to true reindeer herding, i.e., the keeping of semi-domesticated reindeer as the main source of livelihood, only relatively late due to the decline of the wild reindeer stocks; the Nganasany were probably the last, as late as the middle of last century. As far as possible the hunting of wild reindeer and fishing were continued as the next-important branches of the economy. In the course of large-scale displacements of population the Nentsi may have brought reindeer herding from the *tayga* of southern Siberia to the tundra, or may correspondingly have developed it further. The sea mammal hunting mentioned earlier may indicate that an earlier coastal-dwelling population may in part have been assimilated in the process. The latter applies also to the hunting-oriented Chukchi and Koryaks, some of whom switched to reindeer herding in the interior, while the remainder overlapped the coastal areas inhabited by the East Siberian Eskimo and adopted sea mammal hunting.

A characteristic common to all the groupings was a nonsedentary lifestyle and economic model, whereby dwelling sites were moved depending on the spatial and temporal variations in available resources and the use of animal resources permitted a largely autarchic economy.

4.2 The first initiatives oriented to the world economy

Encounters with European seafarers and explorers who were searching for a Northeast or Northwest Passage left no detectable influence on the cultures of the arctic peoples; wood and metal obtained by barter or salvaged from wrecked ships were adopted in only a few places for the production of traditional weapons and tools. But the references to rich stocks of animals contained in the travel accounts gave an impetus to the utilization of arctic biotic resources, while information on the previously largely unknown indigenous people aroused the interest of missionary societies and national administrations. Thus a process of gradual reshaping of the indigenous cultures was set in motion, spatially and temporally conditioned in each case depending on the contact, the type of interest, and its intensity. Only a few of the economically important aspects will be discussed below.

4.2.1. Arctic whaling. The first phase of commercial arctic whaling began with the voyage to Svalbard of two English ships specifically equipped for this purpose

with Basque harpooners in 1611. This was the so-called bay fishery; a little later the Netherlands was also participating in it, and quickly rose to become the leading whaling nation. Soon Denmark, France, and Spain were also involved and also, from 1644 at the latest, Hamburg, which was undoubtedly the most active of the German coastal cities in this sector of economic activity. At first the Greenland whales, occurring in large numbers, could be killed near the shore in the bays and could be processed at land stations; but from about 1650, due to overexploitation in the nearshore waters, there was a switch to the so-called deepsea or ice fishery, i.e., to the catching and processing in ice-infested waters farther from shore, initially around Svalbard and along the eastern Greenland coast, but later, from 1719 onward, increasingly also in the western Greenland waters of Davis Strait. Thus for the first time commercial whaling intruded into the ecumene of the indigenous population (Fig. 4). When the British assumed the leading role around the beginning of the 19th century, whaling spread to the west side of Davis Strait, with American ships also becoming involved from 1845 onward. From about 1820 the Americans hunted the same species (known here as the bowhead) in the Bering Sea and then opened up the rich whaling grounds in the Chukchi and Beaufort seas.

From 1870 onward, with the rise of petroleum products, the price for whale oil dropped, but due to the enormous profits from baleen production, whaling was intensified even more. It was not discontinued until about 1910 when the elastic baleen was replaced by steel springs and synthetic materials; but simultaneously the stocks of the great whales in the Arctic had largely been exterminated.

The whaling ships began wintering from about 1850; this allowed them to prolong the whaling season and, after the switch to steam ships, to reduce their costs. This practice, in particular, led to closer relations with the indigenous population. Reciprocal dependence formed the basis of all these contacts, in terms of the supply of food. In the fall Eskimos and Chukchi provided large amounts of fresh meat, especially caribou, as well as furs and skins for the production of winter clothing; in return during the food shortages that commonly occurred in late winter they could count on the support of the whalers. The resultant barter and trading arrangements increased in scale over the years with the decline in the yields from whaling; they embraced baleen and whale oil, walrus ivory as well as furs and hides, all of these being exchanged for guns, ammunition, steel traps, etc., but also for household items and clothing as well as beads, tobacco, and alcohol. In the interst of maximizing returns it is quite understandable that the whalers arranged for indigenous crews independently to operate whaleboats that they had brought north. Rifles and whaleboats were integrated into the traditional branches of production wherever they offered advantages on the basis of their greater reliability and range. Simultaneously both introductions led to changes in socio-economic systems—to mention only the most critical results. Whereas the adoption of rifles led to a reduction in cooperative hunting of caribou or seals and thus led increasingly to individualization in the traditional branches of the economy, the whaleboat led to an intensification of communal hunting of walrus and the smaller whales.

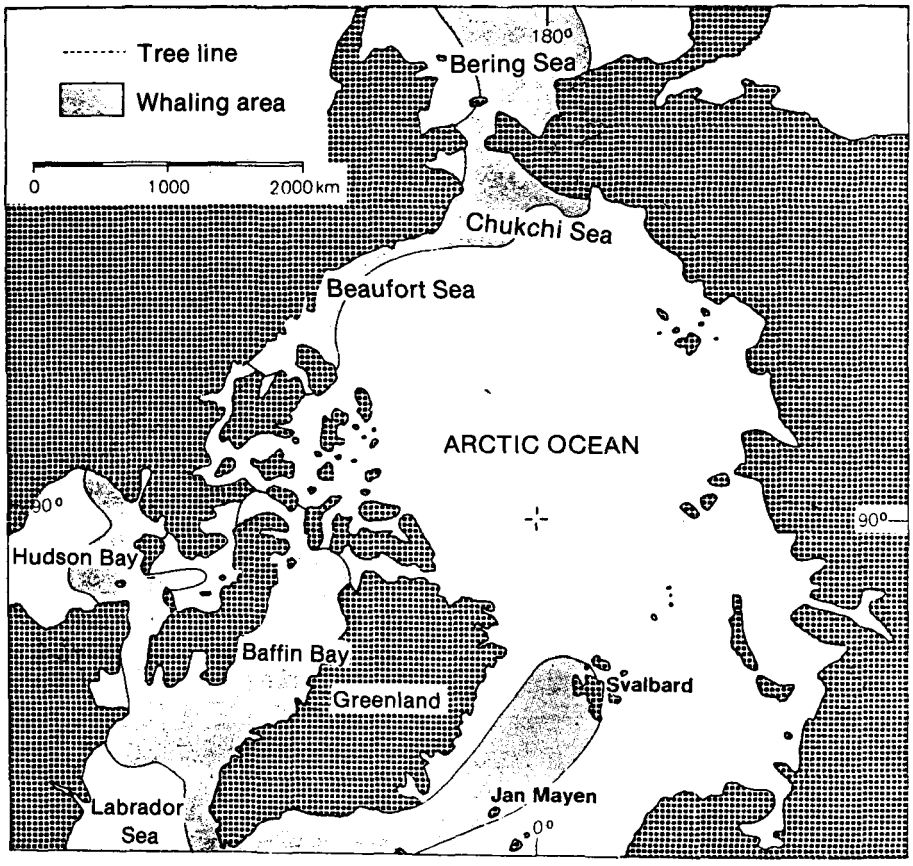

Fig. 2. Areas of commercial whaling in the arctic seas.

4.2.2. The fur trade. The Russian conquest and opening-up of Siberia, which occurred within a few decades in the 17th century, were based on the fur riches of the area. One cannot make any definite statement as to the extent to which at this early stage trade contacts were already established with the Eurasian arctic peoples and to which these latter participated in the exchange of indigenous products for foreign goods. The interest of the fur traders, fur trappers, and the Cossacks who collected tribute for the Moscow Tsars in the form of furs, all of them pushing eastward mainly via the river systems, lay predominantly in the sable, whose range is confined to the coniferous forest zone. Certainly numerous trading expeditions were already being dispatched along the arctic coast by the first half of the 17th century, the best known probably being that in which the Cossack Dezhnev participated. The latter sailed around the eastern cape of Siberia, later named after him, in 1648 and landed south of the Anadyr. But the real aim of these undertakings must have lain in the forest regions along the middle and upper courses of the rivers, and less in the tundra and forest tundra. Despite this, one may proceed from the fact that arctic fox pelts and walrus ivory could be disposed of by the tundra inhabitants in sufficient quantities to cover the initially very

limited needs of the indigenous people. On the other hand it is certain that from the mid-seventeenth century, i.e., about 100 years before the Russian fur traders and trappers reached Alaska, or about 50 years prior to the founding (1799) of the Russian American Company which was granted a trade monopoly there, European goods were reaching northwest Alaska from the Chukchi and Eskimos of northeastern Siberia via the Diomede Islands and Seward Peninsula. By the middle of the 19th century this barter trade, handled by intermediaries, had reached a scale which gave the Russian American Company cause for concern; that concern was strengthened by the appearance of the whalers in the Bering Sea and by the expansion of the Hudson's Bay Company from western Canada.

In the case of the Canadian Eskimos contacts with trading posts located outside the Arctic were well established from the middle of the 18th century onward. It was only with the appearance of the whalers that the locus of trade migrated into their own ecumene, and it remained there even after the demise of whaling. When the prices for arctic fox pelts suddenly rose from about 1900 onward, the Hudson's Bay Company expanded into the area in the shortest possible time and established a dense network of trading posts. Of the numerous competitors of the Hudson's Bay Company I will mention here only the Herrnhuter Brudergemeinde (the Moravians), operating out of Germany, which from 1771 maintained mission and trading stations on the north coast of Labrador, relinquishing their trading function to the Hudson's Bay Company only in 1926.

From about 1670 the Dutch in particular had regularly made trading voyages to the west coast of Greenland and had also caught whales there; the Danes broke off these contacts when they took possession of the island in 1721 and developed trade through their own settlements; they left the whaling industry undisturbed.

As distinct from whaling, whose direct impact was felt only at widely spaced points, but the trading activities of which could result in a regional impact through the efforts of intermediate traders, fur trading must be seen as a phenomenon embracing large areas. Through it the possibility of acquiring firearms was felt throughout the Arctic, but at the same time this implied the obligation to make increased efforts at trapping furs, since without regular supplies of ammunition a rifle represented at best an unproductive prestige object; its increased use admittedly led initially to considerable increases in yield but ultimately to overhunting and in part to the elimination of caribou stocks. The abandonment of the communal execution of economic activities, mentioned earlier, was intensified even more by the parallelly occurring gradual intensification of trapping. Dependence on this single branch of livelihood, which was alone capable of providing a product that could be exchanged for foreign goods, increased, and with dependence on trapping arctic foxes there was also an increase in dependence on the predictable cyclic fluctuations in fox populations, on the one hand, and the unpredictable price fluctuations on the world market, on the other (cf. Fig. 3). An initial price collapse as a result of the Depression and another after the end of World War II led to the fur trade losing its fundamental importance.

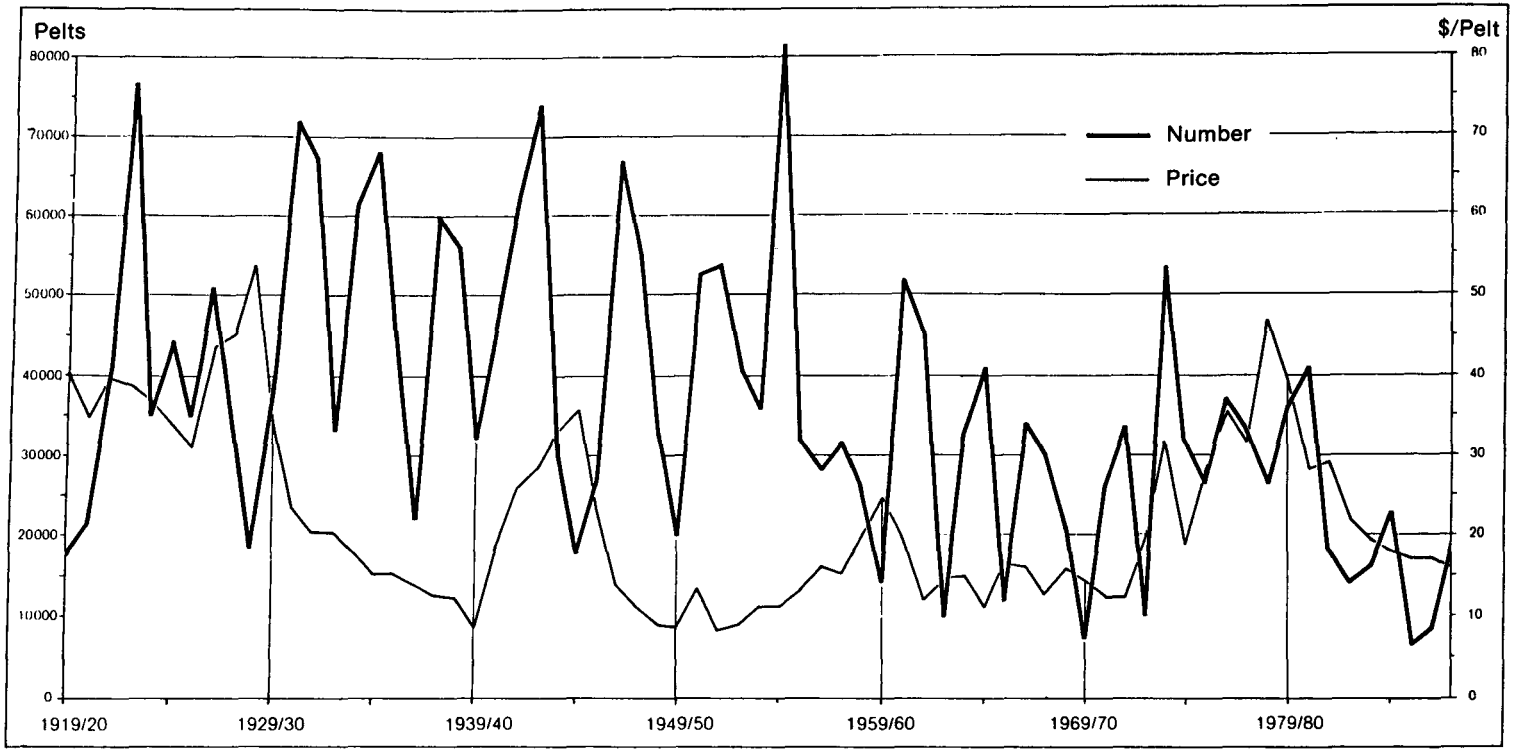

Fig. 3. Arctic foxes trapped in Canada 1919–1920 to 1987–1988; numbers and average price of pelts reaching market (according to Statistics Canada data).

