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The Development of Fisheries in Greenland, with Focus on Paamiut/Frederikshåb and Sisimiut/Holsteinsborg

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THE DEVELOPMENT OF FISHERIES IN GREENLAND

WITH FOCUS ON PAAMIUT / FREDERIKSHÅB AND SISIMIUT / HOLSTEINBORG

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CONTENTS

PREFACE	iv
1. INTRODUCTION	1
2. GREENLAND IN GENERAL	3
2.1. Population and Settlements.....	3
2.2. Environmental Conditions.....	4
2.3. History.....	5
2.4. Current Fisheries.....	9
2.4.1. History.....	9
2.4.2. Description of fishing fleet.....	10
2.4.3. Description of technology.....	13
2.4.4. Description of catch.....	14
2.4.5. Description of processing and marketing.....	14
2.5. Fish Stocks and Management.....	15
2.5.1. Stock structure.....	15
2.5.2. Catch regulation.....	16
2.5.3. Means of management.....	18
2.6. Changes in the Fishery Over the Last Two Decades.....	18
2.7. Environmental Change.....	19
2.8. Economic Activities.....	19
3. PAAMIUT / FREDERIKSHÅB	21
3.1. History of the Municipality.....	21
3.2. Infrastructure.....	22
3.3. Neighboring Activities.....	22
3.4. Population.....	23
3.5. Current Fishery.....	24
3.5.1. History.....	24
3.5.2. Description of fishing fleet.....	24
3.5.3. Description of catch.....	25
3.5.4. Description of processing and marketing.....	25
3.5.5. Economic activity.....	25
3.5.6. Political and policy issues.....	26
4. SISIMIUT / HOLSTEINSBORG	27
4.1. History of the Municipality.....	27
4.2. Infrastructure.....	27
4.3. Neighboring activities.....	27
4.4. Population.....	28
4.5. Current Fishery.....	29

4.5.1. History.	29
4.5.2. Description of fishing fleet.	30
4.5.3. Economic activity.	31
5. SUMMARY.	33
6. FIGURES.	34
7. REFERENCES.	54
8. SOURCES OF DATA.	57

PREFACE

The Development of Fisheries in Greenland is the first in a series of community case-study reports, prepared in connection with research on environment and social change in the North Atlantic Arc (NAArc). Material for this report was drawn from a number of different historical and statistical sources. We have sought to cite the original sources as appropriate. In addition, statistical information used for our analyses are available in text form or as downloadable datasets on the NAArc Web site (<http://pubpages.unh.edu/~lch/naarchom.htm>). Our purpose in writing this report has been to unify some of the existing wealth of background information, and make it more widely accessible in English, as a foundation for future research. More detailed original analyses have appeared in our scholarly articles, including Rasmussen (1998, 2000), Rasmussen *et al.* (1998), Hamilton *et al.* (1996) and Hamilton, Lyster and Otterstad (2000). Other work is in progress, focusing particularly on the links between oceanographic, ecological and social change in this region over the past few decades.

Support from the NAArc project has come chiefly from the Arctic System Science and Arctic Social Sciences programs of the U.S. National Science Foundation. We are grateful also for the assistance of our home departments, North Atlantic Regional Studies at Roskilde University and Sociology at the University of New Hampshire. Several individuals contributed to the preparation of this manuscript and its Web presentation, including Oddmund Otterstad (NTNU Trondheim) and Melissa Butler (UNH).

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1. INTRODUCTION

Situated along a mountainous coastline between cold seas and continental ice, Greenland's human populations face severe environmental constraints. Both individual and cultural survival have always depended upon flexible use of the available resources and, when these fail, relocation. The 20th century saw great transitions, notably from Danish colonial to Greenlandic Home Rule government; an almost fivefold increase in population (from 12,000 to 56,000); and from a seal-hunting subsistence economy to commercial fisheries in a new global marketplace. But throughout these transitions, the economy remained tied to renewable resources, and therefore could not transcend the underlying environmental constraints. Greenland's 20th century history demonstrates anew the adaptive necessities of flexible resource use and relocation, in this tough and highly variable environment.

At the beginning of the 20th century, most Greenlanders lived by subsistence hunting and fishing. Seals were their staple resource. Seal populations were falling, however, due to overhunting throughout the northern Atlantic. Warming seas and retreating ice margins around southwest Greenland made the remaining seals less accessible to hunters there as well. At the same time the settlement populations, and their material needs, were increasing. The traditional seal-hunting livelihood thus grew untenable, and alternatives were urgently needed. Commercial fisheries—particularly for Atlantic cod (*Gadus morhua*), which began to appear abundantly with warming waters off southwest Greenland during the 1920s—provided just such an alternative (Mattox 1973). Investment in commercial cod fishing, initially under the direction of Danish planners (especially following recommendations of the Greenland Commission of 1948, published in 1950) and after 1979 Greenland's own Home Rule government, built up Greenland's capacity to capture and market this resource as the basis for a new modern economy. Unfortunately, as with seals before them, cod populations fell under the combined pressure of over-exploitation and environmental change. By the early 1990s cod were gone, while other marine resources, especially shrimp, had become the export pillar of Greenland's economy.

This repeated pattern of synergistic interaction between resource consumption and environmental variation, visible not just in the 20th century but in some earlier episodes as well (Amarosi *et al.* 1997), makes Greenland particularly interesting as a case study showing the human dimensions of climatic change. A striking feature of the cod-to-shrimp transition, well documented because it occurred so recently, has been its locally uneven effects. The overall value of the present shrimp fishery is comparable to the previous cod fishery, but it does not always benefit the same people or places. Some former cod-fishing communities have lost their economic foundation, while others, well-positioned for shrimping, have gained (Hamilton, Lyster and Otterstad 2000). The west Greenland municipalities of Paamiut and Sisimiut could be viewed as a loser and a winner, respectively, during the cod-to-shrimp transition. Even these relatively straightforward examples, however, well illustrate the complexity with which modern social systems mediate the impacts of environmental change.

In this report, prepared as part of the North Atlantic Arc (NAArc) research project, we outline the development of Greenland's fisheries, with special focus on the communities of Paamiut / Frederikshåb and Sisimiut./ Holsteinsborg. We begin with some background on Greenland in general, including its environment, history and fisheries. Next we turn specifically to developments in Paamiut and Sisimiut themselves. These developments contribute to a more

formal analysis, presently underway, documenting the details of linked environmental, ecological and social change in west Greenland. Finally, we conclude with some notes on what these patterns in the recent past suggest about possible futures.

2. GREENLAND IN GENERAL

2.1. Population and Settlements

Greenland's population currently numbers some 56,000 people, living in 18 towns and more than 100 smaller settlements. A large majority recognize themselves as ethnic Greenlanders. There is no clear-cut definition of this term, but for statistical and some administrative purposes, birthplace has been an official criterion; about 89% of the current population is Greenland-born. Population has grown more than tenfold since the 18th century, and fivefold in the 20th century alone. Much of the increase followed Danish-led public health improvements and economic development in the 1950s and 1960s (**Figure 1**).

Greenland's largest settlement is the capital city, Nuuk, with over 13,000 people (about 76% Greenland-born). In colonial times the trade monopoly did not need larger settlements, since trading posts or colonies only required a few people to take care of the trade activities. In fact, for the colonial relationship a more dispersed population structure with many small settlements of villages was preferable as it enabled Greenlanders to use scattered resources, while giving Danes a more limited social responsibility. But some Greenlandic hunters were attracted to the foreigners, and not only traded in their surplus catch, but also seals that ought to have been used for their own subsistence. The slowly growing concentration of population into a handful of larger towns worried colonial authorities. As the adverse effects of the trade became visible, civil servants such as Hinrich Rink, who was responsible for the southern Greenland district, made reports back to the authorities remarking on the increasing poverty among the Greenlanders.

Figure 2 shows the shift of population balance from dispersed villages to the towns. This shift remained gradual until the modernization process after World War 2 suddenly accelerated things. Today there are approximately the same number of people in villages as 100 years ago. The great population increase during the second half of the 20th century has been completely absorbed by the towns.

The modern capital, Nuuk (formerly Godthåb) grew slowly during the 18th, 19th and early 20th century (**Figure 3**). Fluctuating resources in the Godthåb fjord held back growth, as did the fact that the settlement's primary function was to be an administrative center for South Greenland. Although Godthåb's population was small in absolute terms, it included a relatively high proportion of non-Greenlanders early on. This proportion declined slowly as the population grew, but the modernization process and increased connections with Denmark brought a 20th-century explosion in the number of administrators and colonists as well as general population.

Administratively, Greenland today is divided into 18 municipalities, each containing a main town (byer) with the same name as the municipality, and also one or more smaller villages (bygder). A 19th municipality, Vaigat, became deserted after 1969 when coal mining activities in its main town, Qudlissat, ceased. Greenlandic names (e.g. Nuuk, Kangerlussuaq) were made official for all settlements after the Home Rule government took power in 1979, and are in general use today. Some maps and other sources still refer to their previous Danish names (e.g. Godthåb, Søndre Strømfjord).

The distribution of settlements in Greenland (**Figure 4**) reflects strong environmental constraints. Seas off the east coast are dominated by continuous ice cover in winter, and huge ice masses transported by the East Greenland Current during summer. Only a few small settlements—the municipalities of Tasiilaq (Ammasalik) and Illoqqortoormiut (Scoresbysund), holding 6% of Greenland’s population—persist in these hostile surroundings. In contrast, the relatively warm Irminger Current keeps Greenland’s west coast free of continuous ice cover as far north as Disko Bay. Moreover, the subarctic conditions found in southern Greenland permit limited agriculture, and therefore a more dispersed pattern of settlement than found further north.

Both Sisimiut (formerly, Holsteinsborg) and Paamiut (Frederikshåb) are part of southwest Greenland’s Open Water district, a coastline with comparatively ice-free harbors. At present nearly half of Greenland’s population resides in the five municipalities (Kangaatsiaq, Sisimiut, Maniitsoq, Nuuk and Paamiut) of this district, and the fraction is growing. The Open Water district is well positioned for commercial fishing, which has been a crucial element in Greenland’s economy since the early 20th century.

2.2. Environmental Conditions

Fisheries along the west coast of Greenland are dominated by three major water masses. First, there is cold (−1.8 °C) polar water coming through the Nares Strait, Baffin Bay and Davis Strait. Secondly, there is the comparatively warm (3–4 °C) Irminger Current, a branch of the North Atlantic Current, which transports warm water from the Gulf of Mexico to Europe (Smidt 1989:13). On Greenland’s east coast the Irminger Current meets the Polar Current moving south, and both currents flow south of Cape Farewell and then northward along the west coast of Greenland. The relatively warm surface water keeps the west coast free of ice cover as far north as Aasiaat—except for the drift ice which is brought from the east coast and transported as far north as Paamiut, creating moving ice masses that cause problems for sailing in the southwestern region during spring and summer. The third water mass is the fresh water melting from Greenland’s ice sheet (Nielsen et al 1970:57–58).

West coast water temperatures reach levels around 3–4 °C in July and as high as 6–8 °C in August along the more southern banks. At Store Hellefiske Banke (west and north of Sisimiut) the temperature can reach as high as 4–6 °C in late summer. But variations in summer temperatures are substantial, affecting cod and other marine species.

Systematic investigations regarding the currents and temperatures around Greenland started in the beginning of the 19th century. The Fylla expeditions in 1884, 1886 and 1889 focused particularly on ocean conditions. In addition, the Ingolf expedition in 1895 and 1896 did major research, allowing the main characteristics of the currents to be more or less fully described by 1900 (Nielsen *et al.* 1970:62). From 1900 to 1930 several research programs (*Tjalfe, Dana, Godthaab*) sought to map in detail the environmental conditions related to fisheries (Nielsen *et al.* 1970:63). Overall characteristics of the variability of the fisheries resources were described on the basis of these investigations.

Variability in temperature has been recorded for the last 150 years. In the mid 1850s, a short period of relatively warm water was observed, with concomitant good fishing. Another warm period occurred during the 1880s. By 1926 a new warm era was underway, continuing up to the late 1960s with average temperatures at substantially higher levels (Nielsen *et al.* 1970:62). Such marked changes in temperature influenced fish stocks a number of ways. For cod,

temperatures on the most important spawning areas—the western part of banks from Bananbanken (64 °N) to Navnløse Banke (61 °S)—are decisive for local reproduction of the stock. The average temperature required is 4 °C, but the limiting temperature is around 1.5 °C. (Hansen 1961:21; Hansen and Hermann 1953:21). Low temperatures prevent eggs from hatching properly, and reduce the number of juvenile fish to a minimum. Moreover, low temperatures tend to indicate less influence from the Irminger Current. When strong, this current can transport adult cod to west Greenland, from the warmer seas between Greenland and Iceland. When weaker, such transport is less likely to occur. Thus environmental variations alone could produce a fishery in which some year groups are abundant, while other year groups are more or less absent, as often observed around Greenland (Hansen and Hermann 1953:39).

Predictions based upon knowledge about environment–cod relationships have, in principle, been part of the fisheries planning process for 40–50 years. In practice the application of this knowledge has been limited. One famous example of ignoring the biological knowledge occurs in Mogens Boserup's book *Økonomisk politik i Grønland* (Economic Policy in Greenland). Boserup discussed three potential limitations on economic development in Greenland: nature, capital and market outlets (Boserup 1963:16–18, 480–481). He concluded that none of these are true limitations. The resource may be fluctuating, but not limited; the available capital may be limited within Greenland, but unlimited in the Danish realm; and the market for fish and fish products seems to be unlimited. The most interesting thing about these conclusions is not simply that all three proved wrong, but that a serious analyst could draw such conclusions despite the existing research.

2.3. History

Foreign involvement in the development process in Greenland can be characterized by a number of events that have taken place during the last three centuries. During this period, at least five different objectives have dominated the processes: colonization (1650–1775), colonialism (1700–1940), imperialism (1850–1960), modernization (1900–present) and liberation (1930–present). Each objective has contributed to Greenland's settlement structure, both by creating specific structures and settlement patterns, but primarily through the ways different functions were assigned to different places. Some of these functions were determined by the available local resources. But there also exist settlements that reflect particular political conditions, as well as settlements resulting from specific economic initiatives.

After Hans Egede established the connection between Denmark and Greenland in 1721, the creation of The Royal Greenland Trade Department (Kongelige Grønlandske Handel, or KGH) and the establishing of a trade monopoly in 1776 was the basis of the colonial relationship. With Hinrich Rink's creation of a native advisory council in 1862, which had the form of a committee of stewards appointed for each community, a new era was established. This was followed in 1911 by the popular election of local and two regional councils which gave the Greenlanders elements of a local government.

When Hans Egede established the first Danish settlement and introduced commercial production in Greenland in 1721, production consisted mainly of sea mammals. But by the beginning of the 20th century three conditions created a situation where a new approach was necessary:

- The competition of mineral oils reduced the prices of blubber and whale and seal oil, a process which was also supported by the large scale whaling activities on the southern hemisphere.
- The decline in number of seals reduced Greenlanders' subsistence base, pushing them towards increasing dependency on imported food, and a need for commercial alternatives.
- The new abundance of fish, and successful commercial fisheries by other countries in the Greenland waters, opened eyes in the colonial administration.

Commercial fisheries developed slowly, from the first attempts in the late 19th century through the increased activities during the 1920s, supported by intensification of research activities. But the real increase in activities started after World War II, with the industrialization programs during the 1950s and the 1960s. These led to the development of Greenland's high seas fishing fleet.

There is a parallel development of the population and urbanization. By the turn of the century Greenland had around 12,000 inhabitants, of whom the majority were living in smaller settlements—villages or bygder. Only a few regional centers were recognized as towns. As noted with Figure 2, the total population living in the villages has been more or less constant around 10,000 during the 20th century, with a little increase around the middle of the century, and slightly fewer today. The approximate fivefold increase in Greenland's population during this century has taken place not in the villages, but in the handful of larger towns.

With the amendment of the constitution in 1953, Greenland's legal status shifted from Danish colony to Danish county. This gave Greenlanders in principle the same status as other Danish citizens. Greenland could elect two members to the Danish Parliament. This abolished the formal colonial relationship, and incorporated Greenland into the kingdom of Denmark. Greenland was subdivided into a number of municipalities, with local governments given the same rights as the equivalent local governments in Denmark, except for a number of restrictions reflecting the monopolistic character (not abolished until 1979) of the Royal Greenland Trade Company. The change in status was partly induced by the international attention towards decolonization, but also by awareness among Danes about the miserable living conditions of Greenlanders in Greenland. Colonial rulers had seen it as important to protect the Greenlanders' traditional life, and prevent the intrusion of alien cultures, so strict regulations prevented the modernization of their communities. Unintentionally, this led to poverty and atrocious social, economic and health conditions. Close connections to the U.S. during the second world war, while connections with Denmark were cut, acted as an eye-opener for many Greenlanders. The 1953 amendment represented an attempt to create a new starting point for the development in Greenland.

