The health consequences of 'modernization': evidence from circumpolar peoples

ROY J. SHEPHARD
School of Physical and Health Education, and Dept. of Preventive Medicine and Biostatistics, Faculty of Medicine, University of Toronto, and Health Studies Programme, Brock University, St. Catharines, Ontario

ANDRIS RODE
School of Physical and Health Education, University of Toronto

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Contents

1 *The circumpolar habitat and its peoples: traditional lifestyle and early research findings*

The circumpolar habitat

Boundaries

The circumpolar region is defined by climate and culture, rather than by a specific latitude such as the Arctic circle. Geographic and climatic markers include the tree line, the zone of perennially frozen ground that even in summer only thaws superficially (the permafrost), and the mean July isotherm of 10 °C (Bone, 1992; Burch, 1986; Damas, 1984; Kimble & Good, 1954; Péwé, 1966; Wenzel, 1991). These various boundaries have shifted markedly over the past 10–20 millenia (Lamb, 1965). During the last Pleistocene period of glaciation, ice covered much of North America, Europe and Asia.

The cultural criterion of the circumpolar habitat, at least in North America, has traditionally been the region exploited by a people that early investigators, ourselves included, sometimes termed Eskimos (Damas, 1984). 'Inuk' ('Inuuk,' two, three or more 'Inuit') is the descriptor currently preferred, at least by the Canadian segment of this population. Also, some Amerindian groups can be found living within the geographic boundaries of the circumpolar region even in North America.

Climate

Throughout the circumpolar territories, the temperature remains below freezing for much of the year, and in some of the colder settlements of the eastern Canadian arctic mean daily air temperatures as low as −50 to −60 °C are recorded during the winter months. The average windspeed is about 5 m/s (18 km/h), but windspeeds of 10 m/s (36 km/h) and higher are encountered on some days, and then the windchill is particularly severe (Landsberg, 1970). In contrast, the 24 hour sunshine of late June and early July can occasionally bring mean daily temperatures as high as 25 °C.

In part because the low winter temperatures give a very low absolute

humidity, precipitation is light in most of the circumpolar region. The typical winter snow cover ranges from 0.1 to 0.4 m. Nevertheless, in the early part of winter, high winds lead to an almost continual movement of the snow, with drifting and frequent 'white-outs', blizzards when blowing snow reduces visibility almost to zero. In the islands of the high arctic, pack ice offers a further hazard to shipping for most of the year, but at lower latitudes the ice melts in late June, and here the coastal settlements can be supplied by boat for several of the summer months (Bone, 1992; Stager & McSkimming, 1984).

The local climate is influenced by the extent of snow and ice cover. The snow and ice reflect incident solar radiation and thus reduce potential heating of the ground surface by as much as 80%. Other modulating factors include the proximity of open water, air and water currents and altitude. There are some quite high mountain ranges in the circumpolar territories; air temperatures decrease by 6–7 °C per 1000 m of altitude, and wind exposure is also greater in mountainous regions. In consequence of these several variables, the climate at a given latitude is much colder in the east than in the western Canadian arctic (Fig. 1.1). Likewise, the tempering influence of the Gulf Stream gives ice-free water along the coastline of south-western Greenland and Scandinavia for much of the year.

Geography and economic resources

The climatic and geographic characteristics of the region have had important economic implications for humans who have wished to colonize the circumpolar habitat.

For several months of the year, all outdoor work must be performed under conditions where it is difficult for humans to sustain heat balance. There is partial or total darkness, and visibility is further restricted by blowing snow. Once the tundra is firmly frozen, with light snow cover, travel by dog or reindeer sled or snowmobile is generally possible, but in the more southerly wooded areas or taiga, accumulations of soft snow impede winter travel by all means except snowshoes. During the summer months, much of the region becomes a treacherous swamp of permafrost that can only be explored by boat, plane, or hover-craft.

The soil is thin, poor and dry over much of the arctic. In the more southerly settlements, sparse herbs, moss, lichens, grasses, sages and even small willow shrubs emerge from the snow during the spring, but in the more northerly regions a terrain of gravel and rock is devoid of vegetation. The main potential sources of local ('country') food are hunting, trapping and fishing, although some communities have also learned the arts of