4.2.3. Export-oriented fisheries. In their efforts to expand the basis of existence of the Eskimos of northern Labrador the Herrnhut missionaries succeeded in persuading the members of their congregations to engage in cod fishing, which had not previously been practiced. Initially the mission purchased the dried, unsalted fish in large quantities, and then, in late winter, during the regularly recurring food shortages they sold it back to the people or gave it away. From the mid-nineteenth century the cod was also purchased as so-called "Labrador fish," i.e., heavily salted dried fish, for export to Europe. Since 1926 marketing difficulties have made this fishery practically insignificant.

First attempts at commercial exploitation of the fish stocks of southwest Greenland were repeatedly made by the Danes from 1828 onward; they involved initially arctic char, halibut, and black halibut; they were generally only short-lived because government authorities were afraid that effort would be diverted from the dominant seal hunt. In 1910 a commercial fishery, focussing on the cod, was simultaneously introduced officially at several places, and was intensified in subsequent years. This derived from the desire of the Danish administration to provide income opportunities for that part of the population that could not live from seal hunting. Over the period 1910–1920, however, the background conditions for seal hunting deteriorated due to a steady rise in water temperature; but there was a massive influx of cod. As a result, despite a persistent uncertainty with regard to the permanence of the hydrographic and hence marine biological conditions, the entire southwest coast was covered with a relatively dense network of fishing stations. The cod fishery, which until the end of World War II focussed on the production of dried and salt cod, quickly evolved into the main source of livelihood.

The development of a new preserving process, i.e., canning, made possible the widespread utilization of the salmon stocks of southwestern Alaska. The first canning plant began operating in Bristol Bay in 1884 and numerous other plants followed within a few years. The bulk of the necessary labor force was regularly brought in: Euro-Americans to handle the fishing, then Chinese and later Filipinos and Mexicans to process the catch. Why the Eskimo found employment in only extremely small numbers cannot unequivocally be explained. Difficulties in adjusting to the work rhythm or a lack of interest in steady employment, even if limited to only two months, may have a bearing from the point of view of the Eskimos, along with general prejudice on the part of the entrepreneurs. It was only the perceptible shortage of labor during World War II that led to increased participation of the indigenous people in the commercial salmon fishery.

4.2.4. Reindeer and sheep herding. Whereas traditional reindeer herding, which dominates northern Eurasia, was predominantly subsistence-oriented until the middle of this century, the introduction of this economic activity into North America was based on the intention that the herding families would cover their needs by supplying the market.

Between 1892 and 1902 the American government introduced a total of 1280 Siberian reindeer into Alaska, with the declared aim of supporting the livelihood

of the Eskimo by way of reindeer herding, after the model of the Chukchi (see Fig. 4). Although the need for such a step is disputed even now, it should be noted that the integration of this stock-raising branch of the economy into the otherwise hunting-oriented economic system of the Eskimo was implemented without problems. Difficulties arose from organizational uncertainties and from the high reproductive rate of the animals. By 1915 there were 70,000 and by 1922 260,000 reindeer; one-third of these was owned by the government, individual mission stations, by Lapps who had been hired as instructors, or by Euro-Americans, but two-thirds were owned by Eskimos. The latter covered not only their own needs and the local market but were also able to export to the USA on a limited scale. This obvious success, specifically in terms of the export market, led to the formation of a Euro-American company that (despite some legal wrangles) acquired animals and grazing rights between 1914 and 1929 and thereby ultimately contributed to the later collapse of the Eskimo reindeer economy. By 1932 there were about 375,000 animals in Eskimo herds, whereas the company owned around 250,000; but accurate numbers are no longer available for this period.

Arguments over grazing rights and a division of the increase in the frequently badly mixed herds which was satisfactory to all sides, the cessation of trapping, which had been pursued in parallel after the collapse of prices for arctic fox pelts, a glut of the local market, and a perceptible decline in exports provoked by opposition from American cattlemen led to a general decline in interest. The introduction of extensive forms of herd management and, in association with these, a marked increase in caribou herds, losses through disease, predation and poaching, but possibly also excessive exploitation of the herds led to a drastic decline in the reindeer stocks. When the government purchased the herds of non-Eskimo owners in 1940, only 84,000 animals were recovered. The planned restoration of the reindeer economy was postponed due to the entry of the USA into the war; defense programs with their high wages lured more herders and herd owners away; the demand for winter clothing reduced the stocks even more, and by the end of the war there were scarcely more than 25,000 animals available to form the basis of a new start.

The Canadian reindeer industry, whose initial phase falls within the time period under discussion here, displays certain parallels, although they are temporally offset, as compared to the developments in Alaska even though the phase of non-Eskimo competition is lacking. In 1929 the Canadian government bought 3400 reindeer in Alaska; in 1935 the herd of 2370 animals, accompanied by Lapps and Eskimos, reached the preselected location on the east bank of the Mackenzie River. It was hoped that the introduction of reindeer herding would give the Eskimo economy of the entire Canadian western Arctic, badly hit by the price collapse in the fur trade, a new, solid, and ultimately market-oriented base. The project began with a great deal of promise, with the establishment of two Eskimo-owned herds, but it suffered a severe setback when the managers of both herds died in 1944. Fur trapping, which briefly became attractive again during the war years, complicated the recruitment of suitable herders in sufficient numbers and hampered a rapid expansion after the Alaskan model.

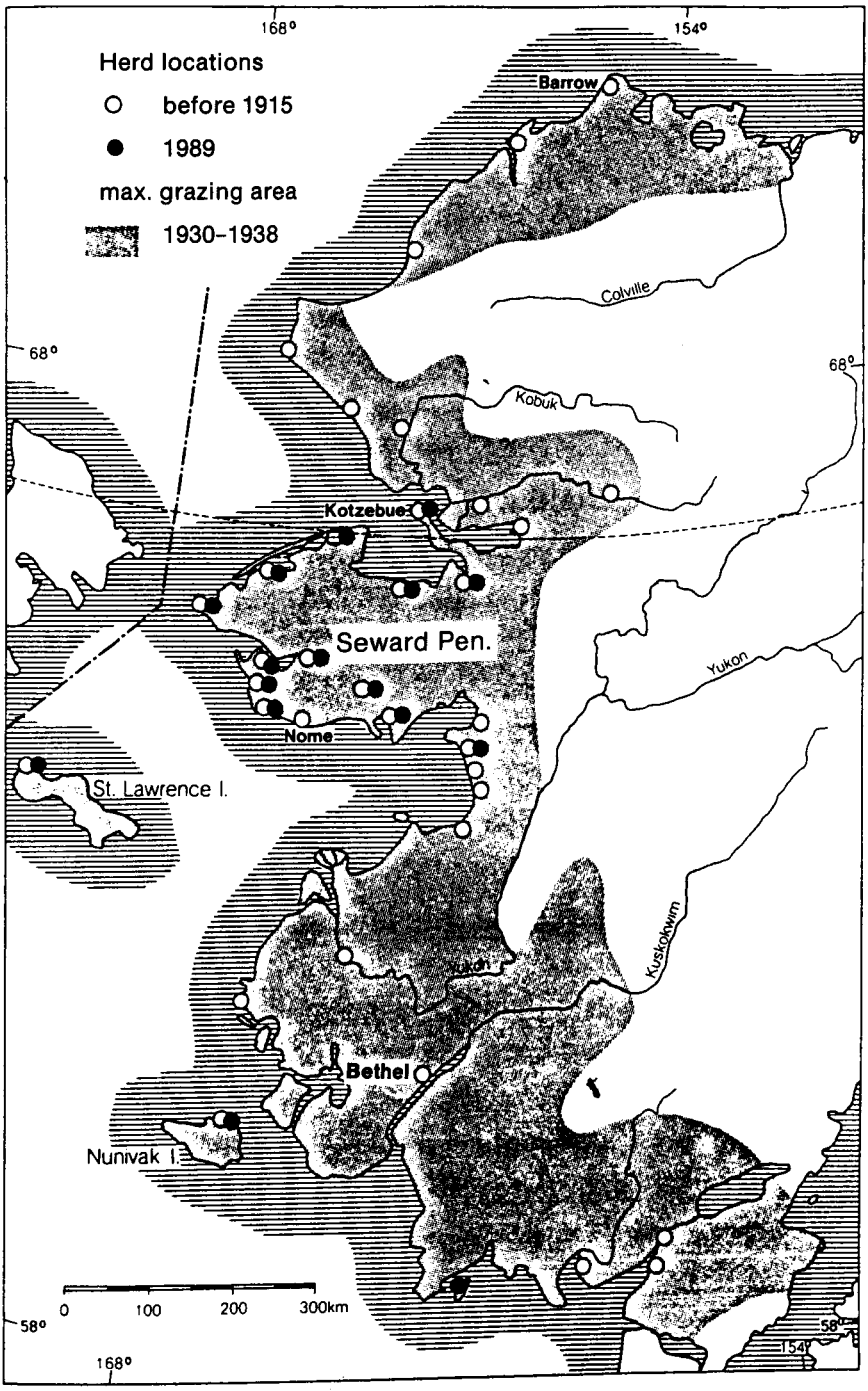

Fig. 4. Reindeer herding areas in arctic Alaska 1914 and 1989 as well as maximum use of the grazings, 1930–1938.

As in the case of the introduction of reindeer herding into Alaska, a priest also played the role of innovator in organizing sheep-herding in Greenland; in 1906 he introduced 30 Faeroese sheep to the extreme southwest of the island as a breeding flock, and breeding animals from this flock were given to individual Greenlanders. His success encouraged the Danish authorities to buy 175 sheep in northern Iceland in 1915; these were superior to the Faeroese animals both in meat yield and in robustness. An experimental station was established in the climatically most favorable area. In some years foehn winds permitted year-round grazing in the inner fiord areas, but in snowy or particularly cold winters arrangements had to be made to feed the sheep inside barns. The main aim of the sheep-rearing was, and is, to raise lambs for slaughter, with wool production being a secondary aim. Despite occasional catastrophic winters, during which a majority of the ewes died, this branch of activity displayed a continuous growth; by 1945 stocks had attained about 16,000 ewes and about 7500 sheep and lambs were slaughtered in that year.

5. POPULATION, SETTLEMENT AND ECONOMY UNDERGOING STRUCTURAL CHANGE

In discussing the changes in population, settlement, and economy that can be observed throughout the Arctic since World War II, one is touching only on partial aspects of a change that embraces this entire area of the ecumene equally. On the basis of the low population and the limited local buying power even this structural change is just as externally controlled and induced from the outside as the overstamping, already described, of those activities essentially still oriented to a subsistence economy; however, it is now exclusively national governments which introduce these measures.

It is only in the case of the Soviet Union that these governmental efforts represent a resumption and strengthening of activities slowed by the war. As early as 1924 the very influential "Committee for the Advancement of the Peoples of the North" was instituted with the declared aim of promoting development in the areas of administration, economics, culture, health care, and the law. In the early 1930s the old administrative divisions were abolished and a new arrangement into National (since 1977 Autonomous) Oblasts and Autonomous Soviet Socialist Republics was created which through its impressive terminology created an impression of self-determination that in reality did not exist, and was probably not even intended. This same period, however, saw the spread of governmentally enacted collectivization to the hunters and nomads of the Arctic. In view of the sometimes bitter resistance, especially on the part of reindeer owners, who in some cases opted to slaughter their animals rather than to transfer them to communal ownership, associated with simultaneous sedenterization, initially the Soviets contented themselves with an intermediate form, whereby the animals remained in private ownership but were herded communally; but then in the 1940s true collectivization began and was completed only in the early 1950s.

World War II brought an end to all Danish efforts to hermetically seal off the colony of Greenland from all external influences in the interests of a slow and

undisturbed development. With the German occupation of Denmark the link with the mother country was broken; the Americans who saw Greenland, in keeping with the Monroe Doctrine, as belonging to their sphere of influence, took over the supply of the island and made the Greenlanders familiar with pretensions and ideas that made a return to isolation after the war impossible. Denmark made allowance for this changed situation politically; Greenland's colonial status was abolished and in 1953 it was made a province with equal rights, whereby the Greenlanders were given equality with Danes. At the same time Denmark also assumed the obligation to strive to raise the Greenlandic living standard to that of Denmark.