During the 1950s, industrialization had begun with the G50-plan (Grønlandskommissionen 1950), which was primarily based on expanding the local fisheries for shrimp and cod. The first attempts aimed at development based on public investments in infrastructure, but with private investments in industry. These attempts failed, however. Apart from the fisheries, where a major part of the larger fishing fleet was owned by Danes, private investments were absent. With the G60-plan (Grønlandsudvalget 1964) public investments were also introduced in the production sphere, and attempts to concentrate the population in the larger settlements were made. The basic elements of the present production structure thus were established during these two decades. In 1964 the Council—Grønlandsrådet—was established to

oversee and promote development in Greenland. The council included five members from Denmark and five from Greenland (Nielsen *et al.* 1970:114).

Colonial activities required relatively few colonists—usually a group up to 10–20 persons engaged by each colony. The proportion of non-Greenlanders began to rise, however, after World War II. Modernization and industrialization required a skilled labor force, for which the Danish-dominated authorities brought in Danish craftsmen and trainees. The building industry required skilled workers, and at first filled this need with seasonal personnel. Later, however, workers on longer contracts—mostly single men, or men who left their families behind in Denmark—were engaged. The new workers swelled the ranks of Greenland’s non-Greenlandic population. Some of them married Greenlandic women, who often migrated to Denmark with their new husbands after the men’s work contracts were finished. In consequence, the proportion of outsiders (primarily Danes) in Greenland grew steeply, from 2% in 1945 to 19% in 1975. During the next decades this proportion declined slowly, with a small decrease during the 1970s as skilled Greenlanders entered the work force, and growing antagonism between Greenlanders and Danes reduced the attractions for Danes of taking temporary work in Greenland. Concentrated efforts in vocational training of Greenlanders enabled them, during the 1970s, to take over jobs previously held by Danes. A new boom in Danes involved with the Greenland economy occurred as the Home Rule government took over administrative responsibilities after 1979. With the introduction of Home Rule, demand increased for academic skills in particular, causing a minor rise in the proportion of outsiders. Activities which had previously taken place in Denmark were moved to Greenland, and the Home Rule Government therefore had new needs for knowledge workers. As a result of these forces, the number of Danes in Greenland reached its maximum in the late 1980s. Their continuing presence in skilled jobs produced a situation where Danish became the main administrative language, and in administrative centers such as Nuuk even turned out to be the dominating language.

Due to a systematic emphasis on education in vocational and academic skills, Greenland today is experiencing renewed “Greenlandization.” Greenlanders are taking over jobs on all levels, and the number of outsiders is kept to a minimum. Many Danes have settled permanently in Greenland. At the same time, there are a number of ethnic Greenlanders born in Denmark where their parents are attending school. The net result could well be a stabilization with around 10% of the population born outside Greenland.

Gender imbalance is becoming a serious question for the survival of modern arctic communities. Tendencies towards gender imbalance and outmigration of females have been observed both for the smaller settlements and the Arctic in general (e.g., Hamilton and Otterstad 1998; Hamilton *et al.* 1996; Hamilton and Seyfrit 1994). Many settlements in Greenland have proportionately too few women. This stands in contrast to earlier Greenlandic society, where the imbalance was often reversed. When survival depended upon hunting, men were exposed to great dangers, and their higher mortality led to a marked surplus of women. As **Figure 5** shows, records from the late 18th century indicate that more than 55% of Greenland’s population was female. This situation continued well into the 20th century, but with fluctuations caused by disease. Tuberculosis, which disproportionately affected women, had severe impacts where people lived close together without proper housing and nutrition. The demographic situation changed, however, after the modernization process slowly took off around the start of the 20th century, with the introduction of fisheries as a major activity.

Three different mechanisms contributed to the 20th-century reversal shown in Figure 5. One element was the reduced danger for men, for whom fishing in larger boats presented less danger than hunting in kayaks. A second factor was a growing influx of Danes, primarily male, which both raised the total number of males and (through marriage) the rate of female outmigration. During the industrialization process, many marriages occurred between Danish men and Greenlandic women. When the Danes left Greenland, wives typically went along with their husbands, leaving a deficit of women behind. The third factor was improvement in public health, reflecting both better medical services, and generally better living conditions including food supply and housing. The lowest proportion of females occurred during the 1980s, followed by a recent trend of slow increase as Greenlandic women returned after completing their education in Denmark.

Figures 6 and 7 show the age/sex composition of Greenland's population in 1965 and 1998, revealing changes in structure. Comparing these two figures, we can see a shift towards a more uniform distribution of ages. Figure 6 (1965) shows a steep pyramid typical of developing countries that have high birth rates and comparatively low life expectancies. In Figure 7 (1968) the picture changes to one more typical of developed nations, with an older and more stable population structure. The bulge of 30–39 year olds visible in Figure 7 corresponds to the large cohort of young children in Figure 6. Both figures also show deficits of adult women—among 20 to 39 year olds in 1965, and among 30 to 59 year olds in 1998. Especially among 40–59 year olds in 1998, this partly reflects outmigration by women who married temporary workers from Denmark during the industrialization process. Another element has been the growing number of women involved in higher education, spending up to 10 years outside Greenland, with some of them getting married and settling outside Greenland. The “Greenlandization” of Greenland has now resulted in a larger proportion of women staying in Greenland, just as a larger proportion of Greenlandic women with higher education are returning to Greenland. For whatever reason, however, around 10,000 Greenlanders have currently settled in Denmark. The majority of these are women.

The total population size has stabilized, as indicated in **Figure 8**. Natural increase (births minus deaths) averaging around 600 people per year had been countered by net outmigration around 300, slowing net population change. In recent years the outmigration rose to nearly equal the natural increase, keeping net change close to zero. Such outmigration has come in large part from non-Greenlanders, whose numbers have declined by 3,000 during the past decade.

Power was transferred incrementally from Danish to Home Rule governments during the decade after 1979. Key elements are listed in **Table 1**. It is possible to characterize the development process in a number of phases (partly based on Poppel 1997):

- 1979–84: Initialization. A period of building up the Home Rule by taking over responsibility in different fields step by step, although faster than initially anticipated. This involved taking over not just responsibility but also the finances. With the abolition of many traditional institutions, substantial sums were available to new initiatives. The main focus was on development based on renewable resources, with emphasis on the industrialization of fisheries as the backbone of the economy.
- 1985–87: Economic boom with an overheated construction sector and over-investment in the fishing fleet. Due to the breakup of existing institutions it appeared to be a period of organizational fragmentation. At the same time it became obvious that there were

limitations to how many new initiatives could be undertaken. Consequently the focus was much more on industrialization, and less on diversity in the use of renewable resources.

- 1988-89: Stagnation, consolidation and recovery. The government sought to get control over public expenditures, while at the same time increasing exports and opportunities for the Home Rule treasury to raise loans on favorable conditions. The need for economic alternatives to the traditional renewable resources became more and more obvious. One attempt to resolve this problem was to convert Royal Greenland into a multinational corporation.
- 1990-93: Restructuring of Home Rule activities towards market orientation, and converting the former Home Rule owned companies into quasi-private companies, with the Home Rule as the main shareholder.
- 1994–present: Consolidation and new business strategy. Economic expansion based on renewable resources is seen as limited. The concept of “the three pillars” (fishing, minerals and tourism), subsequently extended to include a “fourth pillar” (other land-based enterprises), has been envisioned as a path to further development. The transfer of the office concerning the managing of the shared responsibility for the mineral resources to Nuuk may be one of the events which enables minerals (including hoped-for offshore gas and oil deposits) to become as important as the fisheries are today.

2.4. Current Fisheries

Development of fisheries in Greenland can, according to Smidt (1989:119), be described in three phases:

- The pre-industrial phase from the beginning of the expansion of the cod stock in 1920 to around 1950, characterized by inshore small-boat activities focused on the production of salted products in summer and dried products in winter. Fishing technology mainly consisted of hook and lines, jigging and longlines.
- The land-based industrialization during the 1950–60s, utilizing freezer technology, and with bottom traps for cod, and bottom trawl for shrimp. The production of salted and dried products continued in the small settlements.
- The large scale on-board production since the 1970s, based on trawlers, offshore fisheries and local fisheries within the 200 nautical mile economic exclusion zone (EEZ).

2.4.1. History

Hunting, especially for seals, had been the main focus of economic policy for Greenland well into the 20th century. But increased human populations and fewer seals, as well as declining European and North American markets for seal blubber, produced a need for other commercial activities. The first commercial fishery was begun in Ilulissat in the 1890s as a private activity (Nørrevang *et al.* 1971, 233). This was soon taken over by KGH, with an initiative in 1904 towards commercialization by enabling sale of Greenland halibut (*Reinhardtius hippoglossoides*) in Ilulissat, and Arctic char (*Salvelinus alpinus*) in other parts of Greenland. (Smidt 1989:118). The *Tjalfe* research expedition in 1908–1909 had shown that fish were available in several other places along the coast, so in 1910 foreign fisheries for halibut (*Hippoglossus hippoglossus*) started around Sisimiut, and a fishery for Greenland halibut was also established in the fjords

around Qaqortoq. At the same time, the first processing plant for salted cod was established at Qeqertarsuatsiaat—Fiskenæsset—south of Nuuk. The experiences from this plant were of great importance for the further development and expansion of processing activities, as several Greenlanders became experienced in the processing technique (Nørrevang *et al.* 1971:234).

In the following years additional salting plants were established along the coast. One consequence was that a substantial number of Greenlanders already had experiences with the processing of cod when that resource became more abundant as waters warmed around 1920 (Smidt 1989:118). As seals declined, cod fishing replaced seal hunting. But whereas seals had traditionally provided Greenlanders with almost everything they needed to survive, not only food but also basic elements of clothing, cooking and heating, the cod fisheries provided only food. This created an obvious demand for commercial activities (Smidt 1989:118).

The expanding resource attracted a large number of foreign vessels, with Norwegians in 1924, Faroese in 1925, and the following years also British and Portuguese. Besides cod, a large number of Greenland halibut were caught, and especially around Sisimiut. As a result, halibut stocks there declined (Smidt 1989:118).

Until 1950 all economic activities were fundamentally based on the double state monopoly held by KGH. This was a monopoly of trade of fish and hunting products, as well as monopoly on retail trade of consumers goods (Nielsen *et al.* 1970:121). After World War II a development process was initiated. Its purpose was to reduce the backwardness of the economy, and to bring a modern standard of living to the population. Previous development efforts had lacked a sincere inclusion of Greenland communities. In 1948 the Prime Minister Hans Hedtoft established the Greenland Commission (Grønlandskommissionen). In 1950 this commission presented an important report, later termed the G50-plan, which emphasized the need for new private initiatives to stimulate economic development (Nielsen *et al.* 1970:122). A consequence of the breaking the KGH monopoly was the creation of a number of private companies in retail sales, as well as a large number of private craftsmen etc. Most of them, however, were Danes, former employees of KGH. By 1965 around 20 to 25% of the business in construction, crafts, retail and exports involved this new private sector.

After 10 years, however, it became obvious that the privatization had not succeeded with respect to production. There were not any private initiatives on which to build the economy. It was therefore decided to establish a new commission in 1960. By 1964 the report (the G60-plan) was ready. It stressed that public activities were necessary to create a take-off situation for the home economy. For such a process, public investments in infrastructure, including housing, was considered crucial (Nielsen *et al.* 1970:123). In addition, private access to public funding was seen as a way of invigorating the private business. Substantial funds were made available for private enterprises interested in getting involved in fisheries (Nielsen *et al.* 1970:124).

2.4.2. Description of fishing fleet

- Greenland's fishing fleet consists basically of three segments (Rasmussen *et al.* 1998):
- The small boats, generally below 5 gross registered tons (GRT). Today these are mainly dinghies (skiffs) with outboard motors, but earlier in the century they were rowing boats and kayaks. These small vessels used to be dominant, but today less than 15% of the value of the formally sold fish stems from this group. In connection with the informal sector, however, they still remain dominant. Due to their speed they have a large action

radius, but they are also limited to one-day activities, and lack space for ice and larger equipment. They are most suited for jigging and line fisheries. The total number has probably been around 3,000–5,000 since the commercial fisheries started. In the beginning most of this segment consisted of kayaks, but today there is a larger variety, typically in the 15–25 foot range and with 20–100 horsepower outboard motors.

- The medium size group consists of vessels in the size group from 5 up to 80 GRT. The group includes the smaller motor vessels which were introduced in the first part of the commercial fisheries called “nummerbåde” (numbered boats, because they had an identification number) up to 20 tons. These boats were of great importance during the industrialization. With about 100 vessels in 1960, 250 in 1970, and 350 from 1980 until today, they dominate the small-scale fisheries. Their size enables them to bring along ice and a variety of equipment, but generally they are limited to one-day operations, and therefore also to a restricted operating radius.
- The offshore fleet with vessels above 80 GRT—mostly, far above this level. Usually the vessels are equipped for long-distance fisheries, and trips up to one month duration. Many of them can also do processing on board.

The dividing tonnage is a somewhat arbitrary line. Boats close to the 80 GRT level can be equipped to conduct fisheries over considerable distances, and at the same time with an efficiency in trawling comparable to the larger boats. When an 80-ton limit was introduced by the authorities to prevent the biggest boats from competing with inshore fishermen, several 79-ton boats were built for use in both offshore and local fisheries.

The ways of classifying boats into different size groups have changed over time, and we lack good data particularly about small boats. The following analysis reflects a compromise with the available data, using size groups that are recognizable through the entire time span of interest. **Figure 9** depicts the number of boats in three size groups: 5–49, 50–99 and 100+ GRT.

Numerically, the fleet consists mainly of small boats. Their dominance is even greater if we consider that there exist perhaps 3,000–5,000 additional boats below 5 GRT that also contribute to the fishery, especially its informal sector.

Figure 10 graphs the total tonnage in the two main groups, boats for inshore or local fisheries, i.e. below 100 GRT, and for offshore or long-distance fisheries. Here the dominance is reversed: the tonnage (and fishing power) of the offshore fleet dwarfs that of the numerically larger inshore fleet.

Figures 9 and 10 provide background for a history of Greenland’s fisheries development. From 1920 some Greenlanders, but especially foreigners including Norwegian, Faroese, British and Portuguese boats, were fishing in Greenland waters. Their target was primarily cod, and to a lesser extent Greenland halibut. Two types of technology were employed, jigging and longlines. Both required larger vessels plus a large number of dories.

The history of Greenland’s large-scale industrial fisheries has been closely connected to Denmark. This is due not only to the role of KGH as trade monopoly and a main producer, but also because the pioneers in modern fisheries were two private companies based in Esbjerg, Denmark, starting their activities in 1948. These are “Det grønlandske Fiskerikompani” and “Grønlands Havfiskeri,” which established bases in Tovkussaq (just north of Attammik in Maniitsoq Municipality) and Søndre Strømfjord (today Kangerlussuaq). The company working from Tovkussaq had a large boat, *Greenland*, equipped with on-board processing facilities and a

freezer. Several other boats also were stationed there—in 1949 more than 10—and the production on land included a large freezing plant (Manitsok 1994).

An important element in the modernization of the fisheries was the introduction of freezing plants. Det grønlandske Fiskerikompani had a processing plant in Tovkussaq and established together with KGH in Maniitsoq, Aasiaat and Qasigiannugit the first freezing plants in Greenland in 1941–51 (Smidt 1989:128).

With the beginning of industrialization—the late 1950s and early 1960s—the fleet and equipment were transformed. In shrimp fisheries between 20 and 30 new privately-owned boats were bought during the 1950s. The boats were of the traditional Danish type, but kept rather small, around 20 GRT, for use by Greenlanders without any formal training as pilots (Smidt 1989:129). According to Danish law at least one person with professional training and a diploma as pilot is required when using boats above 20 GRT.

The introduction of bottom traps in 1948 and 1949 increased the accessible resource considerably. Traps without poles required new development which was done locally. The bottom traps were especially used in shallower regions of fjords, where the bottom and ice conditions were not too destructive. In the outer parts of the fjords and offshore, longlines and handlines were the most useful equipment (Smidt 1989:130).

The industrialization of fisheries also influenced the structure of fleet, although small boats remained most numerous. The legal requirement regarding training of pilots for boats larger than 20 GRT limited Greenlandic development. In 1965 KGH acquired four large longliners (100–150 GRT), but these turned out to be less successful than anticipated. It was not until 1969 that the large-scale fisheries began in earnest, when the first off-shore trawler—the 500 GRT stern trawler *Nuuk*—was acquired (Smidt 1989:134, 138). In following years additional vessels as large as 800 GRT were acquired. By the mid 1970s the fleet consisted of 7 large vessels. In 1985 there were 45 trawlers larger than 45 tons, including 22 over 500 GRT, and 10 that were publicly owned (Smidt 1989:138).