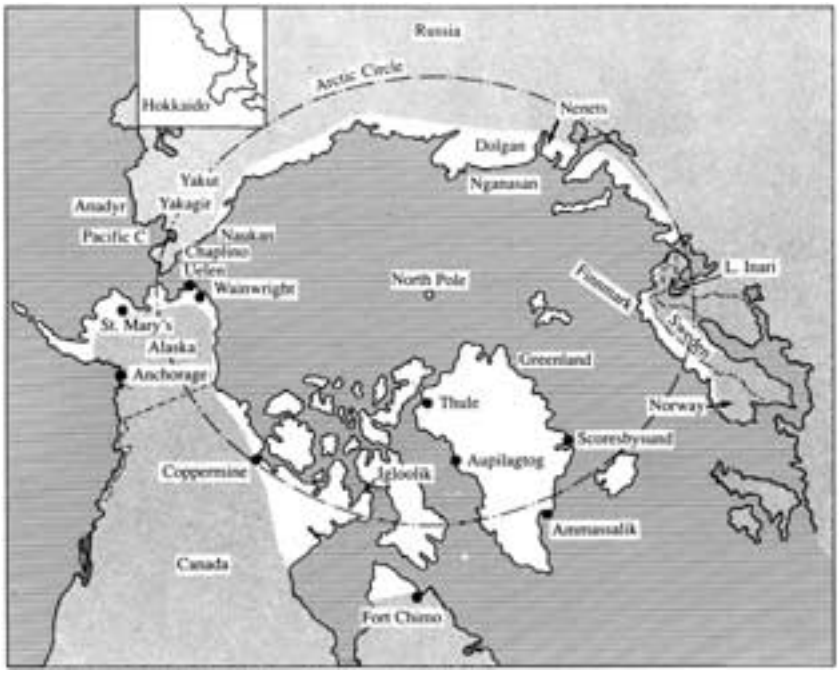

Fig. 1.1. Circumpolar regions, as defined by treeline. Unshaded land mass is devoid of trees. Arctic polar projection.

herding caribou (reindeer), foraging for berries and growing root vegetables. Many areas of the tundra such as Northern Québec still have large herds of wild caribou, but in other locations a sparse fauna and flora have caused animals and their pursuers to range over vast distances. Available species (Freeman, 1984) include various large mammals (seals, whales, walruses, bears and musk-oxen), smaller mammals that are prized mainly for their furs (wolves, arctic foxes and hares), birds (ptarmigan, ducks and geese) and fish (particularly arctic char and lake trout). A combination of local ground conditions and seasonal variations in the quality of the pelts has favoured the hunting of different species at different times of the year (Shephard, 1978; Fig. 1.2), to the extent that some Inuit communities have named the various months in terms of the hunting opportunities that they offer.

Most parts of the arctic give little scope for the growing of vegetables, even during that short period of the year when there are 24 hours of daylight, but some communities have had success in cultivated root crops, particularly potatoes. Some groups also gather berries, roots and mushrooms

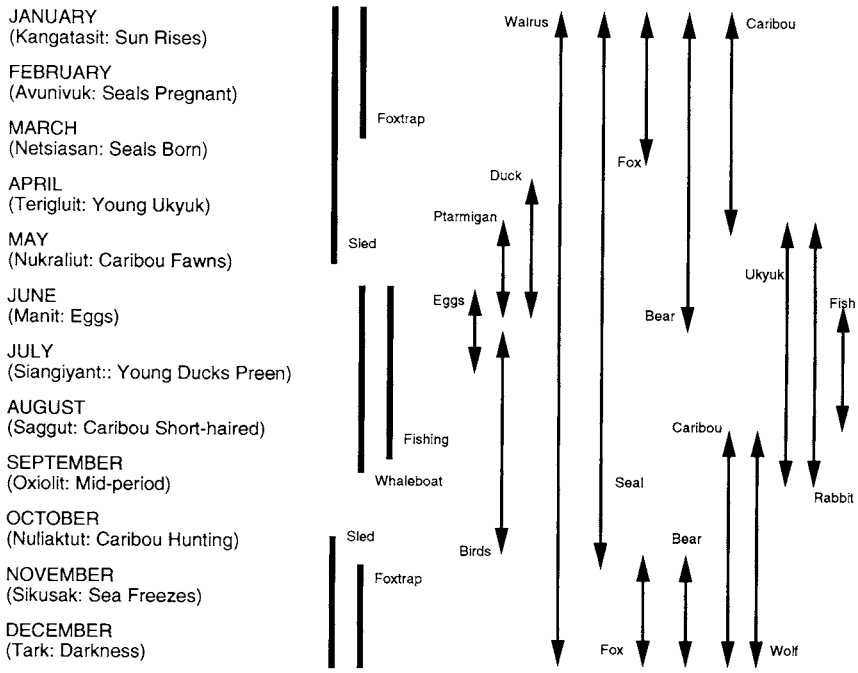

Fig. 1.2. Inuit names of months of year, with hunting equipment used (solid bars) and game sought (arrows). Source: Godin & Shephard (1973a).

by foraging during the summer months. Nevertheless, until recently it has been necessary for the indigenous population in most parts of the arctic to obtain much of their normal vitamin C requirement from sources other than typical vegetables, including plankton found in the stomachs of raw fish, raw meat, blood ('blood soup') and the stomach contents of the walrus and the caribou.