In contrast to the situation in Greenland, where the few American airfields and radar stations were consciously built without the participation of the indigenous population, in Alaska, after the Japanese invasion of the western Aleutians, the construction and maintenance of the innumerable military establishments opened up an almost unlimited access to well-paid employment opportunities for the Eskimos; since 1924 they had possessed all the rights of U.S. citizens and served in military units. When the majority of these installations were closed at the end of the war, there were no longer any permanent jobs available on any significant scale, but a return to prewar sources of livelihood was simultaneously excluded. In this situation the government was challenged to identify new sources of income and to reduce the difficulties of adjustment.

In Canada the military presence was confined to a few locations in the eastern Arctic where airfields were established for the delivery of aircraft via Greenland, Iceland, and Scotland to the European war theater and in this connection Eskimos in limited numbers became familiar with wage employment. The later involvement of the government certainly cannot be traced back to the stimulus or claims of this work force, but was caused by Canadian and foreign press reports which, on the basis of the judgments of construction and Air Force personnel, pointed out the partly suspicious neglect on the part of the Canadian government in caring for the Eskimo population. Whether, as is occasionally asserted, government attitudes in the USA and Canada, possibly unknowingly, also played a role, in that a repeat of the mistakes made in handling the Indians should be avoided at all costs, must remain undecided.

Despite differing incentives and motivations, one can identify in the case of all four governments an effort to introduce measures considered necessary for the improvement of the economic and social situation of the arctic indigenous population. Even if these in part clearly diverged from each other in terms of scale and intensity, they display, at least in terms of design, a common beginning: Absolutely no new area-specific models were set up for the development that was being aimed for; instead the developers dusted off models that had been tried and tested in the south. But even if development models relevant to the Arctic, if necessary to be previously tested within the framework of pilot projects, were not conceptualized, it deserves at least to be stated that until about the early 1960s the traditional structures to a certain degree were respected in part or were even

actively encouraged, until the previously engendered pressure for change turned out to be too strong.

Of significance in this regard are primarily the measures to improve health care for the population. The forced establishment of hospitals or nursing stations and the subsequent implementation of campaigns against the widespread disease of tuberculosis contributed decisively to the gradual lowering of the high death rates, especially infant mortality. As a result, on the basis of the parallel high birth rates which occurred, rates of increase sometimes in excess of 40% began to occur in the 1950s and 1960s. One may assume that this development, which revealed itself so clearly in Greenland, Canada, and Alaska, also occurred in the Soviet Union, even although losses of population due to assimilation disguise the picture. The size of families and the number of individuals to be supported by the head of the family increased, a trend that has been reversed only since the early 1970s as a result of governmentally encouraged birth control; the number of individuals of working age rose significantly. Extensive house building programs were implemented by the four governments, not least from the recognition that the high infant mortality rate and the incidence of tuberculosis could be permanently lowered only when living conditions were decisively improved.

In the process of making government social services available, an element has emerged increasingly since the early 1950s—one which until now has played a significant role in arctic economic life. Expenditures on support for the needy were not new in themselves, and certainly it cannot be disputed that the receipt of these services, which mainly take the form of allocations of provisions, is absolutely essential to ensure economic survival in the majority of cases. But it cannot be overlooked that the readiness and the scale with which this support was provided frequently had a negative impact on the intensity of utilization of natural resources and in many cases completely eliminated the drive toward developing any initiative.

This implementation of government social programs, through their impacts in terms of population dynamics and the guarantee of material goods, led to wide-reaching changes in the distribution of population and settlements. As a sign of the increased government presence, centrally located settlements, central to a number of small settlements, which until then had consisted essentially of a trading post and (with the exception of the Soviet Union) a mission station, were expanded by the addition of central institutions such as a hospital, school, etc. The decreasing returns from hunting for the settlements, resulting from a growing population, on the one hand, and the payment of social assistance, the provision of educational and especially medical facilities, as well as the existence of wage and work opportunities in the central settlements, on the other, led to the abandonment of the smallest settlements, which had been dispersed throughout the resource area that originally had supported them, and to migration to the central places. The term "town," as applied to some of these destinations, is generally an expression for a moderate of degree of centrality, i.e., one covering a fairly large administrative unit; it should not deceive one into thinking that in view of the

small average size (in 1989 of Greenland's 19 "towns," for example, the average size was 2441 residents, whereby the smallest totalled only 3 residents, and the largest, the capital, Nuuk, 11,957; Fig. 5) the characteristic essential criteria required for this settlement type existed in every case from the beginning.

Until the late 1950s this undirected process of concentration was more tolerated by government than encouraged; in Canada, with allusion to inadequate guarantees of a livelihood in the central places, the process was even discouraged. In the Soviet Union, admittedly, by 1951 all nomads had been promised high credit if they became sedentary, but that this program had only limited success is proved, on the one hand, by government efforts to facilitate the migrations accompanying the herds, which traditionally had been carried out in family units, and on the other hand, by the resolutions of the Soviet of the USSR in 1960, whereby all nomads were to be made sedentary within 3 years. The proposal put forward in 1960 for a 10-year development plan for Greenland (1966–1975), the so-called "G-60 Plan," which apart from a strengthened buildup of the fishery, foresaw a major concentration of the population, also coincided to some degree with a rethinking of the situation in Canada and Alaska. The primary rationale behind the preference for and subsidizing of the central places, which now began, was the desire to reduce dispersal and thus encourage greater efficiency in terms of government measures; but undoubtedly a secondary rationale was also an interest in a far-reaching simplification of administration. Apart from a very few exceptions the "settlement" ceased to exist as a place without any central institution; the resource area belonging to the settlement generally continued to be exploited from the new settlement location, even if in a definitely more extensive manner.

It scarcely needs to be especially emphasized that even families living principally from hunting and trapping required an absolute minimum cash income to procure foodstuffs, equipment, ammunition, etc. With the collapse of fur prices they no longer had a product, the sale of which would allow them to make the necessary purchases. The brisk amount of building activity in the central places and the necessary maintenance and upkeep of the inventory of buildings, the existing small fish processing plants in some regions, and also the assumption of certain administrative activities offered the Eskimo population of Alaska, Canada, and Greenland both short-term and permanent job opportunities; this had the effect that the basis of the economy oriented to acquiring cash income unequivocally shifted to wage employment. The organization of the arctic hunters and nomads of the Soviet Union into *kolkhozy* and *sovkhozy* also transformed these people into wage and salary earners.

From the realization that the number of jobs could not be increased as much as one might like, even if one succeeded in filling positions initially occupied by Europeans and Euro-Americans (administrative posts, technicians, teachers, etc.) with indigenous workers, and from the realization that the possible job opportunities lagged far behind the population increase, governments had to strive to improve the income levels of the indigenous population by means of suitable measures, to minimize the susceptibility of their economy to crises, and to prevent

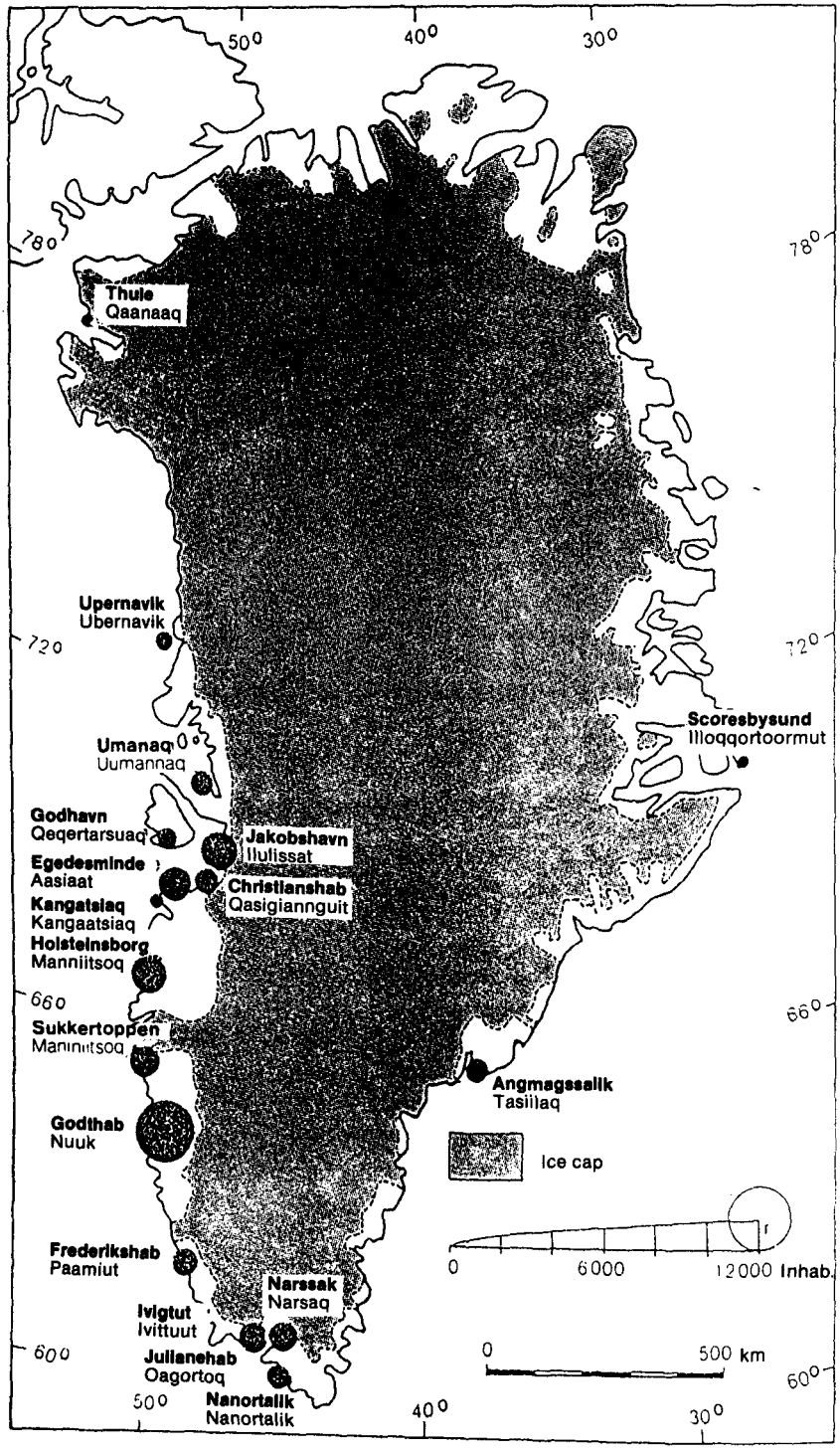

Fig. 5. Locations and populations of Greenlandic "towns," 1989.

the total dependence on social assistance which was threatening in so many cases. The necessary raising of the general standard of living was to be attained by a reactivation, intensification, and in part a reorientation to the market-economy of branches of the economy which were already practiced as well as through the introduction of other export-oriented branches, such as by the expansion of commercial fisheries or the introduction of arts and crafts.

In the Soviet Union and Canada, and to a lesser degree in Alaska, cooperatives formed by those involved assumed the implementation of some of these measures, but these cooperatives differed greatly among themselves in terms of institutional structure, being either pseudo-cooperatives with compulsory membership or "true" cooperatives developed through a voluntary alliance. The first category embraces the collectives (*kolkhozy*) created throughout the entire Soviet Arctic up until the early 1950s; these bodies formally utilized land which was owned by the state but which was transferred to them for their gratuitous and unlimited use, after the manner of a producers' cooperative, whereby the income realized was distributed according to the work contributed. In accordance with the dogmatic conviction as to the superiority of large-scale operations in the 1950s the small individual *kolkhozy* were combined into large *kolkhozy*; of particular interest in this connection is the fact that in many cases *kolkhozy* oriented exclusively to hunting were combined in a single operation with *kolkhozy* oriented to reindeer herding. At the same time some of the new large *kolkhozy* were transformed into *sovkhozy* or state farms. In terms of what is of interest to us in this review it is significant that thereby corporate bodies became available which, in terms of their organizational form and size, could facilitate the introduction of new branches of economic activity. As the task of herd management was confined to the brigades entrusted with that task, a sufficient labor force became available for new initiatives in the areas of fishing, hunting, or even fur-farming, as funds became adequate for these experiments.

In Canada, Eskimo cooperatives emerged from 1959 onward as instruments of economic development of the area by way of government-controlled (and often also church-controlled) enterprises in all the central places. Initiated, as a rule, to execute a specifically delimited project, e.g., the production, purchase, and marketing of handicrafts, within a few years the majority of these cooperatives were able to expand their range of operations, by assuming additional tasks that previously had generally been handled by the government at the local level. These might include the supply and maintenance of housing. But they also sought out and tackled new projects, and thus evolved into so-called multipurpose cooperatives with a combination of several branches of activity which generally were not at all complementary.

Notwithstanding their differing ideological alignments, apart from their primary economic functions both *kolkhozy* and cooperatives acquired a significant social developmental function. Proceeding from the realization that a willingness to collaborate and at the same time a preparedness to be organized and to subordinate oneself had to lie at the basis of execution of any communally handled

activity, the communal desire was able to accelerate the necessary process of integration in the new central places formed from former settlement cooperatives (sometimes, in the case of the Soviet Union, of differing ethnic affiliations).