The massive investments led to overcapacity: the fleet now could catch more fish than Greenland seas could provide. The overinvestment was due to resource management in which the distribution of total allowable catch (TAC) based on the principle first come, first served. With the introduction of other approaches—a capacity quota for inshore fleet, and an individual transferable quota (ITQ) system for the offshore shrimp fishery, the imbalance between fleet and resources became obvious. Consequently the fleet was restructured during the 1990s, to contain a smaller number of very large vessels. This did not cause a corresponding reduction in fishing capacity, however.

Foreign fleets around Greenland played a major role in Greenland's fisheries development as well. Norwegian and Faroese fisheries began in the 1920s. Faroese fisheries had harboring facilities—in 1926 at Ravns Storø, and in 1927 at Færingehavn—that allowed the use of small boats with handlines and longlines. The offshore ships were usually 100–300 and up to 500 GRT, with a number of small dories using handlines and longlines. During the 1950s the handlines were replaced by “sneller”—jigging wheel equipment. Ships were commonly equipped with freezers. About 40 Faroese and 50 Norwegian ships were usually engaged in fisheries (Smidt 1989:145).

The Portuguese fleet employed dory methods, with 30–40 mother ships, each of them engaging 50–70 dories (Smidt 1989:147). In contrast the French, British, Icelandic and German

fisheries, started in the early 1950s, employed trawlers. Russian fishermen entered Greenland waters on a large scale with on-board processing ships. The combined efforts of this international fishery rapidly depleted cod and other resources.

After the introduction of the 200 nautical mile EEZ in 1977, the foreign fleets were drastically reduced. Their remaining presence was negotiated partly through bi- and multinational agreements, in which fractions of the Greenland quota were sold or exchanged.

2.4.3. Description of technology

Table 2.9 gives an overview of fisheries technology used in commercial fisheries in Greenland waters during the 20th century (main sources are Nielsen *et al.* 1970; Smidt 1989; and Rasmussen *et al.* 1998). In the historic overview above, and the description of the different types of fisheries below, several comments have been given regarding the introduction of different technologies. A few general comments should be added:

- The offshore fisheries developed in connection with industrialization. Longliners were used for a number of years, but trawlers took over, despite the problems they posed for resource management. Attempts to invest in large-scale longliners during the late 70s and the 80s caused several boats to go broke.
- The mixed fisheries were for many years dominated by foreigners, with parallel development of the dory/jig-based distance fisheries during the first two thirds of the century, and the introduction of trawlers connected to the banks fisheries. The Danish and Greenland fisheries also started based on the use of jigs and dories as main equipment, but longlines and especially trawls turned out to be more effective.
- In the local fisheries several types of fishing gear are used in parallel, depending on the species sought and the bottom conditions. Trawls are used for shrimp fishing, and gillnets are the main instrument for salmon fishing. Bottom traps were used whenever cod could be found, whereas the longlines are used for the Greenland halibut, halibut and wolffish (primarily *Anarhichas minor*, but also *Anarhichas lupus*) fisheries. Jigging wheels are used by all the small boats with outboard motors, but also by several of the larger boats. In addition to these types, more specialized gear is used in connection with the snow-crab fisheries (traps) and scallop fisheries (bottom scrapers).

2.4.4. Description of catch

Records of cod fisheries show that cod appeared for short time around 1820 and late in the 1840s, coinciding with brief rises in temperature. But the greatest increase in cod fisheries appeared at the same time as the marked temperature increase around 1920 (Smidt 1989:114). Both foreign and Greenlandic fishermen soon noticed the new abundance of cod. Greenlanders developed a small-scale inshore cod fishery in the 1920s, mainly producing salted products. At first they caught fish with jigging wheels, but bottom traps later became more common. During the 1950s the longline and dinghy fisheries were still predominant, but the trawlers' take was increasing.

Figure 11 depicts trends in Greenland and total catches of cod in Greenland waters over 1911–1997. Conspicuous in this graph are the initial buildup during the 1920s, a huge spike of foreign trawler activity in the 1950s and 1960s, the following steep decline and a final collapse in the early 1990s.

Figures 12 through **15** show trends in Greenland's other major fisheries, for shrimp, Greenland halibut, wolffish and salmon. As the cod fishery began to fail, shrimp took over as the main resource. The increasing importance of the Greenland halibut is also apparent, while the wolf fish and salmon fisheries, which used to play basic roles, tend now to be of lesser importance. At times other species, notably redfish and capelin, have also made contributions.

These graphs showing catch volumes give only limited impression of catch values, particularly in the case of the small but valuable salmon fishery. For many smaller communities, salmon fishing had been of great importance, and contributed much more to the total value than suggested by tonnage statistics. The salmon fishery was closed for several years around 1990, for a number of reasons. First, there had been a marked reduction in the total stock. Secondly, an international organization of recreational fishermen (the North Atlantic Salmon Conservation Organization, or NASCO) had initiated a buyout of west Greenland's total salmon quota. Although the buyout brought Greenlanders more revenue than salmon fishing might have done, they eventually voted against continuing the arrangement. Salmon fishing resumed in 1995, but catches were poor as the resource was extremely scarce.

2.4.5. Description of processing and marketing

Denmark has been the principal importer and consumer of Greenland fish and fish products. From Denmark, however, many of the products are re-exported; the United Kingdom has been a major market for peeled shrimp for decades. Most European countries import some Greenland products. A large part of the shrimp catch is processed at sea, aboard factory trawlers under Japanese control, in order to get very high prices on the Japanese market.

As the commercial fisheries grew during the 1920s and 30s, they produced mainly salted and dried products. Even after the freezing plants were introduced, the salted products continued to be important, among other things because they could obtain rather high prices. But with industrialization, especially its second phase from the early 1960s, frozen seafood—particularly frozen cod fillets—became the chief export. When cod stocks declined, other products rose in importance.

Shrimp have been a major export for the last 25 years. At first, peeled shrimp were the main commodity. Their production brought a dramatic increase in the involvement of women in the labor force. During the 1970s, however, it became apparent that the large whole (shell-on)

shrimp could be marketed at substantially higher prices. Today a majority of the shrimp catch is exported whole, processed only by packing and freezing. This takes less labor than the earlier practice of peeling shrimp. To maintain some employment, the Home Rule government requires that one-fourth of the shrimp catch should be landed and processed at onshore plants.

Figure 16 shows the value of fish products exported from Greenland, in millions of Danish kroner. Shrimp products, and particularly the whole shrimp, clearly dominate these exports. Other products also enter the export sector, including Greenland halibut and the high-value snow crab.

2.5 Fish Stocks and Management

2.5.1 Stock structure

Variations in cod abundance are linked to the appearance of richer or poorer year classes. The large available stock during the mid 1950s was due to a very rich 1947 year class. A record catch in 1962 was based on the 1956 and the 1957 reproduction, while the 1967 record was due to the 1960 and the 1961 reproduction. In 1968 the catch was expected to be very rich, but part of the stock fled the sea and went to east Greenland due to very low water temperature, and appeared abundant in 1975 in the catch by German trawlers (Smidt 1989:116).

Analysis of age structure in the catch has been used for a detailed model of stock determination for the last 70 years. Reproduction of the Greenland stock is described in terms of a temperature-reproduction model.

The salmon stock also seems to vary with temperature. After many years of high production, the catch declined in 1983 and 1984, following two extreme cold winters in 1982–83 and 1983–84 (Smidt 1989:116–117). The connection between salmon stocks in Greenland waters and the river systems in North America and Europe is well known, but the relative impact of Greenlanders' salmon fishing, compared to the scale of recreational fishing and habitat problems affecting these same fish elsewhere on their migration, has not been established.

There appears to be a negative relationship between cod stocks on the one hand, and shrimp and Greenland halibut on the other. Details of this relationship are unclear, however, and it does not enter into the single-species models used for fisheries management.

A general characteristic of the longer-lived species has been a population structure with many large, old individuals when the fishery begins. But due to slow reproduction and growth rates in cold and/or deep water, the population's age structure shifts downwards as fishing intensifies, and the large older fish are removed. This trend has been observed not only with cod, but also with halibut, wolffish and other species (most recently including shrimp). In the case of isolated stocks, even a short period of overfishing leads to a drastic reduction. For example, some Greenland halibut stocks appear resident in particular fjord complexes, although reproduction occurs elsewhere. Such stocks are particularly vulnerable to overfishing, either in the fjords or the offshore spawning grounds.

2.5.2. Catch regulation

The first regulation of foreign fisheries occurred with the EEZ expansion from three to 12 nautical miles in 1963. This mainly affected Portuguese fishermen, but a 10-year allowance of fisheries up to 6 nautical miles was established for France, Iceland, Norway, Portugal, Spain, UK and Germany (Smidt 1989:151).

Store Hellefiskebanke is a major cod spawning area. Denmark applied to the International Convention for the Northwest Atlantic Fisheries (ICNAF, the predecessor of NAFO) seeking protection of the bank from trawlers, but the trawler fleet demanded a total closure for all types of gear. That was unacceptable to the dory fleet, so the closure was halted (Smidt 1989:152).

The large international fishery was reduced following Greenland's assertion of a 200-mile EEZ in 1977. But since Greenland (together with Denmark) was a joint member of the European Community, EC rules had to govern its fisheries (Smidt 1989, 152). Danish participation in Greenland fishing continued, with some limitations, until Home Rule took effect in 1979. It had been required since the 1960s that all Danes involved in fisheries in specific areas within the 12-mile EEZ should have an address and live at least half the year in Greenland (Nørrevang *et al.* 1971:235).

The basis for the present legal organization was the creation of Home Rule in 1979. The Greenland Government did not take over all activities right away, but a process was started, aiming at a total takeover by January 1 1985 (Lage and Rasmussen 1993:31; see Table 1). Following a popular referendum, the Home Rule Government withdrew from the European Union in 1985, allowing Greenlanders to take charge of fishery regulation (Smidt 1989:117).

The first law concerning fisheries was passed in 1984. The present complex of legal arrangements governing commercial fisheries is based on the Landstingslov nr. 17 of October 22, 1990. Several major amendments have since been added, including those of November 1991, October 1992 and May 1993.

The main structure of the regulation includes a number of basic principles (presented and discussed in Lage and Rasmussen 1993:34–37):

- One element in the fisheries management system is the **regulation by means of preservation and technical conservation measures**, where the Government is authorized to create limitations in time periods, in areas, and in use, types and characteristics of equipment.
- A fundamental principle is the **regulation of access to commercial fisheries**. Basically the quotas are reserved for vessels and owners of vessels from Greenland recognized as Greenlanders. But it is possible for the Home Rule administration to make exceptions.
- Another main principle of resource management in Greenland is **regulation by setting of TAC and limitations on access to resources**. It is a political decision usually taken once a year by the government, but based on recommendations from biologists.
- The regulation is based on four different types of **licenses**: time-limited licenses with and without quotas, and time-unlimited licenses with and without quotas. It is up to the Home Rule government to decide what type of license (if any) should apply to a given fishery, except for the shrimp and salmon fisheries which both, according to the law, require licenses. In the case of shrimp the law requires time-unlimited and transferable quotas which can be sold.

For fisheries where licenses are not required, the fisheries are open to all Greenland vessels as long as the overall quota has not been used to its limit. And for species where no quota has been set, there are no limitations on fishing.

COD

In 1968 the first international rules appeared, a technical regulation of mesh size. In 1974, international regulation of cod fishing was introduced. A yearly quota was determined by the Northwest Atlantic Fisheries Organization (NAFO), with a part of this reserved for Greenland. The TAC was based on a biological evaluation of the resource. Following the 1977 expansion of the EEZ, virtually all of the cod was reserved for Greenland. A limited bycatch of cod was permitted for German trawlers catching redfish (*Sebastes sp.*), and certain other fisheries (Smidt 1989:116).

SALMON

Political pressure from European and North American recreational fishermen drove regulation of the salmon fisheries. The expansion of Greenlanders' salmon fishing in the mid-1960s led to calls for international intervention; an attempt to totally ban fisheries for salmon was presented in 1969. But not until 1971 did regulation take place (Nørrevang *et al.* 1971:243). ICNAF established a yearly limit of 1,200 tons in 1972, based on the average of the previous three years' catch.

SHRIMP

Until the 1950s, shrimp were pursued chiefly by inshore vessels, and therefore of concern mostly to Greenlanders. But with the expansion of shrimp fishing to the outer parts of banks, broader regulation became necessary.

The introduction of TAC was the first overall regulation of the shrimp fishery. But in Greenland it also created incentives for overinvestment and overcapacity, because the fishery was open to everyone until the TAC level was reached. To reduce the capacity, and find better means for regulating the fishery, two types of quota arrangements were created:

- Government Order 6 of April 8, 1991 determines the regulation of vessels above 75 GRT in an ITQ system. The total TAC was divided among the shipping companies involved in shrimp fisheries at that time, in proportion to their catches during the last 3 years. They received a certain percentage of the yearly TAC. It is possible for the companies to sell the whole share or parts of it, with price determined by the free market. The Home Rule has a precedence for buying the TAC-share in order to reduce the fishing activity, or to redistribute the share.
- Government Order 32 of November 21, 1991 determines the regulation of vessels below 75 GRT in a Capacity Quota system. The regulation method is through a number of points given to each fisherman involved in the fisheries, based on his activities in the previous years and determined according to the technical capacity, i.e. vessel size, gear type, etc. The points are transferable, and it is possible to upgrade the fishing capacity by buying a certain number of points and upgrading gear. The government can reduce the "quality" of the points in connection with transfer of points from one fisherman to another. It is also possible for the government to buy out points in order to reduce the

catch capacity. Given a license to fish, it is possible to do as much fishing as time enables with the specific equipment available.

2.5.3. Means of management

For many decades the practical exercise of authority has been maintained in two different ways. The first of these is by means of inspection and license control. Inspections are conducted by the “Grønlands Komando” (the naval inspection fleet stationed at Grønødal, South Greenland, as well as their aircraft based in Narssarsuaq) and the police force, who do the practical inspection of the ships’ catch, fishing gear etc. when they are in harbor.

A serious problem of discards formerly occurred among the high seas fleet—up to 90% of the shrimp caught have at times been discarded due to small size (Lage and Rasmussen 1993; Rasmussen *et al.* 1998). Small shrimp bring only a fraction of the price of the large shrimp on the Japanese market. In order to control this problem, in 1989 the Government introduced an amendment to the law requiring government inspectors stationed on board the vessels. The inspectors provided a continuous check on fishing activities, reducing opportunities to discard. In the beginning only one controller was installed onboard the ships, but this proved to be insufficient. It was difficult for one person to withstand the pressure from the crew, and impossible to observe 24 hours each day, so discarding could still go on. As a result, two inspectors are now installed onboard all high sea vessels fishing in Greenland waters.

Licenses are controlled by the Government’s “Licenskontrollen” office. All large vessels have to report regularly to the office, and give daily reports regarding their fishing activities, by means of electronic messages as well as written log-books.

A second important—and more political—means of authority has been through the management of fish processing plants. In most cases, these were the only place where fish could be sold. By limiting the time periods of purchase it has been possible to place restrictions on fisheries with very short notice. In some instances—probably most of them—restrictions have reflected real limits in processing capacity. But there have also been situations where purchase closures were used as a means of resource management.

2.6. Changes in the Fishery Over the Last Two Decades

The most important changes regarding fishing fleet, catches and processing have been described above. A few comments should be added regarding conditions in connection with the fishing activities. Public involvement has played a crucial role in the development of commercial fisheries in Greenland. The G50 plan sought development based on private investment. Public investment in infrastructure was supposed to open room for private development initiatives. But it has turned out that public investments are necessary in production as well.

Figure 17 graphs trends in public investment in fishing fleet structure, separately for Greenland towns and villages, over 1951–85. Data for recent years are not compiled, but the main trends in the investment structure are rather clear. The importance of the investments in the larger settlements (towns) seems to be obvious. It has been increasing steadily over almost this entire period, and accelerating since Home Rule took over. Investments in smaller settlements (villages) began at a much lower level. They increased slowly at first, and even stagnated in late

1960s and early 1970s. Since then they have increased more rapidly, though not approaching the levels in towns.

2.7. Environmental Change

Environmental changes, particularly in climate and ocean currents, have always affected fisheries around Greenland. These effects have been complicated, as have their human dimensions (e.g. Hamilton, Lyster and Otterstad 2000). The collapse of cod stocks, partly due to environmental factors, undermined the investment decisions made in connection with industrialization. But at the same time it left room for a greater shrimp fishery. Today, the apparent limitations of shrimp stocks have turned increasing attention towards Greenland halibut, increasing the risk of depleting this resource too. Observed declines in the average size of fish caught in south and central Greenland warn of possible trouble. Several times during the 20th century, politicians (and economists) have stressed the vision of developing Greenland's economy around its living resources. In all cases the consequence has been an increase in attention paid, but with almost the same level of relative activity. Throughout the 20th century between 1/4 and 1/3 of the total population has been involved in activities related to fishing. Today, around 1/4 of the total population still is directly or indirectly involved in fish-related activity. There is no evidence that this will increase in the future. In the following section we elaborate further points about the economic importance of fish.