The local fauna contributed to the circumpolar economy in other important ways. The skin, bones, intestines and membranes of animals such as the caribou and the seal once provided the indigenous peoples with raw materials for the fabrication of clothing, footwear and tents, plus a variety of domestic and hunting implements. As contacts with 'white civilization' developed, a trade in animal pelts progressively provided local residents with a cash or barter income for the purchase of both manufactured goods (including modern hunting weapons, domestic implements, twine and thread) and food (as during the failure of the Canadian caribou migrations in the period 1915–1924).

Communities living above the tree-line could not derive heat from the

combustion of timber (except in coastal settlements, where there was the occasional and unpredictable bonus of finding driftwood or wreckage from shipping). Adaptation to the harsh winter environment thus depended to some extent upon physiological mechanisms, but was based largely upon the development of clothing that provided good insulation during outdoor activities (Renbourn, 1972), and the design of very effective snow shelters (the igloo and the quarngmaq or sod-house). The snow shelters allowed the accumulation of heat from both body metabolism and traditional oil lamps. During the summer months, a change in prime hunting locations and a substantial increase of ambient temperatures led families to adopt differing tactics for both their clothing and their overnight accommodation (for example, the eastern arctic Inuit established temporary tent camps near the floe edge to facilitate the hunting of sea mammals).

The 'cold war' of the 1950s led to the establishment of a chain of radar stations across the North American arctic (the 'DEW' line), with a substantial influx of 'white' immigrants. Airstrips developed at some of these stations were adequate to accommodate large cargo planes and jet aircraft. A more detailed exploration of mineral resources now became possible. Some parts of the arctic proved to have extensive reserves of oil (for example, the Alaskan north shore) and/or minerals (for example, the lead, zinc and silver deposits at Nanisivik, near Arctic Bay, and the uranium found at Baker Lake). Economic exploitation of such resources by southern entrepreneurs has progressed relatively slowly, in part because of the need to resolve the land claims of the indigenous populations, and in part because of a continuing search for industrial technologies that can withstand the rigours of the arctic winter.

The circumpolar peoples and their origins

Before extensive contacts with 'white civilization' had developed (1750–1800), the total number of inhabitants of the circumpolar belt of the northern hemisphere was thought to be about 48 000 people (Milan, 1980).

Rychkov & Sheremet'eva (1980) identified 16 groups indigenous to the arctic. Some of these populations currently inhabit Central Siberia (the Evenki, nGanasan and Dolgans) and North-Eastern Asia (the Yu'pik Inuit, Chukchi and other smaller indigenous groups of the Chukotka region, Vahtkin, 1992). Larger numbers of the indigenous circumpolar peoples are found in North America and in Greenland (Amerindians, Aleut and Inuit). Other circumpolar groups which have been studied by the International Biological Programme include the Ainu living in the northern

part of Hokkaido (Kodama, 1970) and the Lapps of northern Norway (Finnmark), Sweden, Finland and Russia.

An earlier monograph in the present series (Mascie-Taylor & Lasker, 1988) examined the origins of these various populations. A review of geological, archaeological, linguistic, cultural, anthropometric, dental, dermatoglyphic and genetic evidence suggested that many of these peoples had a common ancestry (Crawford & Duggirala, 1992; Dahlberg, 1980; Eriksson *et al.*, 1980; Fagan, 1987; Kirk & Szathmary, 1985; Laughlin & Harper, 1979, 1988; Turner, 1989). Early authors had argued for a migration from the Jenisej River and the Taimir peninsula in central Siberia, the region currently populated by the Dolgans and the nGanasan (Larsen & Rainey, 1948; Sollas, 1924). More recent investigators have suggested that the nGanasan are a distinctive population (Ferrell *et al.*, 1981), and the postulated 'cultural cradle' of the North American native peoples has been moved eastward, to around the mouth of the Anadyr River, much closer to the Bering Strait (Giddings, 1960; Spuhler, 1979).

The current hypothesis is that forerunners of the North American indigenous populations crossed the Beringia land bridge. This land-mass linked Siberia with Alaska from 25 000 to 14 000 years before the present day (BP), during the last (Wisconsin) glaciation of the Pleistocene era (Hopkins, 1967). There has been speculation that genetic changes emerging late in the Pleistocene epoch may have given the migrant Inuit/Northern Amerindian stock an unusual ability to adapt to the very severe cold of the circumpolar regions, and thus to exploit the migratory opportunity offered by the land bridge.