Within the original population *kolkhozy* and cooperatives could contribute to eliminating those tensions that inevitably resulted during the transition from a subsistence economy to a market economy, whereby one part of the population still clings to old values while the remainder has already adopted new norms. A hunter might be given the opportunity to sell his surplus yield through the *kolkhoz* or cooperative store without loss of prestige despite his nonobservance of traditional economic principles such as the precept of meat sharing. In contacts between the aboriginal population and Europeans or Euro-Americans *kolkhozy* and cooperatives provided the prerequisites for a new orientation, in that, at least at the local level, they introduced a gradual equality of rights in terms of claims to command and authority to make decisions.

6. INDUSTRIAL DEVELOPMENT: OPPORTUNITY OR RISK?

6.1 Status of development and participation opportunities among the aboriginal population

Strictly speaking any discussion of industrial development, i.e., development based on the mineral and energy resources of the Arctic, would have to begin with coal mining on Svalbard; it began around the turn of the century and is still pursued today by Norway and the Soviet Union (more for political than economic motivations). But since our interest here lies exclusively in assessment of industrial phenomena with a view to the situation of the indigenous population, rather than the position of the Arctic with regard to national and international supplies of raw materials, a position which in any case is difficult to identify, and since there are no indigenous people on Svalbard, this passing mention will suffice.

In view of the heterogeneity of its geological structures the North of the USSR, as one might expect, is the richest part of the Arctic in terms of exploitable mineral resources. But if one consistently applies the treeline as the southern boundary of the Arctic, thereby leaving well-known mining and industrial centers such as Vorkuta or Noril'sk which are commonly considered as "arctic" out of consideration on the basis of their location in the forest-tundra, the development of arctic mineral deposits at present has barely advanced any farther than in the North American Arctic, even though there are prospects for greater activity in the coming years. The pattern of distribution of mineral resource exploitation sites (Fig. 6) displays three areas of concentration within the USSR. Arctic mining is concentrated in the mountainous areas of the extreme northeast of the country, with several gold and tin mines; these all began operations in the 1940s and 1950s and since then have simply expanded. Oil and gas extraction which, by contrast, has revealed predominantly a gradual advance northward from centers located farther south, and which generally did not reach the tundra zone until the mid-1980s, is concentrated in the northern margins of the East European and especially the

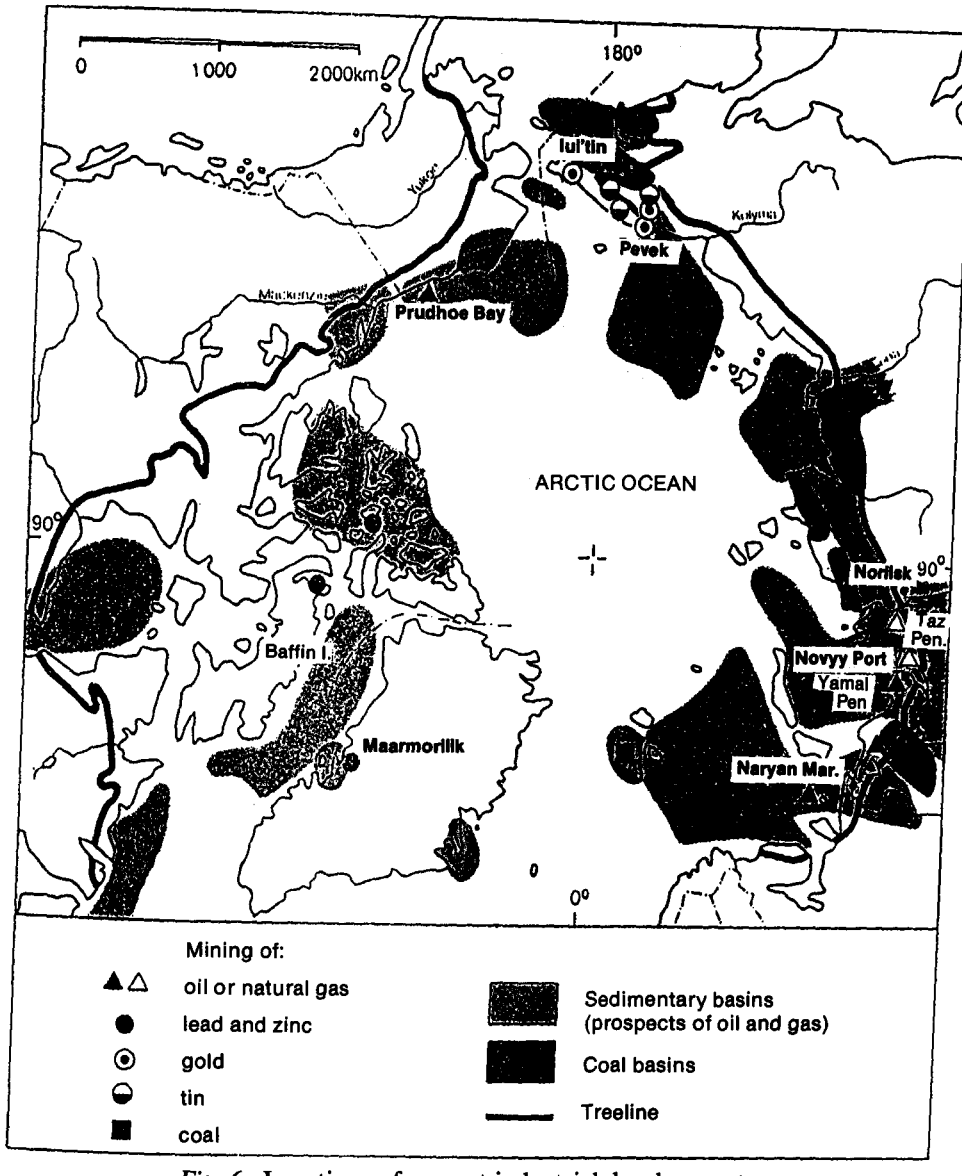

Fig. 6. Locations of present industrial developments.

West Siberian lowlands. In the European Arctic the initiation of gas production from the Vasilkovo field in 1986 to supply the town of Naryan-Mar was more of local significance; by contrast the oil from the Khayaga field flows into the national pipeline network. The oil production which began on Kolguyev Island in 1987 should be interpreted as a first success of the onshore and offshore exploration that has been intensively pursued for a number of years in the Barents Sea area. But these activities clearly are overshadowed by the vastly more dynamic developments in West Siberia which, with fields that are many times larger and with much greater potential, for the moment is among the most significant pro-

duction areas in the world. In 1970 or 1973 the first two small arctic gas fields were brought on stream to the west of Noril'sk to supply the town and its industries. Since 1985 oil has been transported south in large quantities by pipelines from the southernmost of a chain of large oil fields lying on the Yamal Peninsula northwest of Novyy Port; this field is the only one that has significant reserves of natural gas as well as oil. Natural gas production was originally to have begun farther north in 1991, but in the meantime a postponement of 5–7 years has been announced; gas production began from the Yamburg field on the neighboring Taz Peninsula in 1986.

The developments on the Yamburg field merit special attention for another reason: Here, apparently, a new spatial development concept is being applied for the first time, one that links a flexible approach to the demand for increases in gas and oil production with a settlement system that has been applied to the very smallest fields in central West Siberia since the late 1970s, more as a makeshift solution. Whereas previously the annual production targets were established depending on the proven reserves and on the basis of a life of 25–30 years, now for the first time the annual production target has deliberately been set higher and thereby the production life has been reduced to 20 years and less. At the same time the previously customary establishment in or on the production area of a center with functions at the secondary and especially tertiary level has been abandoned in favor of more provisional, temporary small settlements equipped with only the most essential social infrastructure. These temporary "shift" settlements, dispersed across the field, and handling crews of perhaps up to 400 workers who rotate on a specified schedule will be served from the base community of Novyy Urengoy, located 250 km to the south. But whether, on completion of the construction and buildup phase or with the coming on-stream of the largely automated gas production from the Yamburg field, which covers 170 by 45 km, accommodations for 30,000 people will, in fact, still be required in these camps and in a larger base camp on the coast, as Soviet reports have indicated, can at present not be checked.

This concept, presumably developed in light of the extreme arctic living conditions and of the difficulties of maintaining a high quality of life, may certainly appear rational from an economic standpoint, but at the same time it reemphasizes the role of the Arctic as a resource area focussing on the supply of raw materials. Quite apart from all possibilities for cutting costs, it serves primarily to stabilize the base towns located outside the Arctic; from here raw material extraction from several coordinated deposits can be pushed as required and, in the case of ores, any upgrading and processing beyond the level of concentration can be handled here. Moreover, the families of the shiftworkers living in these towns contribute significantly to the utilization of the necessary service facilities. At the same time this concept represents an adaptation to the model typical of non-Communist arctic regions.

Although mineral exploration has been pursued intensively for years, relatively few occurrences of raw materials have been developed so far. In Alaska the oil and gas fields at Prudhoe Bay were discovered only in 1968; since 1977 they have been

supplying oil to the American market via a pipeline to Valdez. In Canada lead/zinc ores have been worked since 1976 at the Nanisivik mine on northern Baffin Island, and since 1981 at the Arvik Mine on Little Cornwallis Island; an asbestos mine which was established in northern Quebec in 1973, and whose output was shipped direct to Nordenham am Weser, and whose reserves were expected to last until 1988, discontinued operations in 1981 due to persistent sales problems. In Greenland the cryolite deposit at Ivigtut, which had been worked since the last century, had been worked out by the 1960s, yet the waste heaps still contained sufficient ore that they were worked until 1987. The Sørte Engel [Black Angel] lead-zinc mine at Maarmorilik near Uummanaaq began production in 1973, but had to cease operations in 1989 due to a lack of workable reserves. After 1968, under the impact of the discoveries at Prudhoe Bay, exploration for oil and gas in particular was intensified throughout the entire Arctic and expanded to include offshore exploration in the Bering Sea, Beaufort Sea, Davis Strait off southeast Baffin Island and western Greenland, as well as off northern Labrador. So far localized workable gas deposits discovered in Alaska, the Mackenzie Delta in Canada, and in the Arctic Archipelago have remained undeveloped, since no agreement has been achieved as to the routes of the necessary pipelines.

In the case of the Soviet Union any attempt to examine these projects with regard to provision of jobs for the arctic indigenous population fails for lack of appropriate data. One can be sure that participation of this sort, however it is achieved, does occur in West Siberia or in the Far East, even though the exact scale cannot be determined. The few available data are difficult to interpret in the light of the classifications, which are far from clear. According to the data, in 1979 in the Yamalo-Nenets National Okrug, i.e., the northern part of West Siberia, including the base communities of Novyy Urengoy and Nadym and a section of the arctic coast, of a total of 9338 Nentsy, Khanty, and Selkupy who were employed, only 3125 or 33% were engaged in industry, whereas in the Khanty-Mansi National Okrug, bordering it to the south and surrounding the old established oil centers, of 7438 Khanty and Mansi only 1319 or 18% were engaged in industry. From this, however, one can only speculate as to whether one should conclude that there is stronger participation by the indigenous people during the exploration and development phase, as was the case in the arctic zone of West Siberia during this period.

The experience from Canada might indicate that this interpretation is correct. Here job opportunities in oil and gas exploration (and the same can be imputed for pipeline construction which is equally a short-term operation) are grasped on quite a large scale, inasmuch as the rotation scheme offered allows sufficient time to spend with one's family and for engaging in hunting and trapping. At the instigation of the government, employment programs were developed for both skilled and unskilled Inuit workers with a schedule of 20:10 or 14:7, in terms of working days to days off; these programs significantly reduced the anticipated difficulties of adjustment and thus offered income opportunities to a larger number of interested potential workers over the years.

But the employment situation in mining is in strong contrast to this. The Canadian parent company operating the mine at Maarmorilik, on being granted the concession, had undertaken to employ Greenlandic workers to the greatest degree possible, but initially encountered extraordinary difficulty in finding workers interested in working conditions that stipulated a 60-hour week for 3–4 months, followed by 1 month's vacation, and at wages which were markedly lower than those of comparable Danish mine workers. It was only when the Danish and Greenlandic government authorities promoted a comprehensive training program that the number of indigenous workers gradually rose until by 1983 it had reached its peak at 151 workers or 42% of the total work force; during the inevitable slow reduction in the work force leading down to the closure of the mine the unskilled Greenlandic workers were the first to be laid off. The average period of employment was evidently markedly less than 6 months; here it was in particular the separation from the family that was cited as the decisive reason for giving notice.

Of the 315 Inuit from 23 settlements in the Canadian Arctic who found employment between 1975 and 1978 at the Nanisivik mine (almost 60% of them as unskilled laborers), 39% worked for less than 6 weeks, a further 26% for less than 4 months; only 19% stayed longer than 1 year despite a rotation schedule (at first sight extremely attractive) of 6 weeks on and 2 off. One may assume that this situation has changed little in the past few years, since changes at the mine, which under certain circumstances might have enhanced its attractiveness, have not been undertaken and a house-building program implemented by the company at the mine site provided houses exclusively for employees who had already completed a long term of service. The long separation from their families and, as a result, the nonfulfillment of self-imposed moral obligations to provide the family continuously with the products of hunting and trapping carry greater weight than the view, which is certainly present, that wage employment is essential. According to the assessment of the Inuit, wage employment, for the most part, is essential to cover the expenses associated with involvement in hunting and trapping. The majority of the Inuit solves this problem by giving up their work at the mine. It is not without significance that 42% of those employed were unmarried; this means that the relatively high wages to a considerable degree were being earned by those who needed them least. In the case of the Arvik Mine the work-rotation offered is one of 6 weeks on and 4 weeks off; as a result, clearly a somewhat longer average term of employment could be achieved. The difficulties alluded to here would probably be eliminated if the mining settlements were not organized as closed company towns (or rather camps), built and maintained by the mining companies but rather, as was repeatedly requested in Greenland, were run as open settlements with their own appropriate administrative boards and "normal" working schedules. But this is hampered by the relatively short life of such mines, which does not appear to justify the high investment in infrastructure and housing (see the Soviet concept of development).