2.8. Economic Activities

Figure 18 illustrates the comparatively small changes in the number of people working in fisheries and the fishing industry, from 1974 to 1996. But while fisheries employment has stayed almost the same in absolute terms, its relative position in the economy has shifted. In 1974 it was the largest employment sector, but by 1996 two others, public service and administration and "other" (meaning land-based activities such as trade and industry, commerce, arts, crafts) had more workers. Today the largest job sector in Greenland is the public administration and service. There is nothing extraordinary in this development, which resembles trends found throughout the world and the circumpolar North.

The increase in other land-based employment is primarily connected to private activities in support of public administration and service. But there are also commercial activities, and, to a certain degree, activities such as crafts and industries.

Public infrastructure, which includes public transportation as well as electricity, heat and water supply, seems to employ a rather constant part of the work force. Although there have been high expectations regarding the development of tourism, comparatively few people are actually supported by this industry. During the 20th century mining has been a minor part of the overall employment picture. The most important mining activities, in terms of employment, have been the Qudlissat coal mine on the Disko Island, and the "Black Angel" lead and zinc mine at Maarmorilik, in Uummannaq municipality. Both of these at their peak employed several hundred people. But for the last couple of decades mining and quarrying employment has been negligible. Military activities in Greenland have played an important role due to jobs in the service sector, as well as very good vocational training opportunities, but today there are only two bases left—the Thule Air Base in northwest Greenland, and the Grønlandske Kommando at

Grønnedal. The number of persons involved is small. On the other hand an increase in scientific research has brought many more jobs, and to some degree replaced the former military role.

The most important contribution to the national economy from fisheries is the export value of the fish and fish products, currently around 2 billion DKK (about \$250 million U.S. dollars) per year. Part of the revenue from fisheries generates income directly among fishermen. The amount of income generated in this way is limited, however. In most years the value of income to fishermen is less than 10% of the total taxable income.

Fishing also makes a substantial contribution to the informal economy and subsistence activities. The informal economy includes unrecorded household and individual sales of products and services. Subsistence refers to food and other products for direct household consumption rather than sale. **Figure 19** shows some estimates of the mean percentage of income (or equivalent value) derived from the formal economy, transfer payments, the informal economy and subsistence activities, for three different ranges of settlement size. In all settlements the formal and transfer elements are most important, together accounting for 60–90% of income. But in small and medium-sized settlements, subsistence also makes a substantial contribution. The informal economy, i.e. sales of products on the informal markets (brædtet) is proportionately largest in the mid-sized settlements, reflecting their access to local markets (Rasmussen 1997).

3. PAAMIUT / FREDERIKSHÅB

3.1. History of the Municipality

The Greenlandic name Paamiut means “the people at the mouth (of the fjord).” It was earlier known as Frederikshåb, named by Danish authorities after King Frederik V. The first recorded foreign visit to this area was by Martin Frobisher, around 1578. Hans Egede passed by in 1723, but it was the tradesman Jacob Severin who in 1742 established the colony “Friderichshaab” (Nielsen *et al.* 1970:438). A general problem for the settlement then, as well as later, was the ice conditions during summer. The drift-ice from the east coast is transported south of Cape Farewell and northwards as far as Paamiut during cold periods. The reason for establishing a colony here, however, was the fact that many Greenlanders were already settled in this area. Its potential seemed high, even though ice conditions limited expansion.

Marked fluctuations in resources caused the colony to be known as a very uncertain supplier of blubber and skins. For example, the average number of sealskins purchased per year showed the following variation (Fisker 1980:103):

1826–30: 2,597

1866–79: 1,771

1911–18: 404

Most of the catch, however, went for subsistence use. This has been the case well into the 20th century. The large size of the district complicated trade, so several small temporary trading posts were established during the 19th century. Some of these later became villages.

In 1917, commercial trading in fish began. The first building for salting cod was erected in 1920 (Fisker 1980:107). The first church was established in 1742. The present church was built in 1909 (Nielsen *et al.* 1970). The settlement continued to live a rather dull life, however, up until the era of industrialization. A turning point came with the industrialization plans in 1958 and the program from 1959. The G60 development plan had pinpointed Paamiut as a very good place for modern development. Due to relatively favorable climatic and geographic conditions, it was expected to be a place worth investing in. As a consequence great plans were made for the future (Fisker 1980:183).

Large investments were diverted to Paamiut, and building activities commenced. In order to ensure sufficient fish to supply a planned processing plant, it was necessary to improve the fishing fleet, so investments were made in large trawlers which ever since have been responsible for most—up to 80%—of Paamiut’s total landings. Production on the first section of the fish processing plant was started in 1967; the second section started in 1971. Three trawlers were attached to Paamiut in 1971, 1973 and 1975 (Fisker 1980:121–123).

According to the plans the employment at the processing plant would favor women. Sixty percent were supposed to be women while 40% were supposed to be men—altogether 345 women and 120 men (Fisker 1980:121).

The Technical Organization in Greenland (GTO), which was responsible for technical development including all building activities, created a plan according to which Paamiut was supposed to become the second largest settlement in Greenland. Around the middle of the 1970s the settlement was supposed to have 5,000 inhabitants, and in the beginning of the 1980s it should have expanded to 10,000 inhabitants. The GTO considered the settlement to be the best location in the open water district. To support this population growth, housing was erected using

the modern technology of that time, concrete multistory buildings. There was also a new sewage system, new schools, administrative buildings, and the large fish processing plant—at that time the largest in the North Atlantic region (Fisker 1980:243).

These ambitious plans ran into practical complications, however. First, fluctuations in fish catches caused uncertainty and fluctuations in processing activity, so that instead of many full time jobs, a large number of temporary jobs were created. Second, the anticipated immigration did not happen. It had been assumed that the modernized settlement would attract many people from the surrounding settlements, and from the rest of Greenland. When Qudlissat coal mine was closed in 1969, it was supposed that the majority of the population would move to Paamiut (Fisker 1980:183). Instead of moving so far south to Paamiut, however, people chose settlements nearer to Qudlissat, having similar landscapes and climate—such as Aasiat and Ilulissat. Undependable jobs, the large concrete-block apartments, limited leisure time activities, and the limited feeling of “belonging” in this planned industrial community created a strange social environment. In addition, the settlement became known as a town hostile towards Danes. Hospital records showed an upsurge of damage and injuries after each payday, reinforcing the overall image of problems.

3.2. Infrastructure

The colonial government required frequent contact with its colonies, so the first station for telecommunication was established in Paamiut in 1937 (Nielsen *et al.* 1970). Greater changes in infrastructure began with the modernization process. A crucial element of the G50 plan was to open up Greenland for foreign investors, and this meant a need for basic elements such as electricity, harbor facilities etc. In Paamiut the first public power station was built in 1951, and expanded in 1966 (Nielsen *et al.* 1970). Health was also of concern; a public bath was established in 1957 (Bornemann and Petersen 1962:349). The industrialization process and the expected increase in fish processing required further investments in basic infrastructure. The fleet was expected to expand considerably, and to include much larger vessels. Transatlantic vessels should be able to load and unload directly ashore, without intermediate use of barges. Consequently a quay for small and medium sized boats was built in 1960, and a full quay for transatlantic ships with a length of 60 meters was added in 1962 (Bornemann and Petersen 1962:350).

Another part of the process was the establishing of a public water supply in 1964 (Nielsen *et al.* 1970), and parallel to this the creation of a public sewage system. With the advent of transatlantic commercial flights, a domestic flight service arose too—based on helicopters, since airport construction appeared prohibitively expensive. Paamiut’s heliport was built in 1964 (Bornemann and Petersen 1962:349).

3.3. Neighboring Activities

Besides its fisheries, the nearby municipality of Ivituut has had several activities which have influenced Paamiut. Two are particularly worth mention. The first has been the production of cryolite from a mine at Ivituut, situated in the Arsuk fjord approximately 100 km. south of Paamiut. Cryolite extraction started in 1856, and at first it was used for the production of soda. In the 1920s and 30s, cryolite became more valuable for aluminum production, assuming a new and strategic importance. This mine was the largest source of cryolite in the world. In 1940 the

company “Kryolitselskabet Øresund” took over the production and continued until the 1980s. Exports during World War II went chiefly to the U.S. and Canada. Although the main ore had been consumed by 1960, extraction continued from former waste materials that still contained substantial amounts of cryolite (Nielsen *et al.* 1970:424). During the century of production, a large part of the labor force came from Denmark, Norway and elsewhere; relatively few local workers were involved.

The other neighboring activity is the naval base at Grønnedal, established by the US during World War II. It is situated 5 km. from Ivituut mine. The purpose of the base was to protect the strategic cryolite production during the war. After the war the base was converted into a proper naval station in 1951, with surveillance of the ocean around Greenland, security and fisheries inspection as the main purposes. The total number of people involved has varied, typically around 150 persons (Nielsen *et al.* 1970:244–245).

3.4. Population

The population of Paamiut municipality over 1880–1998 is shown in **Figure 20**. Fluctuating resources around Paamiut could support only a limited number of inhabitants, so the settlement grew slowly until World War II. In the postwar years, however, its favorable position for cod fishing on the western banks became more apparent. This triggered a steep increase in population, partly through in-migration of Greenlanders from other parts of the country. Population increased faster than national averages during the industrialization period of the 1950s and 60s, and reached a peak from 1975 to 1985. But with the decline of the cod stock, fisheries activity and the economy as a whole first stagnated, then declined. The population likewise declined. Villages in Paamiut municipality began contracting earlier, in connection with forced industrialization during the 1960s. Over 30 years, 1968–98, village population fell to one fourth of its former size.

Greenland’s industrialization phase had brought a marked increase in foreigners (people born outside Greenland). They comprised around 18% of Greenland’s population from the early 1970s until about 1990 (**Figure 21**). In Paamiut a similar influx of foreigners took place in the 1960s and early 1970s. But as Paamiut’s economy began to decline, the number of foreigners dropped sharply to well below national levels. This outflow continued through at least 1997. One contributing factor, besides the lack of jobs, was the local population’s reputed antagonism towards Danes. Economic troubles fostered a view that foreigners should not be taking the few jobs available. High unemployment was accompanied by problems with alcohol and crime, which contributed to the general pattern of outmigration.

Paamiut’s population historically included a high proportion of women, compared with the rest of Greenland (**Figure 22**). A widespread pattern in Greenland has been the out-migration of women from the smaller settlements, moving either to larger settlements or to Denmark. In Paamiut, however, the proportion of women stayed above the national average during the 1970s and 1980s. The gap between Paamiut and Greenland as a whole narrowed in the late 80s. The explanation for this pattern lies with the fisheries’ traditional division of labor between men and women: men go fishing, while women work in the industry (often, fish processing) onshore. Expansion of the fishing industry in Paamiut created many jobs for women, keeping the proportion who lived there relatively high. This began to change in the late 1980s, as it became obvious that the town’s resource base, primarily cod fish, was vanishing.

3.5. Current Fishery

3.5.1 History

Until around 1900, the main economic activities in Frederikshåb were hunting whales and especially seals, for the production of oil from blubber. The modern commercial fishery in the district was started by colonist Poul Ibsen. He administered the colony in three periods: 1911–12, 1915–16 and 1917–27. In the early years this fisher caught sharks. Later, cod were caught for salting or drying. By 1918 considerable income was generated from the fisheries. Due to the location of cod stocks, a motorboat was acquired in 1920 to drag the dinghies out for fishing in the morning, and returning them in the afternoon (Nielsen *et al.* 1970:439). In 1948 bottom traps were introduced, and these proved to be very successful.

A processing plant started up in 1920, focusing on salted and dried products. In 1959 a new processing activity began for cod liver oil. In 1964 facilities were added for freezing, and in 1967 a full-scale processing plant was built, with a capacity of 10,000 pounds of frozen fillets per day. There were also facilities to produce whole frozen salmon (Nielsen *et al.* 1970:432). Despite fluctuations in fish resources, fishing turned out to generate a reasonably stable income for the settlement.

As describe above, the great turning point came with the industrialization plans in 1958 and the program from 1959, followed by the expansion plans regarding the fishing fleet through investment in large trawlers. Attempts were made to use longlines, but these proved to be less successful. Trawlers, brought to Paamiut in 1971, 1973 and 1975, have been responsible for most—up to 80%—of the landings (Fisker 1980:121–123).

The main fish plant was prepared for processing a variety of species, but soon became specialized in the processing of cod fillet (Fisker 1980:121). (A private company for shrimp processing—Frederikshåb Shrimps Ltd—was established in 1966. They produced shrimp and salmon until 1971.) According to plans the production at the factory was supposed to generate sufficient revenue to cover all costs including investments. Instead, it has always run at a deficit. Its capacity seemed to substantially exceed the uncertain supply of available fish.

There have been no attempts to re-structure the plant. Efforts have been made to bring in more fish, for example by purchasing cod quotas from other countries. But these have not met with economic success.

3.5.2. Description of fishing fleet

Historical trends in the structure of Paamiut's fishing fleet are shown in **Figure 23**. This graph breaks the fleet's total registered tonnage into two segments—local (medium sized) and offshore (large) vessels. The local fleet has been rather stable over the past 30 years. It doubled in size temporarily during the final years of the cod boom in the 1980s, but today is back close to its earlier level.

The offshore fleet has been more variable. Due to the size of the largest ships, total tonnage varies depending on which individual ships are registered there each year. In particular years, some of the ships have been registered elsewhere due to lack of local activities, just as the registration of a few extra ships in other years (e.g., 1991) produces a great increase in the registered tonnage. Overall, however, the expansion of fisheries as a consequence of industrialization brought a clear increase in the size and catching capacity of the offshore fleet.

3.5.3. Description of catch

Since their inception, the main focus of Paamiut's fisheries has been cod. **Figure 24** shows trends in landings (metric tons) of cod, shrimp and Greenland halibut over 1950–96. Other species, including salmon and wolffish, have made comparatively minor contributions. Even the role of shrimp and Greenland halibut, important elsewhere in West Greenland, has been slight in Paamiut.

Effects of the investments in cod fishing, connected with Greenland's industrialization, can be seen in the rapid rise in landings during the 1950s. After landings declined during the late 1960s, the high seas fleet was introduced and began exploiting new sources. This extended reach, especially after Greenland took control of a 200-mile exclusive zone in 1976, led to new peaks in the late 70s and early 80s. But under stress from fishing pressure and cooler waters, the cod resource itself was declining even as effort and landings increased. This eventually led to stagnation and decline in Paamiut's fishing activities, creating a severe crisis. Additional supplies around 1990, partly due to foreign landings in Paamiut, could not turn this tide.

Paamiut's high degree of dependence on a single resource, visible in Figure 24, made the cod crisis particularly serious. Landings of other species had been, and continued to be, slight. Although some of the other catches (notably shrimp, salmon and wolffish) had value, their volume was too low and inconsistent to maintain jobs and commercial production.

Paamiut's development story has been a resource catch-22. The early abundance of cod gave a basis for investment in production equipment for cod processing, while the relative scarcity of other species did not encourage diversification. Then, when the cod disappeared, Paamiut appeared locked into its particular development path and unable to change strategy. None of the alternative resources were sufficient to justify larger investments.

3.5.4. Description of processing and marketing

The main focus of production in Paamiut has been on cod fillets. These fillets formed one element in the commercial strategy of their single producer, Royal Greenland. The company has had an internal division of labor between its different production units. Once again, a kind of catch-22 situation has developed. With abundant access to cod, there was been a reasonable economy in producing bulk products, and investments focused on maintaining an up-to-date processing line. But with limited alternative resources near Paamiut, Royal Greenland saw little incentive to invest here in other kinds of processing equipment, which might be more profitably located elsewhere.

Outside Greenland's open-water region, commercial hunting still comprises an important part of the economy. Paamiut's waters are not always open; they occasionally are obstructed by ice masses from the south. Consequently we might expect to find hunting as an additional activity there. **Figure 25** compares the total value of fishing and hunting products in Paamiut from 1971–1996. The fishing value parallels the cod landings volume shown earlier in Figure 24. Hunting made a negligible contribution to this total while the commercial fishery survived, although the collapse of that fishery brought hunting and fishing to comparable (small) magnitudes.

3.5.5. Economic activity

Selecting Paamiut as a site for large-scale fisheries production called for substantial investments. Relatively high investment activity continued until the early 1970s. After this, however, investments in Paamiut town declined substantially, and instead were diverted towards the villages. The villages—especially Arsuk—showed some of the flexibility that was lacking in Paamiut. The cooperative company Arsuk Amba was able to take advantage not only of cod, when these were abundant, but also some other species that were processed and sold at a profit. This led to Arsuk’s reputation as a “village of millionaires,” reflecting its high average income from fisheries. But during the 1990s the economy of Arsuk too stagnated, and the cooperative was taken over by Royal Greenland.