Until recently, linguistic (Greenberg *et al.*, 1986) and genetic (Schanfield *et al.*, 1990; Shields *et al.*, 1992; Williams *et al.*, 1985) evidence was interpreted to suggest that several successive waves of migrants, arriving in North America between 20 000–15 000 years BP, developed through divergent evolutionary pathways into North Amerindians, Aleut and North American and Greenlandic Inuit.

There are continuing attempts to deduce inter-relationships between the various populations and sub-populations from such gene markers as blood groups and platelet antigens (ABO, Rh, Duffy, Diego and MNS), HLA (histocompatibility) markers, immunoglobulins (Gm1 and Km systems), proteins such as haptoglobin and transferrin, enzymes such as glucose-6-phosphate dehydrogenase, cholinesterase and acid phosphatase, DNA polymorphisms and miscellaneous markers such as phenylthiocarbamide testing and isoniazid inactivation (Dossetor *et al.*, 1973; McAlpine *et al.*, 1974; Roychoudhury & Nei, 1988) (Fig. 1.3). Critics of the resulting dendrograms have argued that even with the propensity for

in-breeding that is an inevitable consequence of life in isolated settlements, intermingling of supposedly distinct populations has continued over many centuries, making the precise characterization of racial origins almost impossible.

Despite such objections, Laughlin & Harper (1988) compared genetic diversity within and between population groups, and by relating this information to ^{14}carbon-dating studies they established time-estimates for a 'genetic clock'. They argued strongly for the arrival of a single, small group of perhaps 300 people in North America about 15 000 BP. Others (for example, Weiss, 1988) have maintained that genetic evidence is insufficient to decide whether there were one or several waves of immigrants.

Contrary to some early hypotheses, it is now considered that much of the Bering land bridge was a frigid polar desert (Ritchie & Cwynar, 1982). In consequence, it is hypothesized that the small band of early settlers remained scattered along its southern coastline for several thousand years. Carbon-dating of currently known archaeological sites in the interior of Alaska has revealed no human remains dating from earlier than 11 000–12 000 BP. Nevertheless, it is dangerous to conclude from this that the interior of Alaska remained uninhabited for several millenia. Given the vast area of the state, it is quite conceivable that fossils indicating an earlier settlement of the interior are yet to be discovered.

The time clock analysis suggested to Laughlin & Harper (1988) that the Athapascan Amerindians diverged from the Bering Sea coastal population around 15 000 BP. The Aleut/Inuit divergence was set around 9000 BP, and the Yu'pik/Inupiaq divergence around 5000 BP. Currently, North American Inuit have greater genetic similarity to Athapaskan Amerindians than to Aleuts, or St. Lawrence Island or Yu'pik Inuit (Szathmary & Ossenberg, 1978; Nazarova, 1989). This may reflect the inland migration of a small sub-sample of the original coastal colonists, with subsequent survival under extremely isolated conditions (Laughlin & Harper, 1988).

Current ethnic groupings

Ainu

The Ainu currently live in Hokkaido, Sakhalin and the Kuril Islands in Eastern Asia. Weiss (1988) has argued that they were one of the original groups inhabiting eastern Asia, but that they were displaced by the expansion of 'Chinese' people. The Ainu share some genetic characteristics with the Aleuts, Inuit and Amerindians (Omoto, 1973b; Weiss, 1988), but

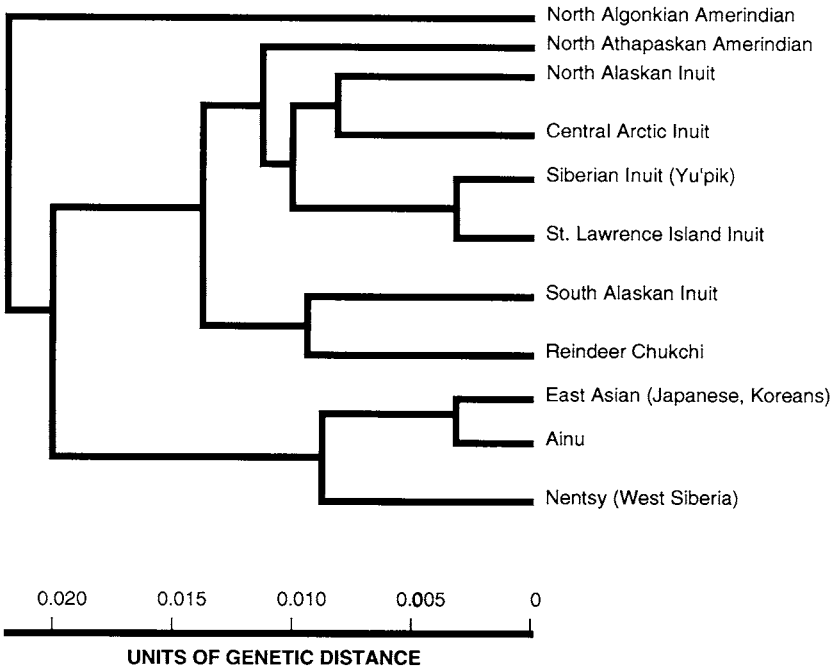

Fig. 1.3 (a). Dendrogram showing affinities between the various circumpolar peoples based on genetic data. Source: Adapted from Szathmary (1981).