A totally different route has been pursued in northern Alaska. Despite the definite resistance of the state government and of the oil companies active at Prudhoe Bay, in 1972 the Eskimos north of the Brooks Range (then numbering

around 4000) succeeded in organizing their area of occupancy covering 228,000 km^2 (15% of the land surface of Alaska) as an independent administrative unit, the so-called North Slope Borough. This is an organization with rights that go far beyond those of the comparable American counties, and thus the Eskimos managed largely to get possession of the taxation revenue from the oil companies. This income, amounting to millions, is used to create a large number of jobs in the North Slope Borough itself, so that employment in the oil patch is largely redundant to the Eskimos. But the resultant close ties with development of oil extraction conceal the danger that with the possible exhaustion of the oil reserves, the level of employment now attained and the standard of living dependent on that employment may not be maintained.

6.2 Industry and environment

In view of the factors in play to be considered in each individual case it appears barely feasible to examine the various development projects for environmental hazards or damage emanating from them, or to classify such hazards and damage according to type and extent. Hence only a few examples will be cited below.

Movement of vehicles on the tundra for the moment is permitted only during the winter months when the ground is frozen; hence, especially where low-pressure tires are used, the danger of damaging the thin vegetation cover and the possible limited thawing of the underlying permafrost have largely been eliminated. Chains of thermokarst lakes that have evolved from early thaw ruts, however, still quite commonly provide evidence of the thoughtless interaction with the arctic environment practiced in the 1950s and 1960s; in certain areas in the Soviet Union, where fulfillment of the plan clearly took precedence over environmental protection, these phenomena have attained such a level that the resultant damage to the reindeer grazings is on a regional scale. But even here negative developments of this type are no longer accepted without protest. Thus the temporary postponement of initiation of natural gas production from Yamal Peninsula may only partly have been cost-related; in equal measure it is the result of massive protests from the indigenous Nentsi and ecologists who were aroused in particular by the corridor proposed for transporting the gas: 10 pipelines running parallel, each with a diameter of 1.5 m, to be laid at a rate of one per year, as well as a railroad accompanying the pipelines would further significantly encroach on the reindeer grazings on the peninsula in particular, which are already reported to have lost 6000 km^2 and 24,000 animals.

On the other hand, one may proceed from the fact that while seismic work involving explosives, test drilling, and the laying of pipelines certainly may have led to the displacement or endangering of individual herds of animals in specific areas, in total it remained of locally limited significance. By contrast the consequences where exploration drilling is carried out in caribou calving areas are more serious and spatially more extensively detectable. An example has been occurring near Baker Lake west of Hudson Bay, during uranium exploration in which Germans are the leading players; the Thelon Game Sanctuary, one of the most

significant arctic nature preserves, is to be sacrificed to this program of exploration. A similar threat menaced the calving grounds on the coastal plain within the Arctic National Wildlife Refuge, known as Area 1002, between Prudhoe Bay and the Canadian border. The threat came from oil exploration which had been planned, until all drilling concessions were deferred for an unspecified time under the influence of the accident to the tanker *Exxon Valdez* off the oil port of Valdez in southern Alaska.

Development, in terms of mining, is not exactly without problems either, with regard to environmental damage. In the case of the Sørte Engel mine in Greenland mine wastes containing heavy metals and with high concentrations of lead, cadmium, mercury, etc., were disposed of in a deep basin in the adjacent fiord; the amount of contaminants could be halved from 1980 onward, but the only prospect of restoration of the fiord bottom lies in a costly procedure of covering the wastes with powdered marble once dumping of the wastes has been discontinued. In the case of the Nanisivik mine in Canada the highly toxic waste materials are deposited in lagoons on land; if one of these lagoons leaks into the adjacent fiord and if the heavy metals get into the productive surface waters, here too these contaminants will make their way into the animals hunted by the Eskimos in increasing concentrations.

For years onshore oil production has been seen as relatively environmentally-friendly; it was only on closer inspection that it turned out that in Prudhoe Bay, for example, the pits excavated to receive the drilling mud and fluid, laced with heavy metals, were inadequately sealed and hence millions of liters were able to seep into the soil; hence the area around the oil fields must be seen as extensively damaged. Since tankers are not yet used in the Arctic, presumably the most serious threat is from offshore drill rigs. So far the blowouts which one has heard about have fortunately produced only water and gas, but in the case of an oil blowout, a possibility which cannot be excluded, depending on accessibility, season of the year, ice conditions, etc., it would take 3 months under the most favorable conditions, but up to 12 months under the most unfavorable circumstances before a replacement drillhole could be drilled and the flow of oil thereby plugged. Hence one would have to proceed on the assumption of widespread pollution of the arctic coasts and of the ice-covered sea. Despite assertions to the contrary from the oil companies involved in offshore drilling, the ultimate consequences certainly cannot be predicted, and all the precautionary procedures are still all violently disputed. To underline just a few aspects: We still do not know how slowly biological decomposition proceeds in ice-covered waters. It is not the determination of how many animals die from the toxicity of the oil that is critical, but the question of the long-term impact of the oil on the size and composition of the microorganisms, e.g., through a reduction in photosynthesis. The oil cannot be totally eliminated by burning, in any case, but the resultant soot particles might possibly considerably disrupt the albedo of the ice. The use of chemical means, so-called dispersants, must also be seen from this viewpoint; they certainly solve the esthetic problem, in that they dissolve the sheet of oil on the surface of the water, but, on the other hand, they aggravate the biological problem, in that they

lead to a uniform dispersal of the oil throughout the entire water column, right down to the sea bed.

On the basis of these few examples, two points should become clear. On the one hand, it remains questionable as to whether resource development projects can provide long-term jobs in any significant numbers, and whether the indigenous population is willing and is in a position to accept these jobs under the circumstances stipulated. On the other hand, these projects in every case represent assaults upon the environment, whereby the traditional livelihood of the aboriginal population is subjected to qualitative and quantitative damage. If the aboriginal population sticks to its traditional patterns of extensive land-use, and at present there is nothing to indicate that this will not be the case, inevitably one may expect an intensification of competing land claims and land-use conflicts.

7. USE OF NATURAL RESOURCES

Despite all the changes in the economic structure the use of renewable biotic resources possesses a significance for the indigenous population that has an extremely variable impact on both the regional and local levels, but one that *in toto* cannot be underestimated (cf. Fig. 7). But on the broad scale it is scarcely possible to determine its significance even approximately. While the market-oriented component can be determined comparatively precisely via sales figures, the more subsistence-oriented component largely eludes any precise assessment because of the lack of suitable data. But it remains to be considered whether such a division according to market orientation or subsistence is at all possible or rational, given the large number of overlaps and interdependencies.

Generally one may assume that in the future a sort of mixed use, with seasonally oscillating operations, will prevail, and that the overwhelming majority of the aboriginal population is involved in it even now, directly or indirectly, for example, through meat sharing. The breadth of use of renewable resources which was characteristic earlier, however, has largely disappeared and has been replaced by a clear narrowing and specialization, i.e., the number and duration of hunting and trapping trips undertaken by an individual have been reduced, but the remaining trips have been intensified and, moreover, increasingly oriented to the harvesting of marketable products. The danger of a possible overexploitation of individual resources which are attractive in this regard, but which are threatened in terms of their stocks (one needs point only to the stocks of polar bears and narwhals) is prevented by a quota system dictated and controlled by the government. Despite this development, however, to continue to talk of a traditional subsistence economy, into which individual commercially oriented branches are integrated, means denying in particular the existence of the umbrella-like, all-embracing cash economy, quite apart from the quite strongly individualistic character of the economy as it exists. The practices of hunting, trapping, fishing, and stock-raising today are so cost-intensive that they are only feasible if the necessary expenses can be covered either from the cash proceeds from selling products not required for home consumption, or if cash income is available from other sources, either from wage

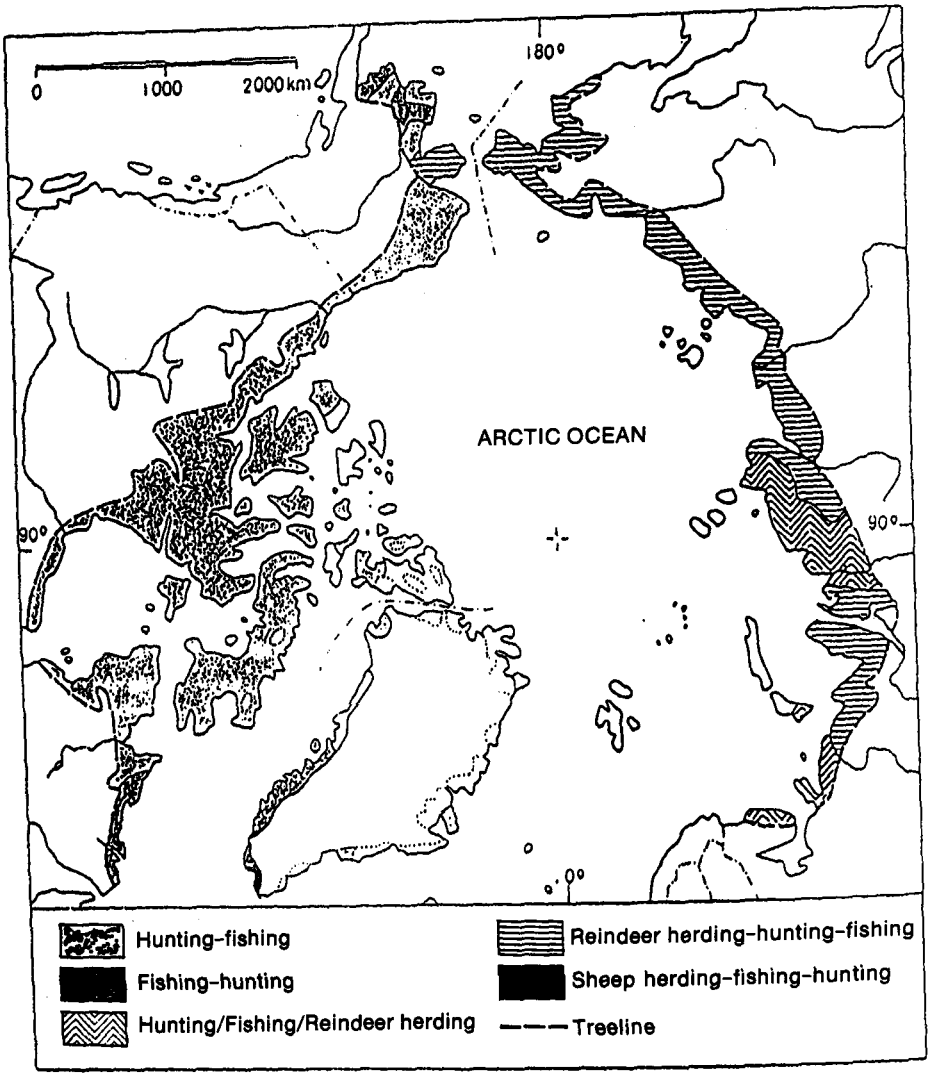

Fig. 7. Structure and distribution of the various arctic economic activities and lifestyles, excluding trapping (Soviet situation after Tyurdenev and Andreyev, 1970).

employment, from the production of art objects or handicrafts, or from social assistance.

Trapping, which in the past was the only type of activity that yielded a product that could be sold or exchanged for commercially produced goods, has lost its former fundamental significance in the "western" Arctic since the early 1950s. Despite governmental assistance programs the low level of prices makes it appear rather unattractive, and even short-term rises in the prices have been able to raise the intensity of trapping only minimally. Once a trapper has moved from the dispersed camps to one of the new central places, the necessary incentive to set out

traplines remote from the settlement and to visit them regularly is lacking. By contrast in the Soviet Union a comparable development, which was already starting to emerge, was overcome by the increasing transfer of trapping to the state *sovkhozy* from 1961 onward. For the individual trapper this had and still has the advantage that he was transferred to a steady position and correspondingly received a guaranteed income, which was supplemented by production bonuses through the allocation of northern allowances. It is occasionally conceded that the costs of this sort of trapping exceed the income recorded by the *sovkhozy* from this branch of activity. The instability in income deriving from the cyclical fluctuations in population of the arctic fox is partially balanced by large-scale feeding with low-value fish or the waste from slaughtering reindeer or from hunting marine mammals (approximately 2–5 tonnes per trapper per year). Moreover, in the interests of ensuring a return the number of trappers is limited, depending on the productivity of the available trapping area; on average it is limited to one trapper per 400 km^2 of tundra.