There have been no forceful attempts to create alternative economic activities in Paamiut. It has never been a destination for tourists. One reason has been its reputation as a place with social problems, but other key reasons have been the lack of specific tourist attractions combined with relatively high transportation costs. There have also not been any extraordinary governmental job-creating investments in infrastructure or services, of the sort that have benefitted several other Greenland communities. Subsistence hunting and fishing have been an important source of income and food, but we have no data about their levels. Apart from the fluctuating fisheries, the major economic activity in Paamiut has been in the public sector, connected to administration and education.

3.5.6. Political and policy issues

Political changes in recent decades have affected this municipality in a negative way. Since Royal Greenland controls the main economic activity, development in Paamiut has been strongly influenced by the company’s efforts to intensify and rationalize its production. In order to take advantage of the high production capacity in most processing plants, minimizing overall costs and maximizing revenue, Royal Greenland directed investment towards a small number of plants. Over the last decade, no new investments came to the plant in Paamiut. Paamiut’s declining population, absence of local initiatives and lack of alternatives to cod, combined with a limited support from Royal Greenland and public initiatives, has led to a situation where the future of the settlement is uncertain.

To promote education activities the local STI school (vocational training school) was established in connection with the school reform in 1987. In addition, a training school for the fishing industry was established, but has had a limited number of students due to weak interest in fishing careers among young people.

4. SISIMIUT / HOLSTEINSBORG

4.1. History of the Municipality

The Greenlandic name Sisimiut means “the foxholes.” The Danish name Holsteinsborg was given in honor of the Count Johan Ludvig Holstein, owner of the mansion Ledreborg, close to Roskilde in Denmark (Nielsen *et al.* 1970:492). The place was visited many times before Danish settlement. For example James Hall, exploring the area for Christian IV as pilot for Cunningham and Lindenow, was killed and buried here in 1612 (Nielsen *et al.* 1970:492). Hans Egede heard reports of whaling activities at this place in 1723.

The first Danish colony was established in 1756. It was originally placed at Sydbay, a location frequented by Dutch whalers, but the colony was moved to Sisimiut’s present position in 1764 (Nielsen *et al.* 1970:500). The first church was established in 1775, supported by funds from local people. The present church was established in 1926 (Nielsen *et al.* 1970:492).

The region has been fairly productive in terms of sea mammals, as well as reindeer and other hunting animals on land. Thus, during the centuries, it proved to be a good colony. When commercial fishing began in the early 20th century, Holsteinborg soon became an important center for this activity as well. It is situated close to some of the most important fish-spawning and shrimp-producing banks along the coast, which gave it good prospects for economic development.

4.2. Infrastructure

Commercial fishing activities began relatively early in Sisimiut, and this created a need to service the expanding fleet. A shipyard was established in 1932, the first such in Greenland. In the beginning it was primarily for repair, but later began the production of vessels (Nielsen *et al.* 1970:493). Besides servicing Sisimiut-based vessels, this shipyard performed repair activities for most of the coastal fleet (Smidt 1989:54). Establishment of a telecommunication station in 1949 signaled the take-off of the modernization process. This was followed by construction of a public power station in 1950, which was expanded in 1969. The expanding fisheries required facilities for unloading boats, so a “skonnertbro”—schooner-bridge—was built in 1953, and fisheries harbor facilities in 1957. The loading and unloading of transatlantic vessels was initially done by means of barges, as in most other Greenland settlements. Reflecting Sisimiut’s growing needs, however, a full quay for transatlantic vessels was completed in 1970 (Nielsen *et al.* 1970:494).

Public services were also important to the modernization process. A water supply was established in 1955 and expanded in 1966. Sisimiut was also one of the first places in Greenland to have a large number of private telephones (Nielsen *et al.* 1970:492). Sisimiut’s heliport, built in 1964, connected the town to the domestic air transport system (Nielsen *et al.* 1970:494).

4.3. Neighboring activities

The village of Itelleq, 49 km. south of Sisimiut was established to provide facilities for fisheries in 1847. Sarfanguaq, 43 km. from Sisimiut, was established in 1847 for cod fishing. Qerrortussuoq, 11 km. east of Sisimiut, was first established in 1778, abandoned as settlement in 1801, but re-established later and inhabited until the late 1920s (Nielsen *et al.* 1970:495,500).

Søndre Strømfjord—Kangerlussuaq in Greenlandic—is situated east of Sisimiut. A landing strip there was established for a US Air Base named Bluie West 8 in 1943. In 1954 the facilities were opened for non-military use, and the airstrip formed part of the trans-polar connection from Copenhagen to Los Angeles. This connection was no longer used after the mid-1960s, as jet aircraft became capable of nonstop flights. Instead, and despite its distance from population centers, Kangerlussuaq became the main airport and air traffic center in Greenland. During the 1950s additional facilities for civil air transportation, including a hotel and restaurant, were built. These were further expanded in 1960, 1964 and 1966 (Nielsen *et al.* 1970:498).

4.4. Population

Sisimiut's population, the second-largest in Greenland, has followed trends that resemble an average between those of Greenland as a whole, and its capital city of Nuuk. Sisimiut grew steadily to reach its present level well over 5,000 people (**Figure 26**). As noted in the previous section there are a number of villages within Sisimiut municipality, but these experienced falling populations as industrialization gave incentives to move into Sisimiut town. The low point for villages came during the 1980s. In recent years, village population began to increase again, partly reflecting new investments.

Population trends in Sisimiut broadly followed those of Greenland as a whole, with a long period of slow growth followed by a boom with industrialization. This applies equally to the native and foreign-born population. Colonial relations required only limited involvement by foreigners. Industrialization, on the other hand, called for a skilled labor force and hence a heavy influx of foreigners, primarily Danes. As a growth town, Sisimiut received newcomers from outside Greenland. The proportion foreign-born increased faster than the total population until the mid-1980s, although this proportion remained somewhat below that of Greenland as a whole (led by Nuuk), as shown in **Figure 27**. Moreover, it began falling sooner, by the mid-1980s. The early decline in the fraction of population born outside Greenland had several causes, including the fact that Sisimiut's attractive, dynamic character created a counterbalancing in-migration of educated, skilled Greenlanders. With the development of vocational training in Greenland, some jobs formerly held by Danes were taken over by Greenlanders during the second part of the 1970s. The introduction of the Home Rule, and its takeover of administrative activities formerly situated in Denmark, required academically trained workers and hence a new increase in Danes. Again, these jobs too have been gradually taken over by Greenlanders finishing their education, causing a new decline in the group of persons born outside Greenland.

Compared with Greenland as a whole, Sisimiut had a relatively high proportion of women during the 1950s and 1960s because of the character of the industrialization (**Figure 28**). Expansion of the shrimp industry required a large and predominantly female workforce to handle the peeling of shrimp. This situation continued until the general shift to mechanized shrimp peeling during the 1970s. A corresponding fall in the proportion of women shows up clearly in **Figure 28**. After the late 1980s, this proportion stabilized, and it has since followed general Greenlandic trends.

It is interesting to compare the share of population born outside Greenland in the three settlements Nuuk, Paamiut and Sisimiut. These graphs show some remarkable similarities as well as a number of important differences. Nuuk/Godthåb (**Figure 29**) has the highest proportion of residents born outside Greenland, mainly due to its role as the central administrative center.

Sisimiut (**Figure 30**) more closely resembles the average trends of Greenland, with two peaks: one related to the building boom of the first industrialization, and a second due to the gradual Home Rule take over of administrative activities, during which skilled labor from Denmark was invited to participate in development. In Paamiut (**Figure 31**) the industrialization also brought in many foreigners. But the decline in cod stocks soon caused a general decline in economic activities, reducing demand for foreign specialists. And whereas Nuuk and Sisimiut received new duties in connection with the Home Rule takeover of administrative activities, no such activities were assigned to Paamiut. This—in connection with a reputation of unfriendliness towards non-Greenlanders—caused a sharp decline in Paamiut’s foreign-born population.

4.5. Current Fishery

4.5.1. History

At the entrance to the municipal graveyard in Sisimiut there are a large pair of whale jawbones, emphasizing the importance of this activity in times past. Rich sea-mammal resources, and a comparatively dense human population, first attracted Danish colonial authorities to the area. Subsequently, abundant fish resources created a favorable situation for the development of commercial fishing.

Facilities for salting fish were established in 1914. In 1924 this activity was expanded with a production line for canned flounder. The equipment was moved from another site (Grædefjorden) where it had been installed for the production of Arctic char since 1913. But that production had over-exploited small rivers, and could not get a steady supply of char. Consequently the equipment was transferred to more favorable activities. Around Sisimiut, however, foreign fisheries—especially the Norwegian and the Faroese—caused a steep reduction in the halibut stock, forcing a halt to production in 1934.

The Norwegians used boats from Ålesund—approximately 40 fishing boats aiming at cod in the Davis Strait and along the west coast of Greenland. In 1926 a 5,000-ton steamship arrived, equipped with a freezer and several large motorboats and dories. There also were two large English freezers and additional one Norwegian ship for halibut fisheries. Estimates for the Norwegian longline fisheries at this time showed that the length of the line in use would reach three times around the world (Smidt 1989:51, 118).

Since the *Tjalfe* expedition in 1908 had discovered shrimp resources in the area, this appeared a natural avenue for commercial production. When the halibut fisheries stopped in 1934, fish processing facilities were rebuilt for the production of local shrimp. The supply came from four former halibut boats, and involved skilled fishermen from Denmark as well as local fishermen (Smidt 1989:51, 119). Shrimp were peeled and canned onshore. During World War II production halted, but resumed afterwards. Shrimp became scarce in 1949, so production again stopped (Nielsen *et al.* 1970:492). This was due to a severe winter 1948–49, in which cold bottom water ($-1.6\text{ }^{\circ}\text{C}$ instead of the usual 1 to $2\text{ }^{\circ}\text{C}$) caused the near extinction of both shrimp and fish stocks in formerly productive areas. A marked reduction in cod catches occurred too. This was, however, a comparatively local problem. When waters warmed again, stocks re-established themselves through migration from other areas.

New sources of shrimp were found in Disko Bay, but their distance was too far from Sisimiut. Instead, KGH established a processing plant in Qasigiannugit, and the plant in Sisimiut was closed down (Smidt 1989:128). This turned into a positive development. The old and

outdated equipment in Sisimiut were torn down, and in 1957–58 a larger production unit was established. At first, this aimed at the production of salted products, but within a few years a freezing plant was established. By 1964, production began on frozen cod fillets, with a capacity for 20 tons of fillets per day (Nielsen *et al.* 1970:492).

The research vessels *Tjalfe* (1908) and *Dana* (1925) had found some potential for shrimp fisheries, especially around Store Hellefiskebanke and in the Disko Bay. New research in 1966 by the *Dana* established this resource, as well as a relationship between stocks found north of Hellefiskebanke and in Disko Bay.

A private company—“Holsteinsborg Shrimp Ltd”—was established in 1962, as new shrimp resources were found. In addition the company also produced salmon, Greenland halibut and meat from whales and reindeer. In 1965 KGH started shrimp production again. The production of peeled shrimp was viewed as an alternative when it was impossible to produce cod fillets due to lack of supply. A large production plant was established in 1968–69 with a capacity of 3 tons of shrimp per day, and engaging 60 or more women; in peak periods up to 200 people were employed in production (Nielsen *et al.* 1970:492). Investment in large trawlers in early 1970s enabled larger-scale production. The main stocks were found on Store Hellefiskebanke, and therefore very close to Sisimiut (Smidt 1989:52).

The abundance of shrimp attracted large-scale international fisheries as well. Heavy fishing caused depletion of the stocks, which led in 1975 to intervention based on fisheries research.

A cooperative company, Sipeneq (from Sisimiut peqatigit neqaerniat, i.e. Sisimiut company for meat production), also started in the late 1960s. Its production was based on reindeer and fish, especially salmon and Greenland halibut (Smidt 1989:52)

4.5.2. Description of fishing fleet

Figure 32 traces development of the fishing fleet in Sisimiut, 1968–1996. The fleet of vessels for local fishing has been relatively stable, with a total capacity of around 500 GRT. This fleet was sufficient to for local resources, including the shrimp stock available on the banks close to Sisimiut, and even parts of Disko Bay. But as production expanded during the 1970s, larger supplies were needed, which led to expansion of the large-vessel fleet. Figure 32 depicts this substantial increase through the early 1990s, when ITQs arrested the trend towards overinvestment and excess capacity.

When the first large vessels were introduced in connection with cod fisheries, longlines were still in use. In addition, local fisheries for cod still use bottom traps, just as a certain part of the local small-boat fishery is based on jigging wheels. But a much larger part of the fishery depends on trawlers.

The mix of species landed over the past 40 years, shown in **Figure 33**, shows the clear influence of cod’s varied availability. Like Paamiut, Sisimiut originally developed a cod-directed fishery. Local cod resources were less rich than Paamiut’s, however, and other alternatives—notably shrimp—existed. In consequence, Sisimiut’s production facilities were historically more flexible. The plant was able to take whatever has been available and process it in a proper way. This diversity of the processing facilities is reflected by the landings data of Figure 33.

Several different species were available in commercial quantities. This is visible from the late 1960s through the mid-1980s, when the main focus narrowed to shrimp and cod processing. Several other species contributed as well, especially from the late 1960s through the late 1970s. After this point Sisimiut's cod landings erratically declined, while shrimp became increasingly dominant. If we took into account not just the tonnage but the high value of these shrimp, their economic dominance would appear even greater.

The graph shows some of the general characteristics of most species in Greenland, where generally cold waters lead to slow growth and reproduction rates—and hence, vulnerability to overfishing. Several of the more permanent stocks have proven sensitive to human influence. Exploitation of wolffish and Greenland halibut, for example, started at fairly high levels. But after 20 years of continuous over-exploitation, the stocks have been greatly reduced. Populations are young, and therefore also made up of small, lower value, and perhaps not-yet-reproducing individuals. This situation inevitably describes a fishery in decline.

Figure 34 compares the economic importance of Sisimiut's fishing and commercial hunting. Hunting products have been worth a small fraction—between 1/100 and 1/1000—of the fishing products. One should keep in mind, however, that this graph reflects only hunting's formal economic contribution. Hunting for subsistence (food) and the informal economy plays an important, although difficult to measure, social role.

Like Paamiut, Sisimiut has been dominated by Royal Greenland which is the major player in the fish processing game. But Sisimiut has at the same time been known as a place where private initiatives have flourished. Some of these were mentioned in the historic section above. Furthermore, compared with Paamiut, Sisimiut enjoyed a continuing high level of public investment both in Sisimiut town and in the surrounding villages.

The pattern of environmental changes and the local resource availability have been described in earlier sections. It is apparent that environmental changes, such as ocean conditions and shifts in the abundance of important fish species, have affected this municipality's development. But due to its stable and high-value production base, using facilities for a variety of species, fisheries activities in Sisimiut have been maintained at comparatively high levels. Compared with Paamiut, Sisimiut exhibited less specialization or path dependency. Shrimp processing has been at the core of this activity. For the last decades the local shrimp resources have been far from sufficient, so large supplies of shrimp are brought to the plant by the offshore fleet—which is required by the government, as a subsidy for community development, to bring at least 25% of their catch ashore for processing.

4.5.3. Economic activity

Sisimiut has been known as a place of diverse economic initiatives. Land-based production activities played a part; for example the shipyard for maintenance, repair and construction of ships. Tourism has also developed in Sisimiut, based in part on the town's proximity to the international airport at Kangerlussuaq, and its position as the most southernly Greenland settlement permitting sled-dogs.

In an attempt to decentralize administrative activities, several agencies have moved their headquarters from Nuuk to Sisimiut. These include the KNI, or Greenland Trade Organization. This increases the number of jobs considerably, and has multiplier effects in creating other activities. A training school for woodworking and carpentry was established in Sisimiut during

the 1970s, and in connection with the vocational training reform, a local STI school was established. Outside of the formal economy, the informal economy and subsistence hunting/fishing still play important roles as sources of income and food.

Sisimiut remains known as a very active place, with good connections to important national politicians. At the same time, production facilities are constantly busy, due to their favorable location relative to local and more distant resources. With its population increasing, and prospects for an airport to replace the present heliport, there is good reason to hope for the future.

5. SUMMARY

Paamiut and Sisimiut, like other Arctic settlements, face great challenges in developing modern economies from the human and natural resources of their northern environments. Commercial fisheries have offered the best hope for development in 20th century Greenland, and this path was followed—with different emphases and results—in both municipalities. Paamiut was built up largely around its codfish resources, when these were plentiful along the southwest coast. Other resources appeared not to be present in commercially viable quantities, and there was correspondingly little incentive or effort to diversify the economy. This concentration on a single resource proved unfortunate as the cod population began to fall, due to a combination of climatic changes and overfishing. Soon Paamiut's economy and population were declining too.