they are physically, linguistically and genetically distinct from most of the circumpolar peoples discussed above. Indeed, they seem more closely related to the Japanese and Polynesian groups (Omoto & Misawa, 1974; Weiss, 1988). In recent years, there has been much inter-marriage between the Ainu and the Japanese. At the time of the IBP project, the amount of genetic admixture was already estimated at 40–50% (Omoto & Harada, 1972).

Siberian populations

Chuchki

The Chuchki have been of particular interest to Soviet/Russian scientists. This population has quite a close genetic relationship to the Aleuts and the South Alaskan Inuit. About 12 000 Chuchki currently live in the Eastern part of the former Soviet Union, along with smaller numbers of Yu'pik Inuit, Evenki, Yakuts, Yukaghir, Koryak, and Chuvan.

Present-day settlements of the Chukotki and Yu'pik Inuit are found on

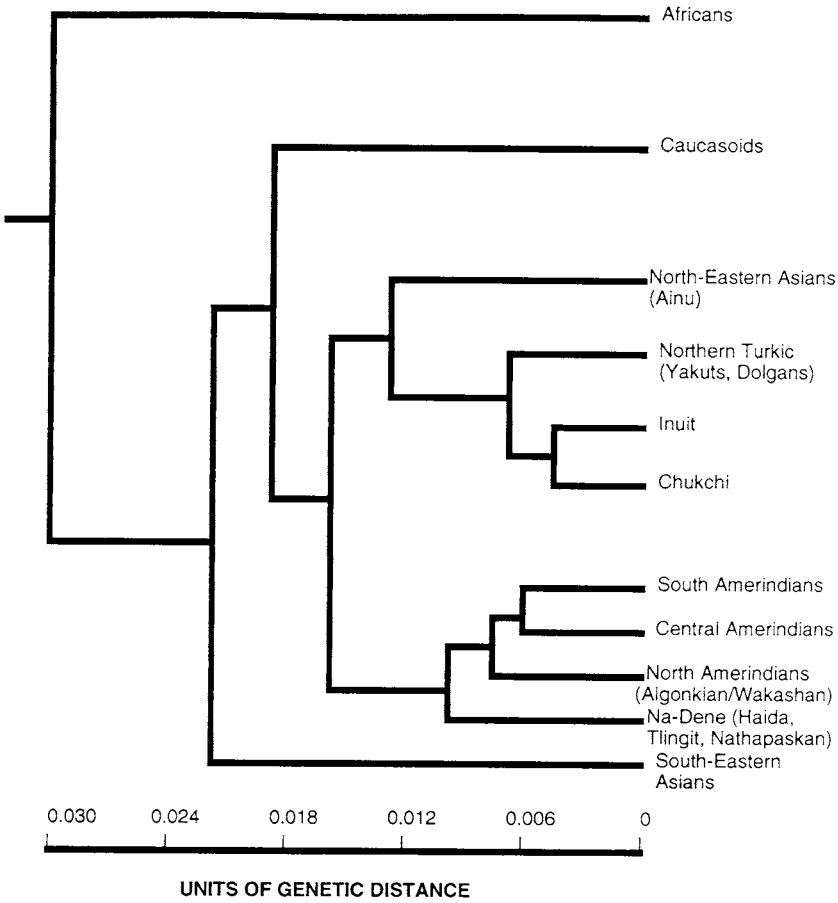

Fig. 1.3 (b). Dendrogram showing affinities between the various circumpolar peoples based on a combination of genetic, archaeological and linguistic evidence. Source: Adapted from Cavalli-Sforza *et al.* (1988).

the Chukotka Peninsula and around the Anadyr River basin (Bering Sea). The Koryak are located mainly on the Kamchatka Peninsula (Pacific Coast), and the Yakuts along the Yana River basin, on the north-eastern arctic coast of Siberia. Inter-marriage has blurred divisions between these various populations (Milan, 1980).

The habitat ranges from the arctic tundra to transitional zones. As with other indigenous groups in the former Soviet Union, the Stalinist government of the 1930s forcibly replaced the traditional Chuchki lifestyle of hunting and fishing by wage employment as reindeer herders on collective farms.