Seal hunting, which is often termed the foundation of the Eskimo culture on the basis of its dominant significance in the subsistence economy, for the first time also achieved an important market-oriented direction in the early 1960s, when sealskin prices unexpectedly rose through the development of improved processing methods for hair-seal pelts and through a sudden demand, in parallel with this, from the European winter fashion industry in particular. To demonstrate the dimension of these price increases which occurred equally in Alaska, Canada, and Greenland, in Canada sealskin prices rose from less than $1 to $15 in 1963–1964 and even to over $20 for particularly good skins. This development occurred at a critical phase in the general structural change in the economy, in that in light of the concentration of population into central places which was just beginning, and of the conspicuously limited availability of jobs there, it presented itself as an apparently extremely viable branch of the economy, one which provided output both for home consumption and for the market and utilized animal stocks which were available in adequate numbers. But pursuit of seal hunting from the central settlements was dependent on the availability of suitable means of transport. Hence this period saw the introduction and rapid spread of efficient, but extremely costly boats with outboard motors and of snowmobiles which permitted the hunter to cover greater distances in a fraction of the time that would have been possible using dog teams. Only in Greenland was the use of snowmobiles confined to the settlements and thus the traditional dog sledges were retained north of Sisimut/Holsteinsborg; farther south keeping dogs is forbidden because of the sheep-rearing economy. The prices paid for sealskins permitted the investment in the necessary equipment, which then in turn contributed to an intensification of other hunting and trapping activities. But as early as 1965–1966 a relapse in prices began, reaching an initial low point below $4 three years later; the arctic seal hunt was feeling the effects of animal protection campaigns against the allegedly cruel practices pursued in the killing of harp seal pups (whitecoats) in the St. Lawrence area of southern Canada. Worldwide campaigns, which had arisen from a misdirected love of animals and which intensified to the level of boycotts on sales, initially had less impact on the Canadian and Norwegian sealers, against whose

methods the accusations were directed, but directly affected the Eskimo hunters. This was despite the fact that they predominantly hunt the nonmigratory ringed seal and do not even encounter newborn harp seals, but can kill only mature animals in summer in the part of the North Atlantic between northern Labrador and east Greenland, as they reach this region at that time during their regular migrations. But the fur trade rejected and still rejects especially those skins that can easily be recognized by the customer as sealskins, i.e., primarily the strikingly marked skins of ringed seals and adult harp seals; by contrast whitecoat skins are so altered during the tanning and dying processes that they no longer correspond to the traditional notion of the appearance of sealskins. Admittedly the market recovered for a short time; in 1975–1976 a sealskin on average commanded a price of just under $24. But then a renewal of the campaign, peaking in an import prohibition by the European Community which had been passed in 1982 and renewed in the interim, again led to a price collapse, this time permanently; as a result seal hunting was no longer viable. This loss of cash income from the sale of skins inevitably led to a contraction in the entire subsistence sector; moreover, this tendency was reinforced by simultaneous price increases for the equipment required for hunting and trapping. Despite changed eating habits, and a clear preference for imported foods, seal meat, which is rich in protein and low in fat, even in the future will continue to be an important, indispensable basic food. During the period of high prices there was occasionally more meat available than could be used locally or could be disposed of within the framework of a loose, regional network of obligations; as a result there was some thought of an export of dogfood. Today at least the Greenland administration is attempting, by subsidizing sealskin prices, to maintain the income possibilities in the so-called hunting districts of the northwest, north, and east coasts and thus at the same time to ensure a supply of meat. But no fundamental change in this situation appears likely in the foreseeable future, since the activities of radical animal protectionists who control the media have started an expanded campaign: The opponents of sealing no longer demand simply a total ban on the "murder of baby seals," which in their view is cruel and threatens the stocks, an activity from which at least Greenpeace for the meantime has expressly excluded the Eskimos, but now demand very generally a cessation of any commercially motivated killing of wild animals. The Eskimos are expressly included in this campaign, since it is thought that one can argue that their culture is no longer that of a "primitive" people and that their economy and society have long since been part of the general consumer society and hence any special consideration is unnecessary.

A regulated harvesting of the stocks of caribou or wild reindeer has so far been complicated by the seasonal migrations between the tundra in summer and the forest tundra in winter as well as by the fact that, as a result, local population densities were high only for a short time; moreover, it was significant that the course of the migrations and especially their destinations were predictable only to a limited extent and hence accessibility to the herd for the hunters, who by this stage were operating predominantly from permanent coastal settlements, was constantly changing. Over the course of the past decade, however, these pertinent circumstances have changed considerably. For reasons which have not yet been

fully explained, but which possibly can be interpreted as an expression of cyclic population fluctuations, the majority of the herds have increased to an almost unimaginable degree, so that despite substantial expansion of their grazing ranges they have in the meantime reached densities which in places greatly exceed the carrying capacity. In the Alaskan and Canadian Arctic the number of animals has risen by about 1 million to the present total of approximately 2.3 million, and in the Soviet Union by about 300,000 to about 750,000. In concrete terms this means that overgrazing of the feed base and thus, ultimately, the collapse of many herds can be prevented only by intensified hunting. In the Soviet Union, and also in Alaska and Canada to a minor extent, a further complication is that expansion of the grazings occurs at the expense of the areas claimed by the reindeer industry, and as a result the pressure on the limited supply of fodder is further intensified. Whereas the stocks can be determined relatively accurately by means of regular aerial surveys, data on the sustainable yield are scarcely available at all, but one may proceed from the assumption that caribou or wild reindeer hunting constitutes a significant component of the economy of the indigenous population. This importance is repeatedly stressed in Soviet publications, although no evidence is cited; but at least it is estimated that the cost of living of the indigenous population is higher where the wild reindeer have been replaced by semi-domesticated reindeer, herded either by a cooperative or a *sovkhoz*, i.e., where hunting has been replaced by reindeer herding. On the one hand, hunting is pursued on a privately organized basis, whereby in the Soviet Union between 25 and 50% of the yield remains with the hunter, and the remainder is handed over to the *kolkoz* or *sovkhoz*; but it is unclear whether and to what extent, if necessary, the hunter can possibly call upon their technical equipment. On the other hand, communal hunts are also undertaken; in Canada these may be organized at a local level and are facilitated by the government by subsidies to the costs of subsistence and transport, and the product of the hunt goes half to the participating hunters and half to social assistance recipients in the settlement. In the Soviet Union *kolkhozy* and *sovkhozy* have apparently increasingly being going over to commercial game harvesting ("game cropping").

There are indications that the efforts of government authorities in the Soviet Union are directed at eliminating the stocks of wild reindeer everywhere that a reindeer industry, i.e., herding of half-domesticated animals, appears viable, on the basis of the state of the grazing, and at leaving them alone only where the grazing is qualitatively unsuitable for herding or the distances between summer and winter pastures are too great, in locations such as the Taymyr Peninsula and along the Yakut coast. But whether reindeer herding in individual areas, taking all the costs into account and given the current size of the wild reindeer stocks, is actually more viable than reindeer hunting, as is repeatedly stressed in the Soviet sources, still has to be proven. By contrast the experience that wild reindeer and reindeer cannot exist alongside each other is undisputed; even if one uses labor-intensive herding methods losses due to reindeer joining the wild reindeer herds are almost unavoidable. If the present number of approximately 2 million animals involved in the arctic reindeer industry in the Soviet Union, which is seen to be the undisputed economic backbone of a large percentage of the indigenous popula-

tion, is displaying a slight retrograde tendency, that may have little to do with with the occasionally cited, but so far unproven transfer of herders to industrial occupations. The data on the number of animals which a *kolkhoz* member was allowed to own privately, but had to relinquish on leaving, diverge markedly; but one may proceed from the assumption that a maximum of 130 animals (a frequently cited number) was possibly permitted in the first years after collectivization (which was associated with considerable resistance), whereas the maximum is now 25 animals. The actual reason for the slight relapse clearly is based, on the one hand, on extensive damage to the grazings which can be ascribed to industrial development projects such as oil exploration or pipeline construction, or to overgrazing and trampling by wild reindeer, and on the other, on the considerable losses to passing wild reindeer herds, already mentioned. At both the organizational and the breeding levels great efforts are being made to expand the reindeer herding industry, which still today is exclusively pursued by the indigenous people, and thereby to increase their contribution to the meat supply for industrial projects in particular.

In Alaska 75% of the present population of about 25,000 reindeer, organized in 14 Eskimo-owned herds, are located on Seward Peninsula (Fig. 4); here they form a regionally significant economic element through providing jobs and by supplying meat to quite a large clientele. It remains to be seen how secure the market is for antlers, harvested in summer when they are in velvet; the antlers are in demand in East Asia as the raw material for aphrodisiacs and, in terms of yield they sometimes surpass meat sales. In Canada everything points to the fact that the Eskimo-owned herds, numbering about 10,000 animals, will be sacrificed to the interest existing in the surrounding settlements in hunting the caribou, which in the meantime have moved into the reindeer preserve. In Greenland, where the stocks of wild reindeer are held relatively low (at present 18,000 animals) by means of regular heavy hunting, 263 Scandinavian reindeer were introduced in 1952 with a view to forming the basis for developing a herding industry in the inner fiord areas of western Greenland which were occupied neither by wild reindeer nor by sheep. Despite very promising beginnings the number of animals very quickly had to be reduced again, in keeping with the grazing conditions which clearly had initially been falsely assessed. They are now divided between two locations (near Nuuk/Godthab and Qaqortoq/Julianehab) and number around 6000 animals at present.

Even the sheep-herding industry, which was introduced into the extreme southwest of Greenland, has not completely met expectations. Since, for reasons of cost, winter feeding scarcely represents a viable option, the sheep numbers have been subjected to severe fluctuations due to the variable winter weather conditions. At present there are about 21,000 animals, 61% of these being located in the municipality of Narssak/Narsaq; the sheep are owned by about 70 Greenlanders, for about half of whom sheep-rearing is their main livelihood.

Utilization of the fisheries potential was and is at times of considerable importance arctic-wide for the economy of the indigenous peoples. Fishing to cover subsistence needs, especially with the aim of obtaining winter provisions, is

pursued throughout the entire area, with varying intensity. One may assume that there is a relationship between fish consumption and amount of income derived from other branches of activity, an amount which varies locally. In total, however, the demand is relatively low, but extremely steady, although it takes precedence over the commercial fisheries pursued in parallel with it. The catches taken for subsistence use remain largely free of the strong fluctuations in yield characteristic of the commercial arctic fishery. Since the abandonment of dog teams which were predominantly fed on fish, a slight relapse may be observed recently in some areas, one which apparently could not be entirely made up by the general increase in population and hence in demand.

The export fishery is represented in western Alaska by the salmon fishery, in northern Labrador by the cod, char, and salmon fisheries, and in western Greenland by the shrimp, cod, and halibut fisheries. In terms of the number of jobs and the amount of income it represents the true basis of the Eskimo economies of these areas; a market-oriented fishery is also alluded to in connection with the Nentsi and Entsi in the Nenets and Yamalo-Nenets National Okrugs, but no further details are known.

In western Alaska the species of salmon fished by others apart from Eskimos (Fig. 8) reveal clear differences in their spatial and temporal occurrence as well as in their size. On the long-term average around 90% of the salmon landed in western Alaska come from Bristol Bay, some 80–90% of these landings being red salmon (weighing around 3 kg). By contrast, in the more northerly coastal strip extending north to Point Hope, which accounts for about 10% of the West Alaskan landings, the dog salmon, weighing up to 1 kg, accounts on average for 65% of the catch. Landings of pink salmon (weighing around 2 kg) come overwhelmingly from Bristol Bay, but the latter contributes very much less of the silver salmon (weighing around 10 kg). The small, oil-rich pink and red salmon today tend more to be used by the canning industry, whereas dog salmon and especially king salmon predominantly reach the market as fresh and frozen fish. The annual fluctuations in the catches are the result of variations in the size of year-classes; these follow easily predictable cycles of 2–6 years, depending on species and lead to salmon runs of varying sizes. They are also due in part to catch limits imposed by the government in the interest of safeguarding the fish stocks.