Although cod could also be caught at Sisimiut, they were less abundant there. At the same time other species, notably shrimp, did occur in exploitable quantities. The harvesting and processing capabilities of Sisimiut developed in a comparatively flexible and diverse fashion, adapting to shifts in the available resources. As cod abundance faded, shrimp catches increased to a point where they more than replaced the value of cod. Sisimiut became a main shrimping center, eventually able to land fish from comparatively distant parts of the coast. Its secondary/tertiary economy and human population grew also.

These two towns show a marked difference in their degrees of path dependency, due in part to differences in institutional constraints. Paamiut has been a centrally planned and managed town; whereas Sisimiut developed more naturally around its diverse available resources. There were also apparent differences in the readiness with which the populations of these towns adapted to changing conditions.

Resource, historical and social differences between Paamiut and Sisimiut thus interacted to shape their response to economic and environmental challenges. As Greenland's second-largest municipality, Sisimiut today presents a picture of relatively successful adaptation to the large-scale environmental changes that have taken place along this coast during the 20th century.

6. FIGURES

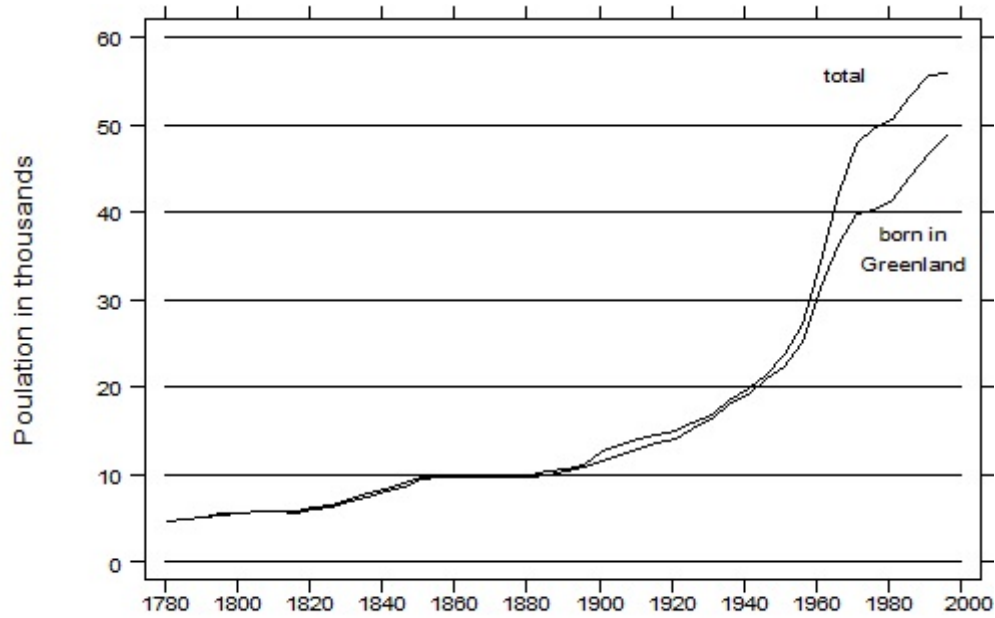


Figure 1: Greenland's total population, and population born in Greenland, 1781–1996. Dataset *DOFGpop1*.

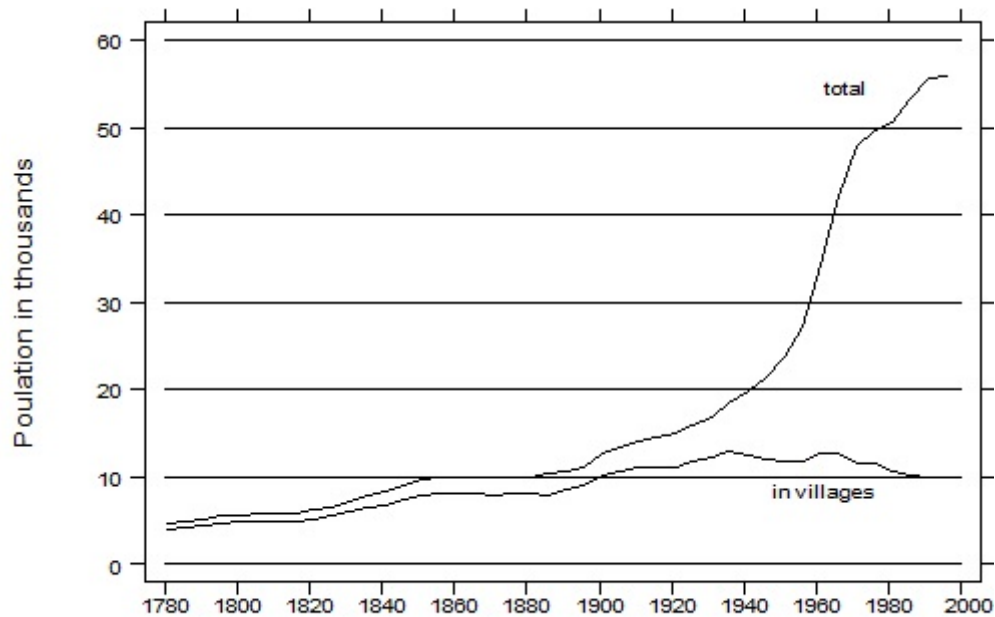


Figure 2: Total population of Greenland, 1781–1996, and the number in smaller villages and settlements. Dataset: *DOFGpop1*.

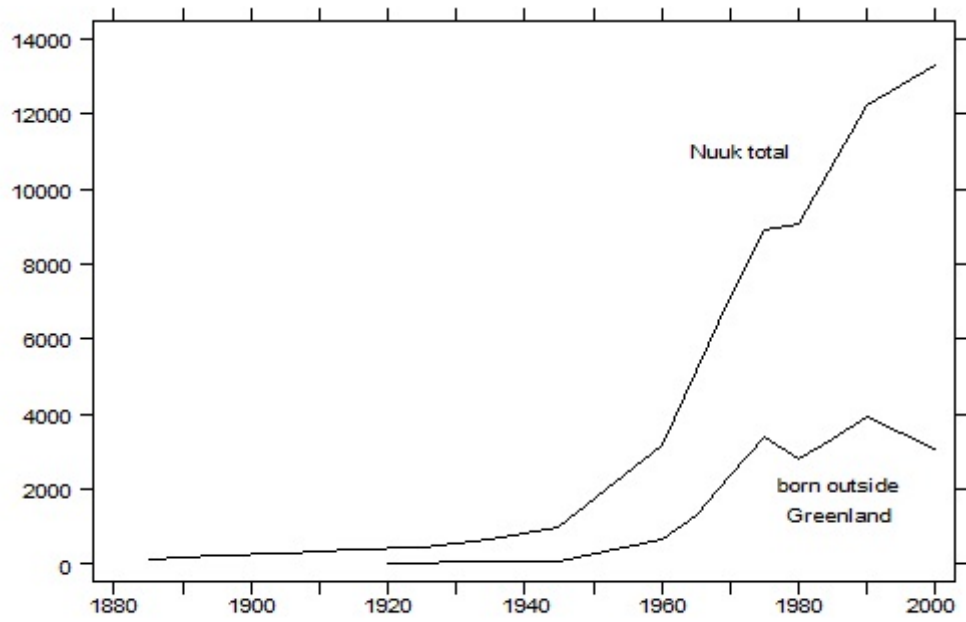


Figure 3: Population of Nuuk/Godthåb over 1885–2000. Dataset: *DOFGpop1*.

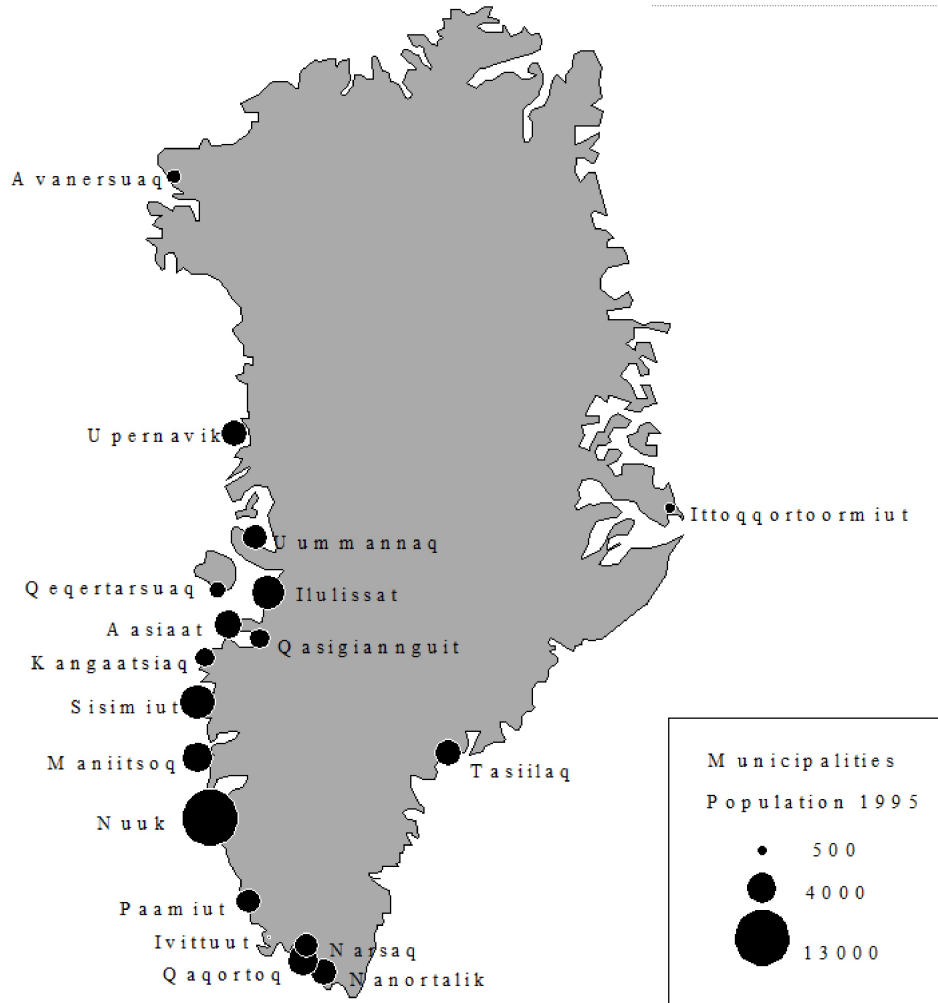


Figure 4: Greenland’s municipalities, with circle areas proportional to 1995 population. Data source: Statistics Greenland.

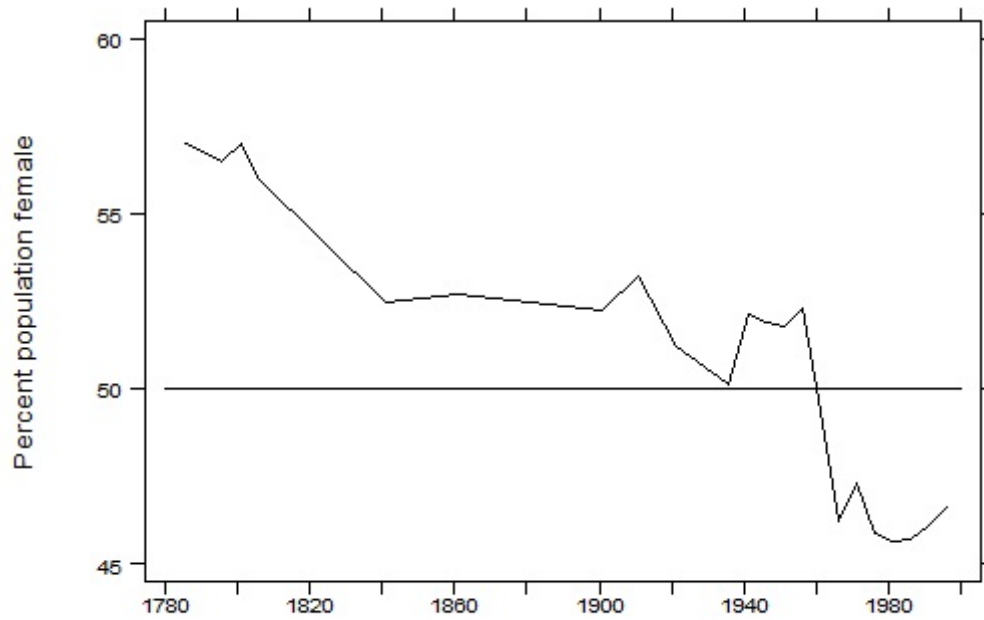


Figure 5: Percent female among Greenland population 1786–1996. Dataset: *DOFGpop1*.

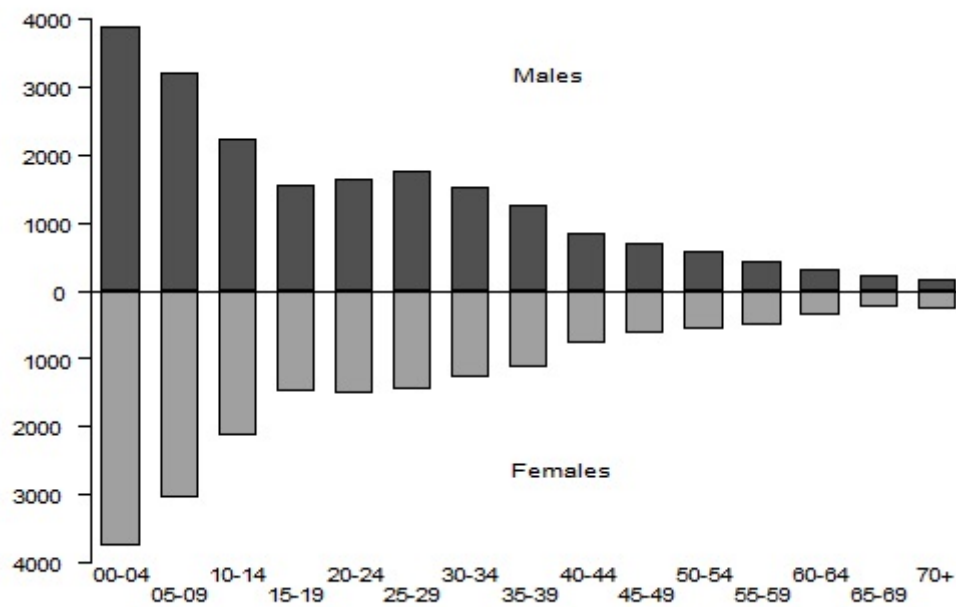


Figure 6: Age/sex composition of Greenland’s population in 1965. Dataset: *DOFGage*.

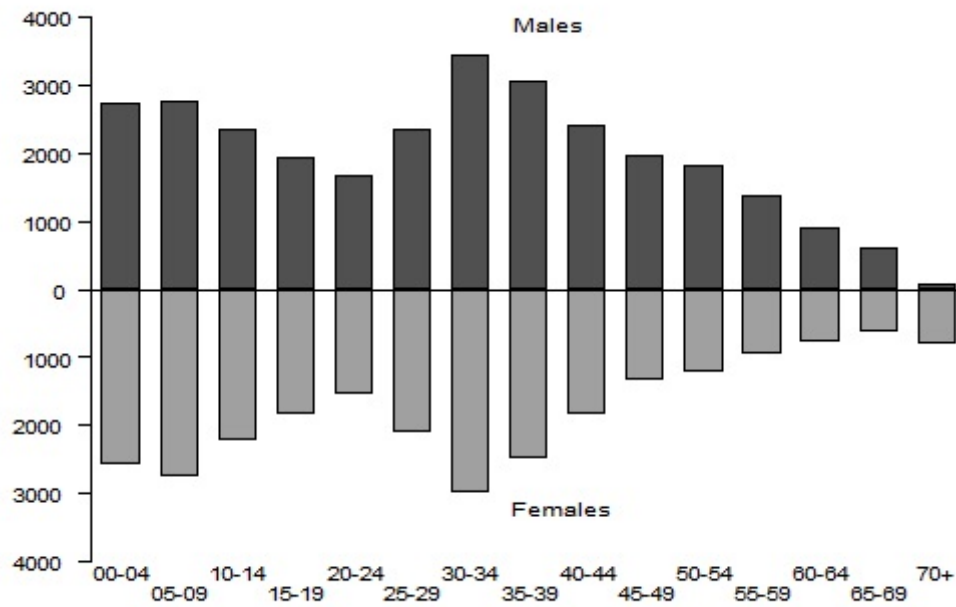


Figure 7: Age/sex composition of Greenland’s population in 1998. Dataset: *DOFGage*.