Evenki

The Evenki are an indigenous group currently living in Central and Eastern Siberia, but having some genetic similarities to the Chuchki. Settlements are now concentrated along the Stony Tunguska River, some 750 km north of Krasnoyarsk. Rychkov & Sheremet'eva (1980) estimated that at the time of the IBP study, the total population of Evenki amounted to some 2100 people, although Hannigan (1991) more recently classed 30 000 Siberians as Evenki. Like most of the arctic, the Evenki habitat is subject to permafrost. Much of their territory is forested, but the higher lands are arctic tundra.

During the Stalinist era, the bulk of the population was moved to 16 collective settlements, each of some 200 people (Rychkov & Sheremet'eva, 1980). Their principal occupations are currently reindeer herding, hunting and fishing, although some are now finding employment in forestry, mining and urban occupations.

Somewhat to the north of the Evenki territory, a group of some 1100 Keto people occupy the fishing village of Sulami (Hannigan, 1991).

nGanasans and Dolgans

The nGanasan (population 680) and Dolgans (population 4080) are two ethnically and genetically distinct small groups of people who are thought to have migrated from central or eastern Mongolia to the Taimir region of central Siberia north of Norilsk (Rychkov & Sheremet'eva, 1980). The first arrivals were the nGanasan. They were followed around 1600 by Russian migrants, and around 1700 by the Dolgans and Yakuts from the southeast. Other native groups further to the west include the Entsy, Nentsy, Selkups, Khants, Komi and Lapps.

The Dolgans are currently the dominant aboriginal culture within a social system that has been imposed by the Russian migrants. The habitat lies at the boundary of two eco-systems: forest and tundra. Traditionally, the nGanasan and Dolgans exploited the resources of the tundra, following the migration patterns of the reindeer as far as the arctic north shore during the warmer summer months, setting up hunting camps at the river and lake crossings of the reindeer during the fall, and retreating to the forests to escape from the heavy blizzards of the Siberian winter. The primary occupations were reindeer herding, hunting, trapping and fishing. The nGanasan used reindeer sledges, and the Dolgans exploited the reindeer for its milk and for riding.

The bulk of the indigenous population of this region was settled on

cooperative reindeer farms in the Stalinist era. Our laboratory has made a particular study of one such community, at Volochanka (71° N, 94° E).

Lapps

The genetic origin of the Lapps is unknown, although the frequency of some blood groupings suggests a distant kinship with the Inuit. It is thought that the Lapps once colonized a large part of the Fenno-Scandia, but that they were forced to retreat progressively northwards with the arrival of the Finns around 300 AD (Eriksson *et al.*, 1980).

By 1970, Lewin estimated there was a world-wide total of some 35 000 Lapps (Lewin, 1971). The majority lived north of the Arctic Circle, with some 20 000 in the Finnmark region of Northern Norway, 10 000 in Sweden, and smaller numbers in Finland and Russia. Von Bonsdorff *et al.* (1974) noted that in 1972, some 3800 Lapps were living in Finland; they accounted for 18% of the total population of northern Finland. Many of these people had been displaced westward in 1944, with the annexation of a part of Finland by the former Soviet Union.

About 30% of Lapps are currently characterized as Skolt Lapps (a group who lived in relative isolation until after World War II). The remaining 70% are classed as Mountain and Fisher Inari Lapps. Many of these latter groups have inter-married with Finns during the present century.

In recent times, the majority of Lapp communities have based their economy upon a combination of reindeer herding and coastal fishing. In a few regions, the local climate has also permitted the growing of potatoes. Both Norwegian and Finnish investigators studied the health and fitness of Lapp populations during the IBP-HA project.

North American and Greenlandic populations

Aleuts

The Aleuts are currently found in the Aleutian islands and along the west coast of Alaska. Like the Inuit, they share their physical appearance and genetic characteristics with the indigenous populations of Mongolia.

Many features of language and culture are shared with the Inuit, although Laughlin & Harper (1988) have argued from genetic data that the two populations diverged from a common ancestry about 9000 years ago. In addition to the game pursued by the Inuit, sources of 'country' food available to the Aleuts include sea otters and salmon.