It is a different situation in northern Labrador where the problem of overlapping of regional and international fisheries interests has become particularly acute. In 1969 the cod, which forms the basis of the fishery, suddenly disappeared without any warning; this disappearance was caused primarily by an intensively prosecuted European trawl fishery on the offshore banks, in certain cases encouraged by minor changes in the water temperature. It was possible, with government assistance, to switch to the char and salmon fisheries, in connection with the production of fresh and frozen fish. The threat of these stocks being overfished was avoided by resumption of the cod fishery from 1979 onward. Although the fisheries in western Alaska and northern Labrador are restricted to a few weeks, it should not be overlooked that they offer a further benefit apart from seasonal

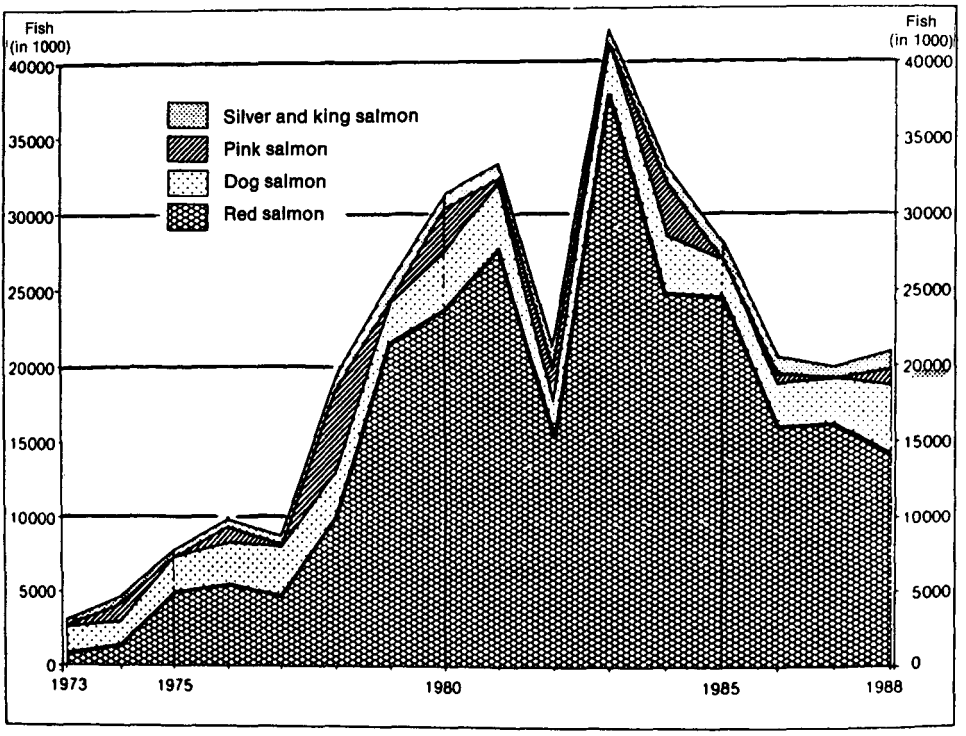

Fig. 8. Commercial salmon fisheries in arctic Alaska (Bristol Bay and Arctic-Yukon-Kuskokwim fisheries regions) 1973–1988 (according to data of Alaska Department of Fish and Game, Juneau).

employment opportunities: They allow the fishermen to qualify for receiving payments from unemployment insurance in winter.

In western Greenland, until the mid-1950s the economic significance of the fishery remained relatively modest; it was prosecuted only in inshore waters from open boats and with handlines. Only the granting of government subsidies permitted the acquisition of larger vessels and the transition to net fishing; as a result the landings occasionally exceeded the processing capacity of the available small plants. In the early 1960s a start was made, on the basis of these cod landings, to build up an ambitious program of industrialization. Harbors and docking facilities were established in six towns on the open-water section of the middle west coast, seen as meriting being promoted; freezing and filleting plants aimed at an export-oriented fishery were built, and the conversion of the previously dispersed population of fishermen and hunters into a centralized industrialized society was initiated. When the existing fishing fleet turned out to be unable to cope with the new demands, it had to be expanded through the introduction of deepsea vessels, including modern stern trawlers of 500 gross tons or more, in order to ensure a steady, year-round supply to the processing plants, and thereby a viable utilization of the plants. But even before the first stern trawler could begin operations, in

1969, the drastic relapse in the cod stocks, already described with reference to northern Labrador, had begun (Fig. 9); it could not even be compensated for by sending the new vessels into Canadian waters off Newfoundland. The processing plants were operating partly at a substantial loss; the smaller fishermen especially were often forced by rising costs to abandon fishing. Admittedly in the late 1970s a further change in water temperature and with it a recovery of the cod stocks began and was reflected in a distinct rise in the landings; but in 1984 there were signs of a further collapse and hence confidence in the future of the cod fishery was shaken. The Greenlanders were obliged to look around actively for possibilities to supplement or replace the income from fishing. These possibilities did not lie in the salmon fishery, which had been prosecuted on a large scale only since 1964, since here the catch quotas had been limited by pressure from Canada and the USA since 1972. The new opportunities lay with the extensive fields of shrimp off the west coast which were largely unexploited, although they had been known about for some time. The center of the shrimp fishery, which in terms of value has greatly exceeded the cod fishery since the 1970s and in terms of volume since the mid-1980s, now lies in Disko Bay. But meanwhile inshore fields are also being fished along practically the entire stretch of coast from Nanortalik in the south to Uummannaq/Umannaq in the north. With the expansion of the national fishing zone from 12 to 200 nautical miles in 1977, the international interest in this resource could be controlled. But in view of the recovery of the cod fishery, which is now occurring, there are persistent doubts as to the permanence of the present shrimp

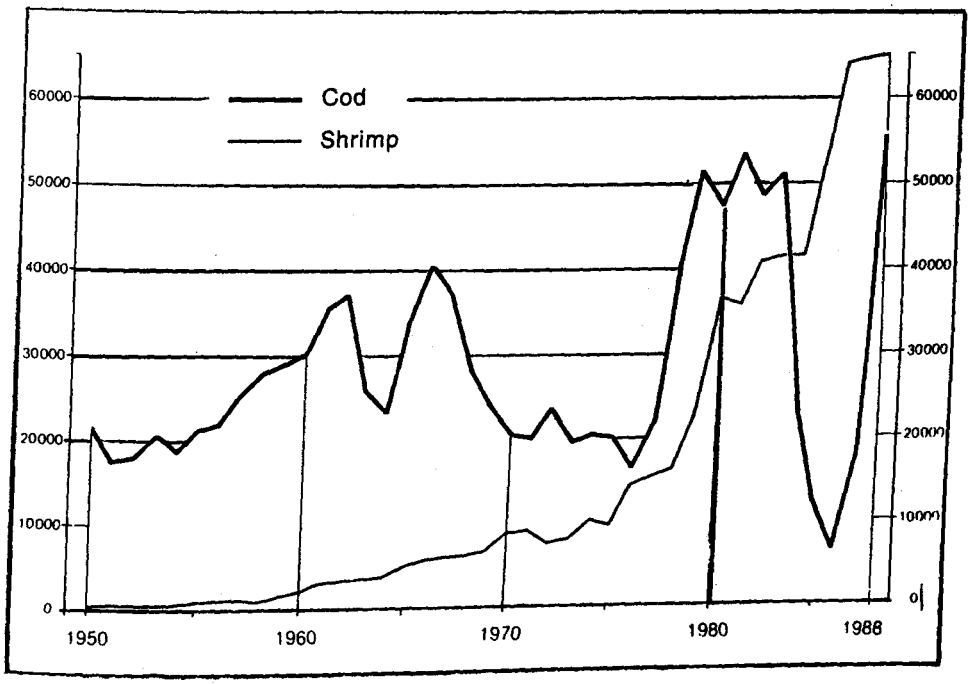

Fig. 9. Commercial cod and shrimp fisheries in Greenland 1950–1988 (according to data from Statsministeriet Gronlandsafdelingen, Copenhagen).

stocks since it was only the collapse of the cod that enabled a comparable rise in shrimp stocks, the major food of the cod; this relationship is comparable to that of the disrupted krill-whale foodchain in the Antarctic.

8. THE STRUGGLE FOR SELF-DETERMINATION

From the preceding discussion the significance of animal stocks to the economy of the indigenous people should have become evident at least in general outline. But it should have also made understandable the aspirations of the Eskimos (and I can report only on them here), to keep this resource area intact as far as possible and to possess at least an unequivocal right of consultation and collaboration in the general development of their area of occupancy. In concrete terms this means, first of all, to unequivocally achieve governmental recognition of their land claims based on their pre-European occupation and exploitation of the area, before any further negotiations can proceed. Contractual arrangements of this type have been achieved four times in the past few years (Fig. 10): in Alaska, the "Alaska Native Claims Settlement Act" of 1971 which affected the entire state; in northern Quebec, the "James Bay and Northern Quebec Agreement" of 1975; in the Canadian western Arctic, the "Inuvialuit Claim Settlement" of 1984; and in the Canadian central and eastern Arctic, the "Tungavik Federation of Nunavut Claims Agreement-in-Principle" of 1990.

In the meantime there is also an application for recognition of Eskimo legal title before the Canadian government for the last portion of the Arctic, northern Labrador.

A common characteristic of the settlements negotiated thus far is the contractually guaranteed transfer of land to the unrestricted ownership of the indigenous people, in association with compensation payments for the express abandonment of further claims to ownership. The selection of the land and the management of the money which had been allotted were entrusted to regional and local corporations expressly set up for this purpose; but in the majority of cases they did not simply assume the management of already-operating development projects; instead they were confronted with the task of first finding projects of this type that merited promotion, a task in which they were not everywhere successful.

One must seriously doubt whether the solutions attempted in the four regions can be seen as optimal. Even the assessment of the Alaskan settlement, once highly praised for its alleged model character, is now seen in a more critical light. In Alaska 162,000 km^2 of land were transferred to the unrestricted ownership of the indigenous people, who numbered about 80,000 (including over 40,000 Eskimo); in northern Quebec, 8100 km^2 to approximately 4500 Eskimo; in the Canadian western Arctic, 91,000 km^2 to about 2500 Eskimo; and in the central and eastern Arctic, 350,000 km^2 to over 17,000 Eskimo. Admittedly the Eskimo of northern Quebec were expressly granted sole usifruct from a further 86,500 km^2, but simultaneously the provincial government was granted the right to approve development projects in this area, so long as the areas required for these were replaced

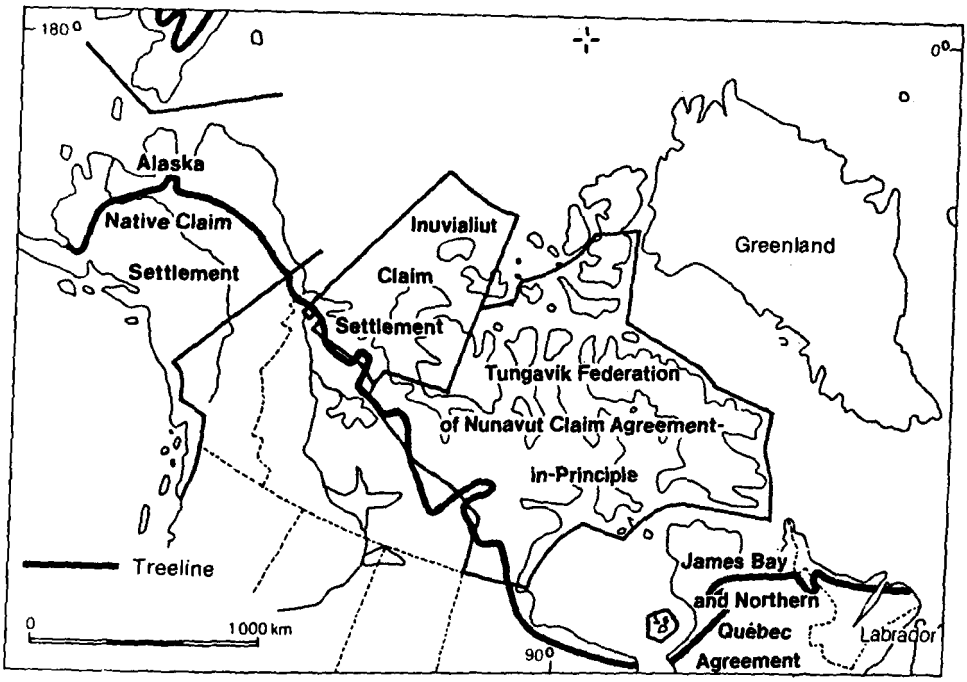

Fig. 10. Areas affected by the land claims settlements signed so far.

elsewhere and hunting and trapping were not disturbed beyond a replaceable level. It remains unfathomable how, on such small areas, an unrestricted continuation or even an intensification of hunting and trapping can be possible, as is set out in different places in the preambles to the settlements as the prerequisite for guaranteeing Eskimo culture in a changing arctic society. An expansion of hunting and fishing into areas not owned by the Eskimos will inevitably lead to increasing conflicts with the nonindigenous population that pursues sport hunting and fishing there.

Hence, with regard to future utilization of the biotic arctic resources by the indigenous population, the express renunciation of further land claims may be more significant than the assurance of the small area specified in the settlements: in Alaska the indigenous people renounced all claims to 89%, in northern Quebec to 98% (excluding the usufruct areas), and in the Canadian western Arctic to 78% of the land area; the figure in the case of the central and eastern Arctic might approximate that for the Western Arctic. The amounts accepted as compensation for this land (a total of $963 million in Alaska, $150 million in northern Quebec, $152 million in the Canadian western Arctic, and $580 million in the central and eastern Arctic), admittedly may initially seem impressive, but they quickly lose their significance if one considers that over the payment period of 10–15 years losses due to inflation and losses in purchasing power of 50% and more will come into play, while the management of the money will require a legally prescribed and extremely costly administration, and the loans required to see the legal claims

through the courts, loans totaling around $10 million in the Canadian western Arctic alone, will have to be paid back—to identify only a couple of points. And there is a final factor which must be addressed: in Alaska the indigenous people also received legal title to the subsurface over the entire area; in the Canadian western Arctic over 11,000 km^2, and in the central and eastern Arctic over 36,000 km^2, so that in all three cases there is at least the theoretical possibility that the Eskimo might participate directly in the development of mineral resources. In northern Quebec there is only a provision for a right of consultation with the Eskimo in the use of the subsurface resources.