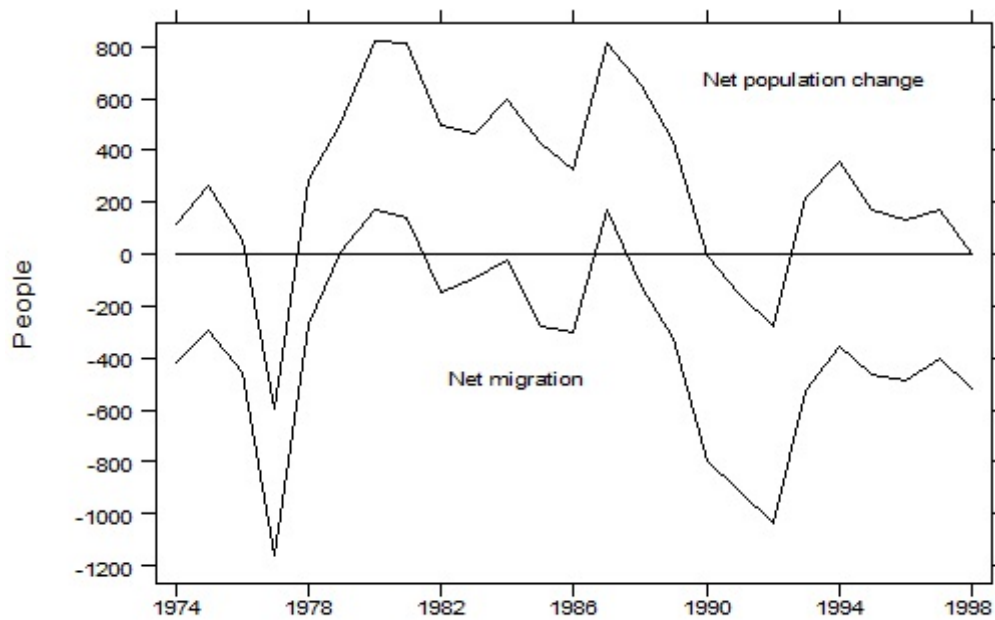


Figure 8: Net migration (in-migration minus outmigration) and net population change (births minus deaths, plus net migration) for Greenland 1974–98. Dataset: *DOFGmig*.

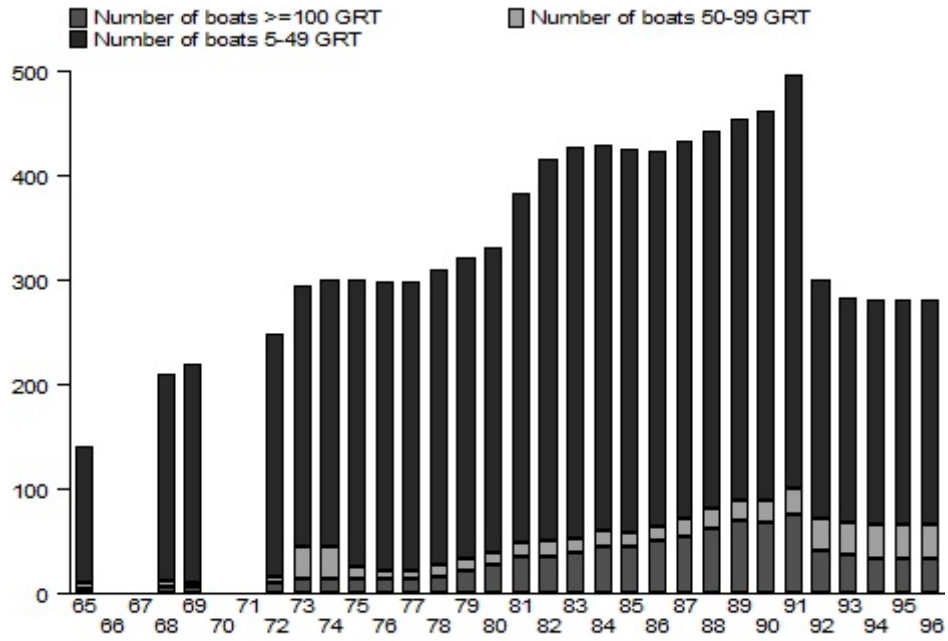


Figure 9: Number of fishing vessels in Greenland, by three size groups, 1965–1996. Dataset: *DOFGfle1*.

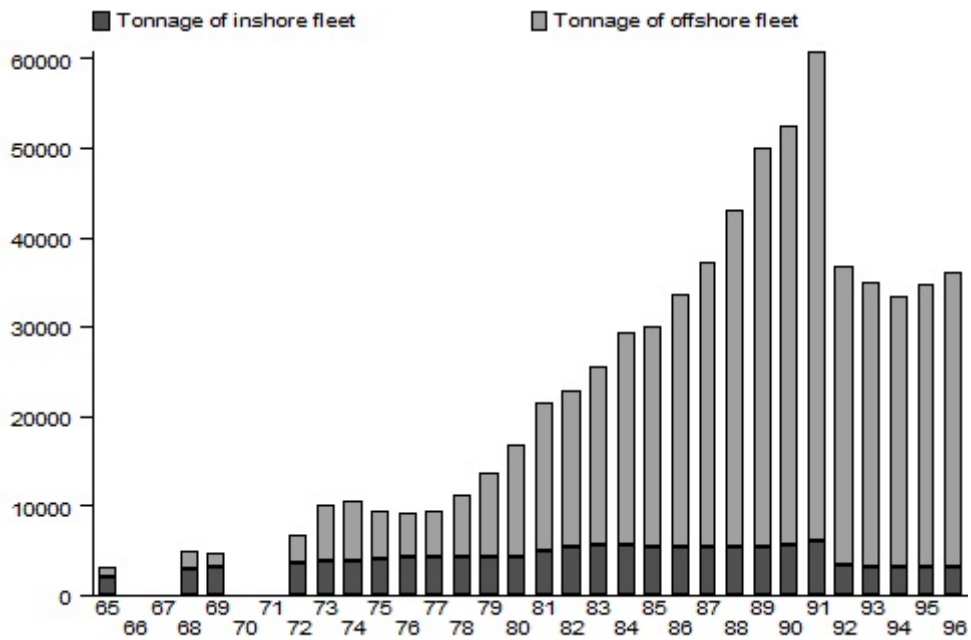


Figure 10: Greenland fishing vessels tonnage, in two size groups, 1965–1996. Dataset: *DOFGfle1*.

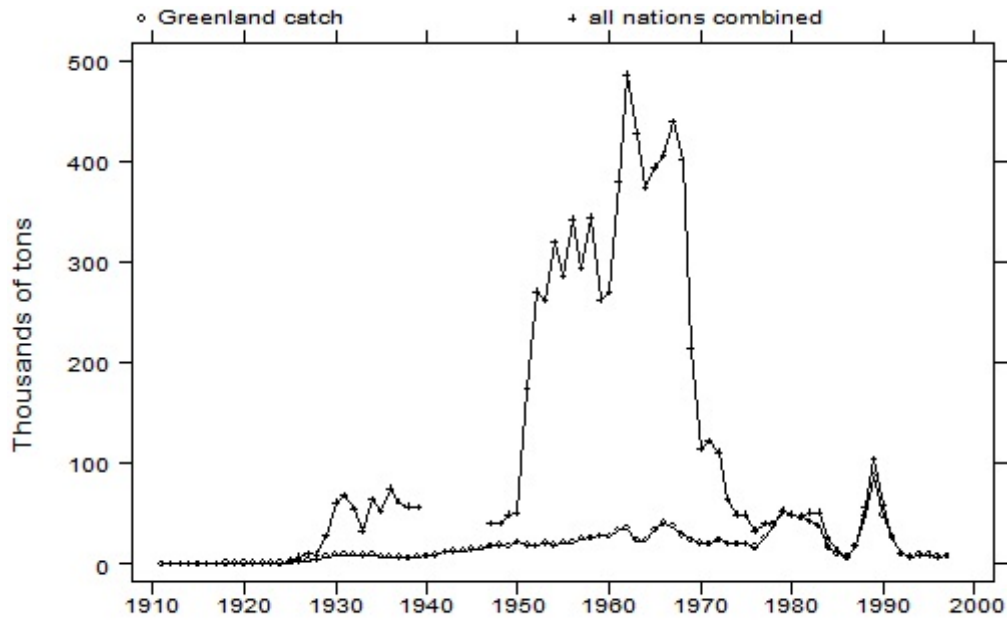


Figure 11: Trends in Atlantic cod (*Gadus morhua*) catches from Greenland waters, by Greenland and all nations combined, 1911–1997. Dataset: *DOFGfish*.

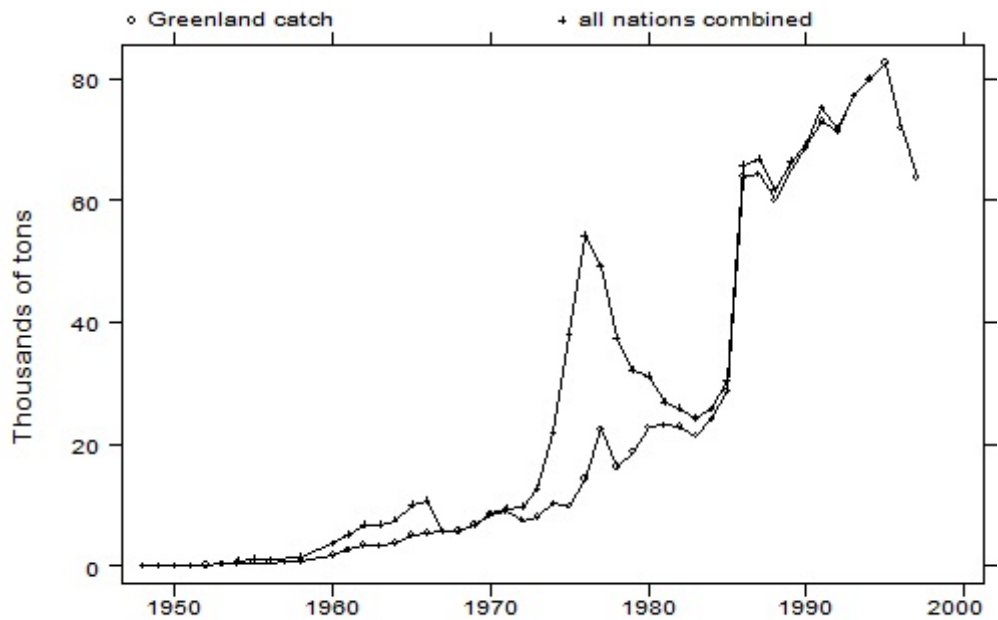


Figure 12: Trends in northern shrimp (*Pandalus borealis*) catches in Greenland waters, by Greenland and by all nations combined, 1948–1997. Dataset: *DOFGfish*.

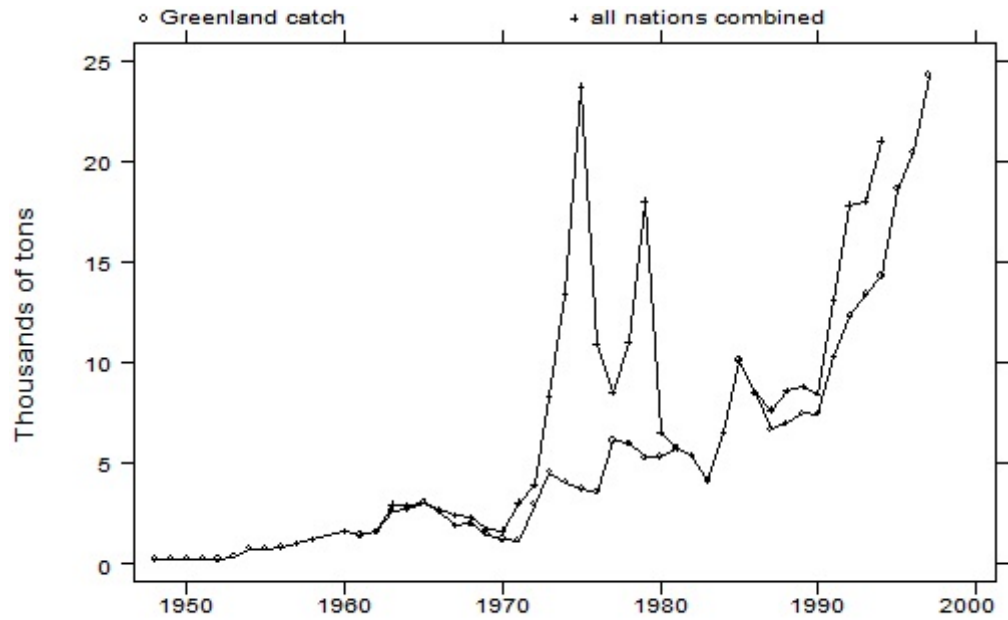


Figure 13: Trends in Greenland halibut (*Reinhardtius hippoglossoides*) catches in Greenland waters, by Greenland and by all nations combined, 1948–1997. Dataset: *DOFGfish*.

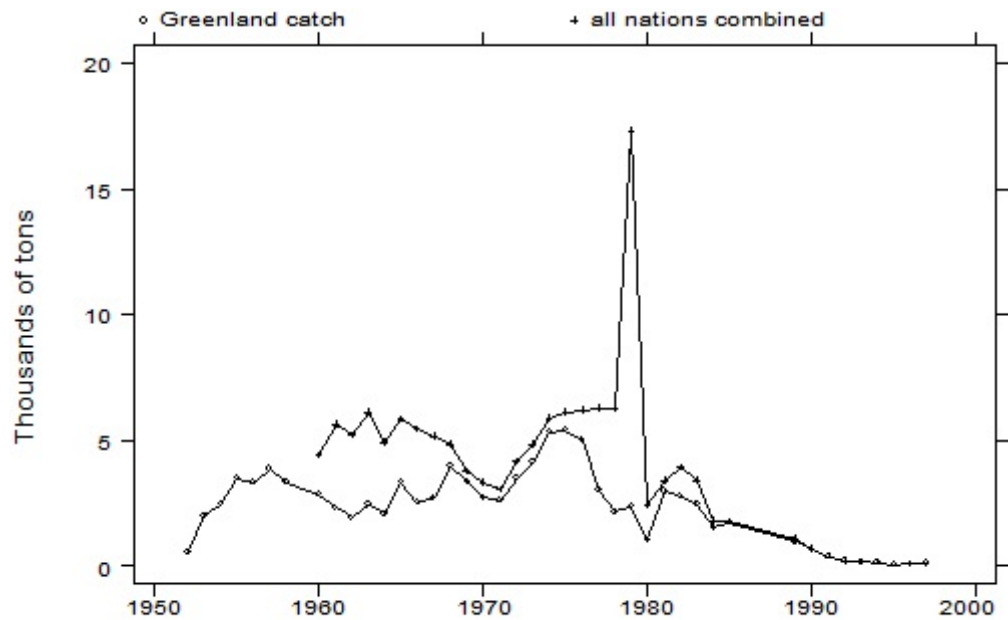


Figure 14: Trends in wolffish (*Anarhichas minor* and *Anarhichas lupus*) catches in Greenland waters 1952–1997, by Greenland and by all nations combined. Dataset: *DOFGfish*.

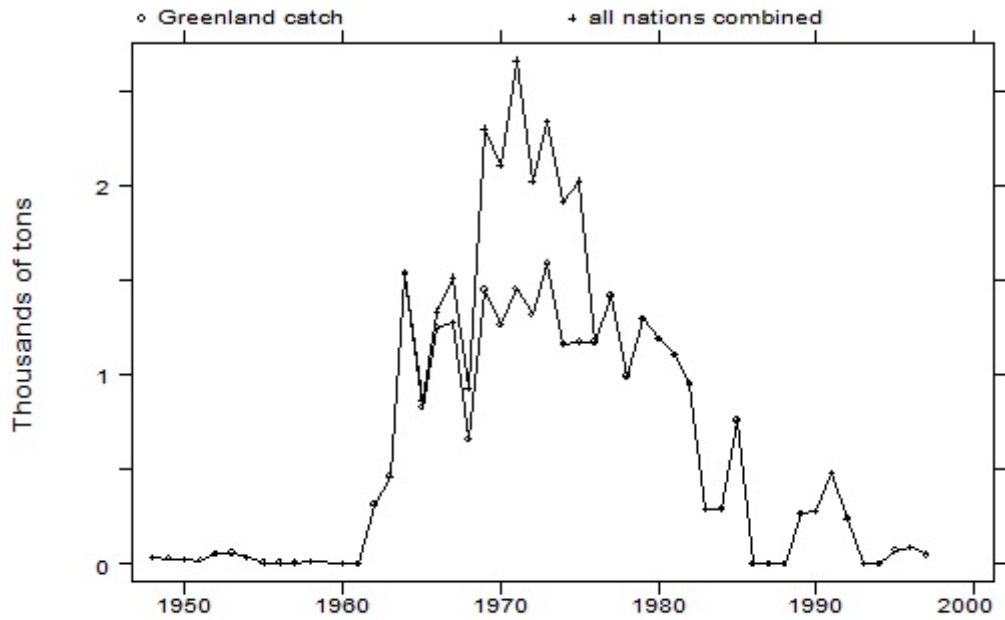


Figure 15: Trends in Atlantic salmon catches in Greenland, by Greenland and by all nations combined, 1948–1997. Dataset: *DOFGfish*.