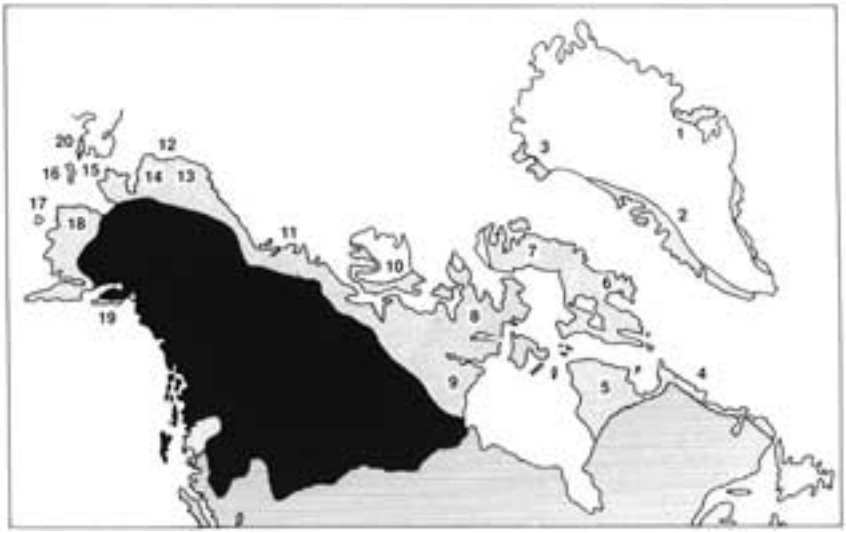

Fig. 1.4. Traditional territories of the 20 tribe-like groupings of Inuit, and the two groups of Amerindians colonizing the arctic habitat (Nadene shown in black, Algonkian Wakashan in horizontal shading). 1. East Greenland Inuit. 2. West Greenland Inuit. 3. Polar Inuit. 4. Labrador Coastal Inuit. 5. Northern Québec Inuit. 6. Baffinland Inuit. 7. Iglulik Inuit. 8. Netsilik Inuit. 9. Caribou Inuit. 10. Coppermine Inuit. 11. Mackenzie Delta Inuit. 12. North Alaskan Inuit. 13. Interior Northern Alaskan Inuit. 14. Kotzebue Sound Inuit. 15. Bering Strait Inuit. 16. St. Lawrence Island Inuit. 17. Nunivak Inuit. 18. Southwestern Mainland Alaskan Inuit. 19. Pacific Inuit. 20. Siberian (Yu'pik) Inuit.

Amerindians

During the period of recorded history, two major linguistic and tribal groupings have exploited hunting and fishing in those regions of North America immediately to the south of the traditional Inuit habitat: the Nadene and the Algonkian-Wakashan Amerindians (Fig. 1.4). Because the climate of the Amerindian habitat is a little less extreme than that of the Inuit, the resources of 'country' food available to more northern settlements are supplemented by variable reserves of moose, deer, and fresh-water fish.

Probably because the Amerindian tribes have faced a somewhat less harsh climate than the Inuit, they have shown correspondingly fewer technological initiatives in combatting cold weather. The snow in the interior of northern Canada is deeper and less packed than that on the arctic shoreline. The traditional winter transport of the Amerindian has thus been by snowshoes and toboggan rather than by dog-sled. During the summer months, their favoured method of travelling has been by canoe.

Inuit

The adoption of a written language and regular communication between the various regions of the arctic are quite recent developments. In part for these reasons, names other than Inuit have been adopted by people who share the same ethnic background, including Inuvalialiut (the people of the MacKenzie Delta), Inupiat (Northern Alaska), Yu'pik (Central Alaska) and Kalaallit (Greenland). However, for the purpose of the present monograph, we have chosen to use the common name Inuk/Inuuk/Inuit, adding where necessary information on the geographic location of particular Inuit settlements.

The small size and considerable mobility of traditional Inuit social units have precluded the description of clear 'tribes', although some 20 tribe-like groups have been identified (Damas, 1984; Fig. 1.4). The Inuit seem to have spread progressively eastward from the Bering Strait, first reaching Greenland and the Canadian arctic about 4000 BP. In the Eastern part of Canada, four distinct cultural waves have been described (Melgaerd, 1960; Crowe, 1969). The first three were the Sarqaq (4000–2900 BP), Dorset (2800 BP–700 BP), and Thule (900–200 BP) people. The Dorset people lived in houses built of sod and stone, and apparently did not use either the dog-sleds or the kayaks and umiaks (larger, open, skin-covered boats) typical of the Thule whale hunters (Taylor, 1963). Some evidence of the Dorset culture still persists around Hudson's Bay (Hughes & Milan, 1980), possibly through a renewal of contacts between Amerindians and Inuit. During the past two centuries, the Thule culture has been supplanted in its turn by a new wave of migrants, comprising the Iglulik, Netsilik and Coppermine Inuit (Fig. 1.4). Among other innovations, the newcomers have introduced a more complicated religious system, with a greater number of taboos (Glassford, 1970a).