In general, at present one must proceed from the assumption that the settlements reached are far from ensuring a continuance of the hunting lifestyle and, thereby, the cultural identity of the Eskimo and hence one must count on a revival of the arguments over land claims. This seems all the more likely in that the political autonomy originally hoped for has not been attained, while the demands for greater independence and self-determination are increasing. So far the further evolution of the Arctic Slope Regional Corporation into the North Slope Borough, alrady discussed earlier, remains an isolated case in Alaska. Possibilities for a greater measure of self-government will open up in Canada with implementation of the plan for a division of the Northwest Territories, as was recommended by the majority in a plebiscite in 1982, and as has been approved in principle by the federal government with the provision that the still outstanding land claims and problems of drawing boundaries are settled. In the eastern part, known as Nunavut (Eskimo for "our land"), the Eskimo possess a population majority of over 85%, which would ensure them realization of their aims. But at present it is still unclear to what extent the Eskimo settlements embraced by the Inuvialuit Claim Settlement would join the Nunavut territory, which initially was conceived as also embracing the western Arctic. An agreement reached in 1987 provided for the split of the area occupied by Canada's Eskimo but the boundaries as drawn did not meet with the approval of the Indians who were also involved, and whose territories lie to the south; there are hopes of achieving the final division of the Northwest Territories by the end of 1991.

The realization of this Nunavut Territory will imply something far beyond the degree of autonomy permitted to the large ethnic Autonomous Oblasts (National Oblasts prior to 1977) in the Soviet Union. The former involves a political-administrative and cultural autonomy represented by an ethnic majority; the latter a cultural autonomy observed by a minority, through which customs and literature are promoted or the use of the indigenous language is guaranteed as an official language of communication.

So far, aspirations for self-determination have been fully realized exclusively in Greenland. Although in 1972 around 70% of the population had voted against joining the European Community, in 1973 the island automatically became part of Denmark. As a reaction to this compulsory membership, the desire for greater political autonomy was reinforced and in 1979 was realized; in a referendum carried out by the Greenlandic government in 1982 52% of the vote was for

secession and this was achieved in 1985. Since then Greenland has possessed the status of an associated overseas territory, making it possible to sell Greenlandic fish products on the European market, but to ignore European Community catch quotas. In this connection it was argued up front that remaining in the European Community was incompatible with implementing their own fisheries policy and that the annual subsidies from the regional and social budgets of the European Community were totally unrelated to the values of the catch regularly being harvested by the European fishing fleets. In the background there was a demand for greater political autonomy, which was not to be constrained by a new relationship of dependence, this time on Brussels. But even the attitude taken by the Danish government in the matter of exploration concessions contributed significantly to this development: whereas the Greenlanders demanded that the mineral and energy resources should be seen as the property of the local population, and that correspondingly the proceeds from any possible finds should stay in Greenland, Copenhagen insisted on the observance of Danish mining law, whereby all mineral resources belong to the state. In 1977 the Greenlanders enunciated their desire that offshore drilling should be suspended, under the impact of the North Sea oil catastrophe, but this wish was not met and this again demonstrated to the Greenlanders their political impotence. Yet despite the granting of autonomy, for pragmatic reasons the ties with Denmark were not completely severed; foreign and defense policies remain in Danish hands and the annual contribution paid by Denmark to balance the trade deficit, to defray social services, and for further development of the economy, building of settlements, and improvement to the infrastructure remain intact.

9. PROSPECTS

The Eskimo population (the only group that can be discussed here) is relatively young, with about 30% of the total population younger than 14. This means that in the coming years increasing numbers of job and income opportunities will have to be created, if an increase in unemployment is to be avoided. Already today, unemployment is leading in many cases to alcoholism, violence, and increasing crime rates. There are some difficulties associated with determining the scale of this unemployment more precisely. For example, official Canadian statistics indicate that about 12% of Eskimos are unemployed; this value embraces exclusively those who have actively been seeking work. But in the small arctic settlements, where everyone knows exactly which opportunities for employment occasionally come available, nobody fritters away his time with "seeking work." On the other hand, if one asks unemployed Eskimos if they are interested in a job, one obtains values of between 45 and 48%. And if, in addition, one considers those who may be holding a temporary job or a casual job, but who would prefer steady employment, the unemployed figure rises almost to 70%. This means that for the majority of Canadian Eskimos, the various social transfer payments, from child allowance to social assistance to unemployment benefits, represent the most important source of income.

From the experience of the past few years one cannot anticipate a migration of indigenous people to the economic centers in the south on any significant scale. But there are scarcely any employment alternatives available. The number of wage-paying jobs can be increased only by an insignificant amount; they are overwhelmingly in the service sector, since "working" Eskimos produce relatively little; rather they are involved primarily in providing services to each other; employment opportunities are provided primarily by the government or by the corporations that it finances. Small industrial operations generally produce fur clothing, winter clothing, or similar articles which in terms of their processing or material are linked by association with the concepts of "Arctic" or "Eskimo" and thus find a market. Any diversification of these products can be based only on the processing of raw materials that are available either locally or can easily be stored, so that they can be imported in bulk relatively cheaply by sea in summer. In the case of the production of art or handicraft items, which were originally conceptualized as an independent activity that might replace social welfare, the number of saleable pieces made from soapstone, ivory whalebone, etc., appears to be decreasing, and quality seems to be more strongly emphasized than quantity. As regards the tourism sector the availability of trophy hunts and the establishment of sports fishing camps will probably increase; the latter is automatically linked to a contraction of the Eskimo fishery, since this is the only way to maintain a stock of large fish in the appropriate rivers.

In general one cannot count on a single branch of the economy, whether it be mining, tourism, commercial fisheries, or reindeer herding, being capable of bearing the load of future development in the Arctic alone. In the process of a thorough and imaginative consideration of all opportunities that offer an expansion, modernization and intensification of hunting, trapping, fishing, and stock-raising will particularly be necessary. However, this presupposes that these activities will be promoted by the government and that, perhaps through a generous renegotiation of the land claims, the impression that these represent rather primitive and outmoded forms of livelihood will be countered.

Literature

Armstrong, T., G. Rogers, and G. Rowley. *The circumpolar North. A political and economic geography of the Arctic and Subarctic.* London, 1978.

Berger, T. R. *Northern frontier, northern homeland. The report of the Mackenzie Valley Pipeline Inquiry*, rev. ed. Vancouver, 1988.

Bronny, H. M. "Recent changes in the population, settlement, and economic structures in hunting settlements in Uummannaq District, Northwest Greenland," in: *Tagungsberichte und wissenschaftlichen Abhandlungen des 46en Geographentages 1987, Stuttgart* [Conference reports and scientific proceedings of the 46th Geographical Conference 1987, Stuttgart]. Stuttgart, 1988, pp. 311–318.

———— and B. Butzin. "Greenland," in: *Norden—man and environment*, O. Varjo and W. Tietze, eds. Berlin-Stuttgart, 1987, pp. 484–498.

Butzin, B. "Autonomy in Greenland. Between the drive for modernization and the

dictatorship of prosperity," *Geographische Rundschau*, Vol. 32, No. 2, 1980, pp. 92–98.

Central Intelligence Agency. *Polar regions atlas.* Washington, D.C., 1978.

Chard, C. S. "The Nganasan: wild reindeer hunters of the Taimyr Peninsula," *Arctic Anthropology*, Vol. 1, No. 2, 1963, pp. 105–121.

Conolly, V. *Siberia today and tomorrow. A study of economic resources, problems, and achievements.* London, 1975.

Dahl, J. "Mining and local communities. A short comparison of mining in the Eastern Canadian Arctic (Nanisivik/Arctic Bay) and Greenland (Marmorik/Uummannaq)," *Etudes/Inuit/Studies*, Vol. 8, No. 2, 1984, pp. 145–157.

Damas, D., ed. *Arctic. Handbook of Northern American Indians, No. 5.* Washington, 1984.

Dege, W. "The west coast of Greenland. Population, economy and settlement amid structural change," *Deutsche Geographische Blätter*, Vol. 50, No. 1–2, 1965, pp. 1–212.

Dienes, L. "Employment structure, settlement policy, and the development of the Northern Tyumen' oil and gas region," *Soviet Geography*, Vol. 26, 1985, pp. 609–622.

Dunbar, M. J. *Ecological development in polar regions.* Englewood Cliffs, N.J., 1968.

Federal Field Committee for Development Planning in Alaska. *Alaska natives and the land.* Anchorage, 1968.

Foighel, I. "Home rule in Greenland," *Meddelelser om Grønland, Man and Society*, Vol. 1, 1980, pp. 1–18.

Frideres, J. S. "Native settlements and native rights: a comparison of the Alaska Native Settlement, the James Bay Indian/Inuit Settlement and the Western Canadian Inuit Settlement," *Canadian Journal of Native Studies*, Vol. 1, No. 1, 1981, pp. 59–88.

Gocht, W. and E. Pluhar. "Development and extraction of mineral resources in the Arctic," *Die Erde*, Vol. 109, No. 2, 1978, pp. 188–205.

Harhoff, E. "Greenland's withdrawal from the European Communities," *Common Market Law Review*, Vol. 20, 1983, pp. 13–33.

Hobart, C. W. "Inuit employment at the Nanisivik mine on Baffin Island," *Etudes/Inuit/Studies*, Vol. 6, No. 2, 1982, pp. 53–74.

Irwin, C. "Lords of the Arctic: wards of the State. The growing Inuit population, arctic resettlement, and their effects on social and economic change—a summary report," *Northern Perspectives*, Vol. 17, No. 1, 1989, pp. 2–12.

Karger, A. and C. C. Liebmann. *Siberien. Strukturen und Funktionen ressourcenorientierter Industrieentwicklung* [Siberia. Structures and functions of resource-oriented industrial development] (*Problemräume der Welt*, No. 7). Koln, 1986.

Kleinfeld, J., J. Kruse, and R. Travis. "Inupiat participation in the wage economy: effects of culturally adapted jobs," *Arctic Anthropology*, Vol. 21, No. 1, 1983, pp. 1–21.

Kryuchkov, V. V. "Man's impact on tundra ecosystems," *Polar Geography*, Vol. 2, No. 3, 1978, pp. 200–215.

Kugler, R. C. "Historical survey of foreign whaling: North America," in: *Arctic whaling*. Groningen, 1984, pp. 149–157.

Leont'yev, V. V. "The indigenous peoples of Chukchi National Okrug: population and settlement," *Polar Geography*, Vol. 1, No. 1, 1977, pp. 9–22.

Levin, M. G. and L. P. Potapov, eds. *The peoples of Siberia*. Chicago, 1964 (Russian original, 1956).

Miles, P. and N. J. R. Wright. "An outline of mineral extraction in the Arctic," *Polar Record*, Vol. 19, No. 118, 1978, pp. 11–38.

Muller, F. *The living Arctic*. Toronto, 1981.

Savoskul, S. S. "Social and cultural dynamics of the peoples of the Soviet North," *Polar Record*, Vol. 19, No. 119, 1978, pp. 129–152.

Shabad, T. "Soviet arctic oil and gas developments," *Polar Geography and Geology*, Vol. 8, No. 4, 1984, pp. 352–359.

Stablein, G. "Greenland on the edge of the ecumene," *Geoökodynamik*, Vol. 3, No. 3, 1982, pp. 219–246.

Stern, R. O., E. L. Arobio, L. L. Naylor, and W. C. Thomas. "Eskimos, reindeer and land," *University of Alaska Agricultural Experiment Station Bulletin*, No. 59, 1980.

Stirling, I. and W. Calvert. "Environmental threats to marine mammals in the Canadian Arctic," *Polar Record*, Vol. 21, No. 134, 1983, pp. 433–449.

Thomas, M. E. "The Alaska Native Claims Settlement Act: conflicts and controversy," *Polar Record*, Vol. 23, No. 142, 1986, pp. 27–36.

Treude, E. "Cooperatives in the Canadian Arctic," *Polarforschung*, Vol. 42, No. 2, 1972, pp. 128–150.

————. "Studies in the development of settlement and of the economy in the eastern Canadian Central Arctic," *Die Erde*, Vol. 104, No. 3, 1972, pp. 247–276.

————. "Northern Labrador. Development and structure of settlement and economy in a polar marginal area of the ecumene," *Westfälische Geographische Studien*, No. 29, 1974 (Munster).

————. 1979. "Forty years of reindeer herding in the Mackenzie Delta, N.W.T.," *Polar Geography*, Vol. 3, No. 3, pp. 121–138 (German original, 1975).

————. "Land use change, potential and conflicts in the Canadian Arctic," *Geoökodynamik*, Vol. 3, No. 3, 1982, pp. 247–269.

————. "The polar regions. Politico-legal problems in their development and use," *Geographische Rundschau*, Vol. 35, No. 3, 1983, pp. 126–132.

Tyurdenev, A. P. and V. N. Andreyev. "Basic trends in the development of agriculture and other primary industries in the Soviet North," *Problems of the North*, No. 13, 1970, Ottawa (Russian original, 1968).

Vaughan, R. "Historical survey of European whaling industry," in: *Arctic whaling*. Groningen, 1984, pp. 121–134.

Vitebsky, P. "Gas, environmentalism and native anxieties in the Soviet Arctic: the case of Yamal Peninsula," *Polar Record*, Vol 26, No. 156, 1990, pp. 19–26.

Wolfe, R. "Commercial fishing in the hunting-gathering economy of a Yukon River Yup'ik society," *Etudes/Inuit/Studies*, Vol. 8, Supplementary Issue, 1984, pp. 159–183.