The total number of Inuit exploiting the circumpolar habitat has varied widely over the past two centuries. Large segments of the population were killed periodically by contacts with unfamiliar 'white' diseases such as measles and tuberculosis (Chapter 8; Keenleyside, 1990). In the last 30 years, the establishment of a chain of modern nursing stations across the arctic has been associated with a rapid growth of the indigenous population. Nevertheless, the precise number of Inuit in various parts of the arctic is still hard to determine, since population censuses usually rely upon a self-ascription of ethnicity.

Danish IBP investigators made extensive study of the Greenlandic west-coast settlement of Upernavik. There has been much inter-marriage between Greenlandic Inuit and Danes throughout the past century. By

1988, Greenland claimed to have a population of some 45 000 indigenous Inuit (Bjerregaard, 1991); however, the number of genetically 'pure' Inuit was probably substantially less than this.

Canada had 34 000 self-reported Inuit in 1986. About two thirds of this group lived in the North West Territories (Norris, 1990b; Statistics Canada, 1989). Medical officers from Indian and Northern Affairs, Canada, have offered anecdotal comments on the health of many Inuit settlements over the past four to five decades. The detailed observations of our own laboratory have been concentrated at Igloolik (69°40′ N, 81° W), a community that is almost entirely Inuit, and that has grown from 500 to some 1150 people over the past 20 years. Auger and associates (1976, 1980) have obtained additional data from Kuujjuaq (formerly Fort Chimo) in northern Québec, a mixed settlement of some 600 Inuit and Cree Amerindians.

The US (US Congress, Office of Technology Assessment, 1986) reported a population of 42 000 Inuit (Eskimos) and 14 000 Aleuts in 1980, although only a small fraction of these people were living in the circumpolar regions of Alaska. IBP investigators made a particularly detailed study of the North Alaskan communities of Wainwright (population about 330, mainly Inuit), Point Barrow (population about 2500, 'white', Inuit and mixed parentage), and Point Hope.

The Chukotka region of Siberia still has some 1000 people who are identified as Yu'pik Inuit (Young, 1994), although there has been much inter-mingling with the Chuchki. The Yu'pik Inuit have been studied by Soviet/Russian scientists, both during the IBP and subsequently.

Lifestyle and adaptive tactics

Social structures and behaviour

Detailed knowledge of social structures and behaviour covers no more than a few centuries, although inferences about earlier times have been drawn from findings at a few archaeological sites. Probably because of the limited economic base provided by a very low density of game, most traditional circumpolar settlements have been small in size and temporary in nature. A complete community often comprised only 80–100 people, amounting to no more than a few extended families. In transitional climatic zones, the development of reindeer herding allowed the construction of semipermanent settlements, but for many of the more northern arctic populations life was essentially nomadic, whole communities migrating seasonally to areas that

favoured particular types of hunting. For instance, the Inuit took their spears to the river mouths in the spring season, when the char were returning to the sea, and tents were moved to the floe edge in late June, when the skins of the young seals were at their prime. Likewise, the nGanasan established camps at river-crossings used by the caribou in the fall, when the skins of these animals were at their best for the making of winter clothing, but as winter set in, they retreated to the protection of the forests.

Marriage patterns

The limited choice of marriage partners has led to some in-breeding, particularly in the smaller and more isolated settlements.

At the time of the IBP surveys, Milan (1980) rated communities on a scale extending from 0 (no in-breeding) to 0.25 (complete in-breeding). Reported coefficients ranged from 0.001 for Igloolik, NWT and 0.004 for Wainwright, Alaska, to 0.045 for the Nellim-Pasvik Skolt Lapps in Finland. However, there was no clear evidence that this degree of in-breeding had caused the emergence of any recessive diseases or disorders.

Traditional religions

The traditional religious cultures of most circumpolar groups were strongly linked to nature, with a profound respect for the earth, the sea and their respective harvests. Thus, for the Huron Amerindians, the deity was perceived as Gitchi Manitou, a mighty hunter, and in Inuit mythology Sedna, the sea goddess, was mother of the many creatures found in the oceans (Boas, 1964). The Inuit believed that all animals had spirits, and certain taboos were developed based on this belief. For instance, the mingling of meat from land and sea mammals was prohibited. If the members of a settlement broke this particular taboo, it was held that the animals would avoid them during subsequent hunting excursions.

In recent years, elements of rival cultures have been imported and sometimes assimilated. For example, the beliefs of the present generation of the Ainu not only show a respect for the forces of nature, but also include an element of ancestor worship that seems to have been borrowed from their Japanese neighbours. Likewise, the kaitvitjvik (winter festivities) of the MacKenzie Inuit now incorporate some concepts drawn from the southern Canadian Christmas season.