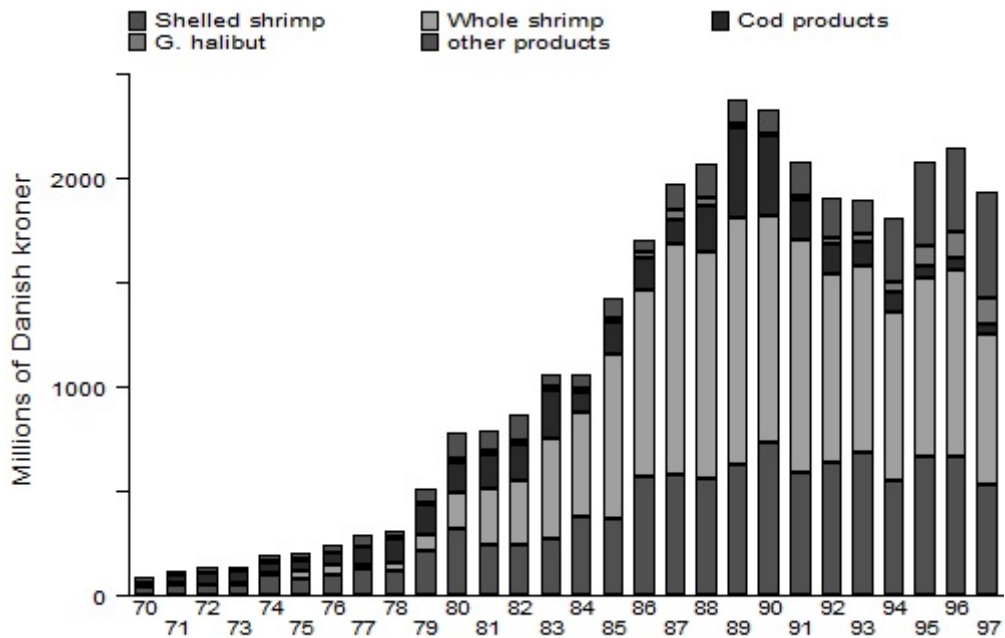


Figure 16: Value of fish products exported from Greenland, in millions of Danish kroner, 1970–1997. Dataset: *DOFGexp*.

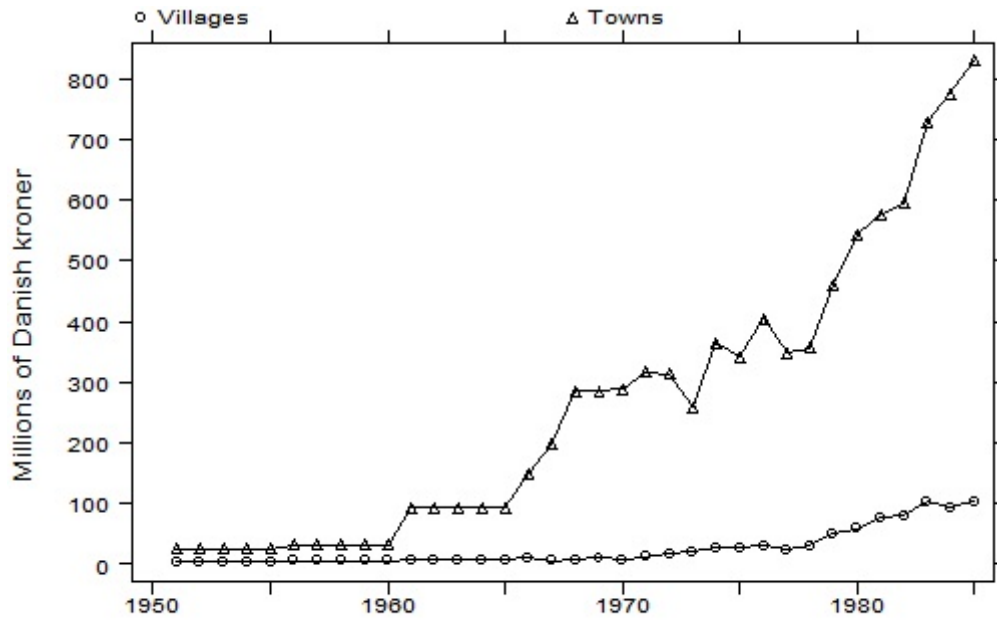


Figure 17: Trends in public investments in the fishing fleets of Greenland towns and villages, 1951–1990. Dataset: *DOFGinv*.

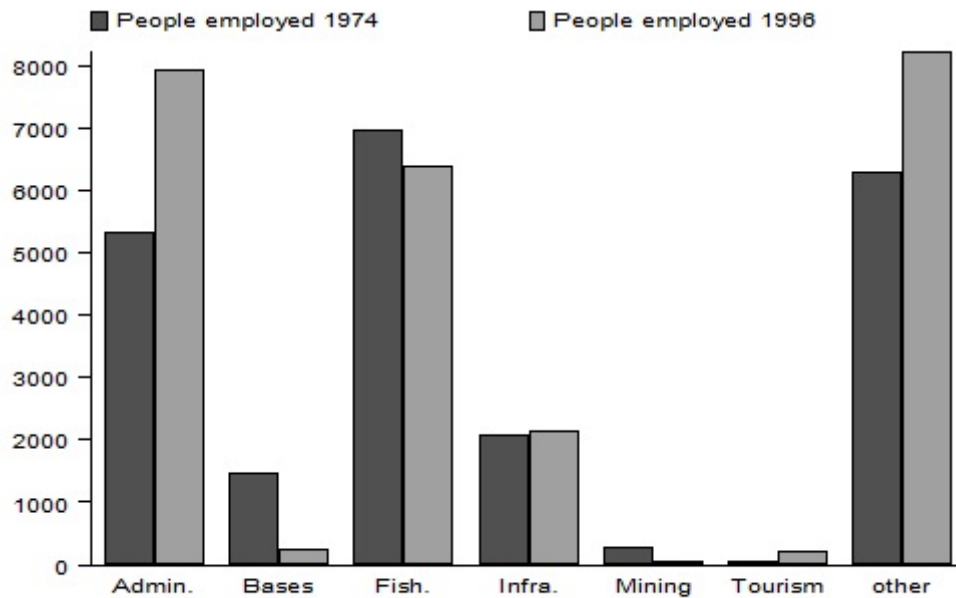


Figure 18: Changes in the number of people employed by Greenland industry sector, 1974 and 1996. Dataset: *DOFGemp*.

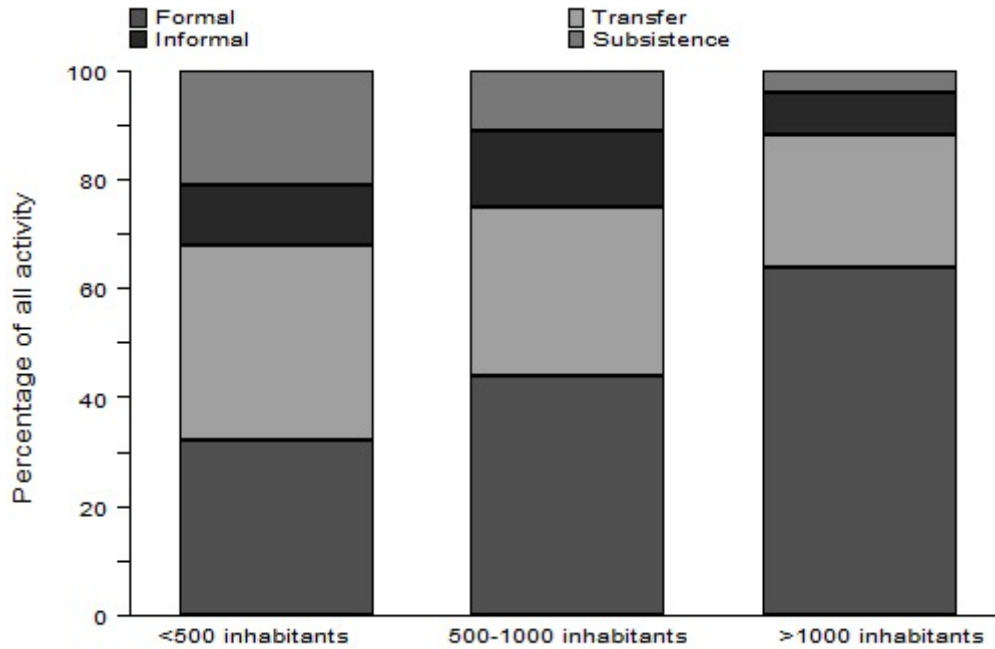


Figure 19: Mean percentage of total income derived from formal, informal, transfer and subsistence economies, in settlements of three different sizes. Dataset: *DOFGecon*.

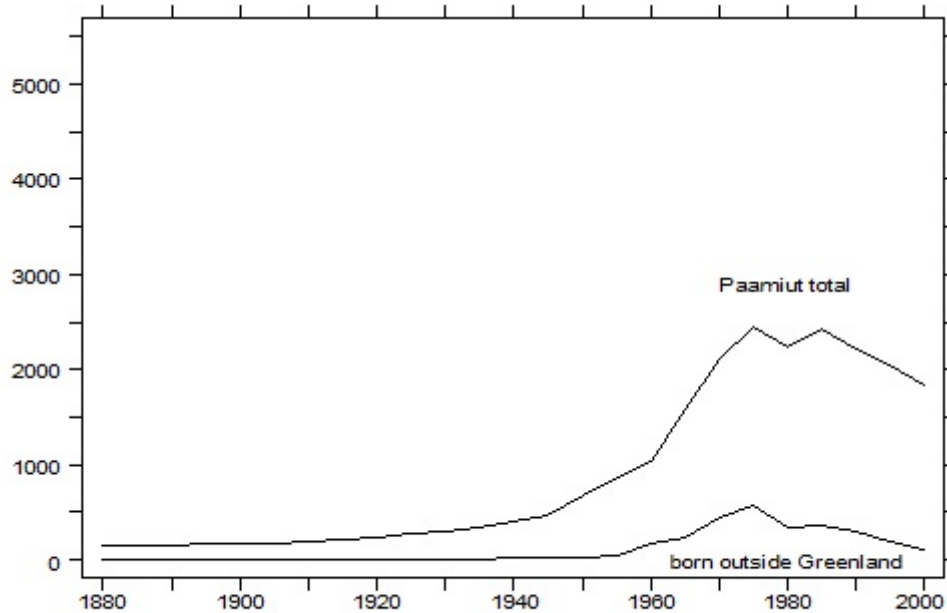


Figure 20: Total population, and population born outside Greenland, in Paamiut municipality 1880–2000. Dataset: *DOFGpop1*.

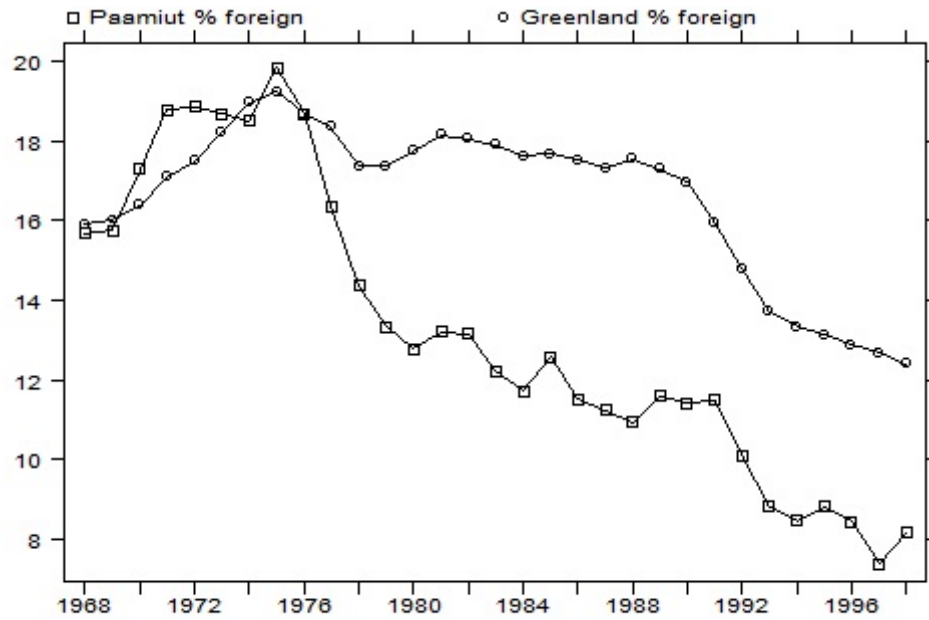


Figure 21: Percent foreign born in the population of Paamiut municipality, and in Greenland as a whole, 1968–1997. Dataset: *DOFGpop2*.

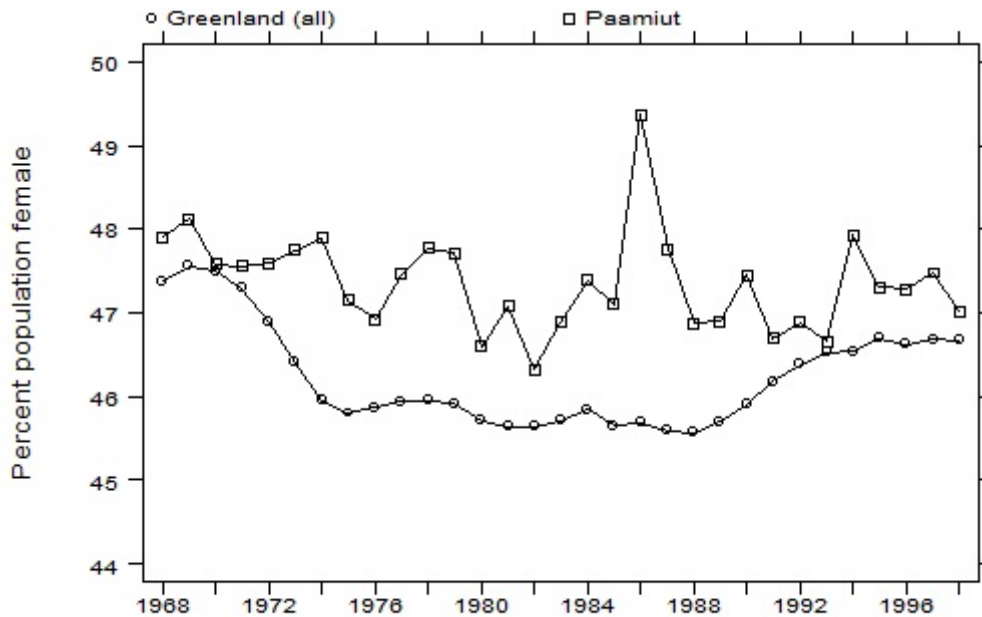


Figure 22: Percent population female in Paamiut municipality and in Greenland as a whole, 1968–1997. Dataset: *DOFGpop2*.

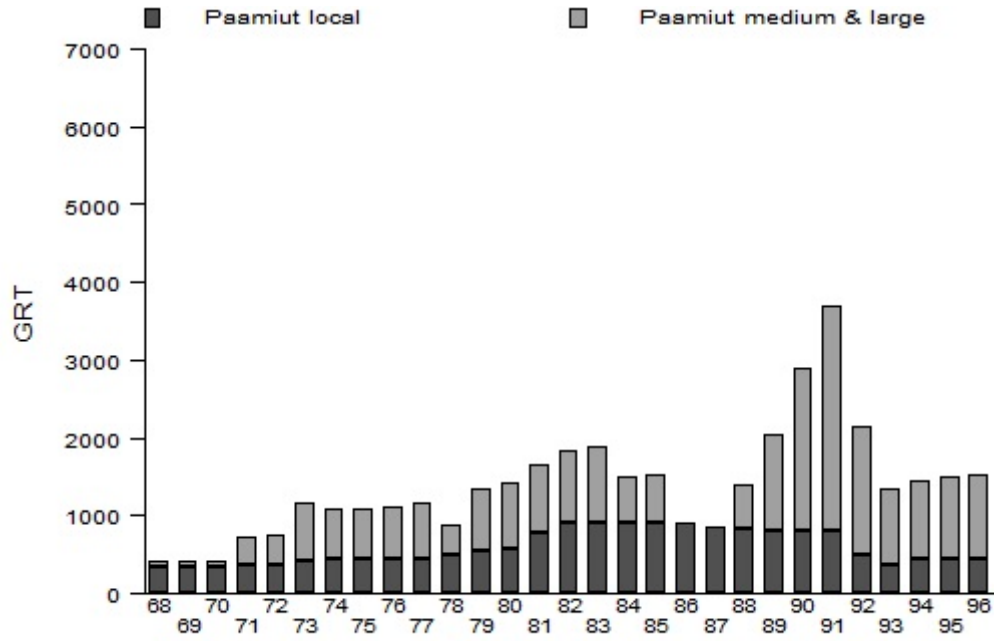


Figure 23: Combined tonnage of Paamiut’s local and medium/large vessel fishing fleets, 1968–1996. Dataset: *DOFGfle2*.

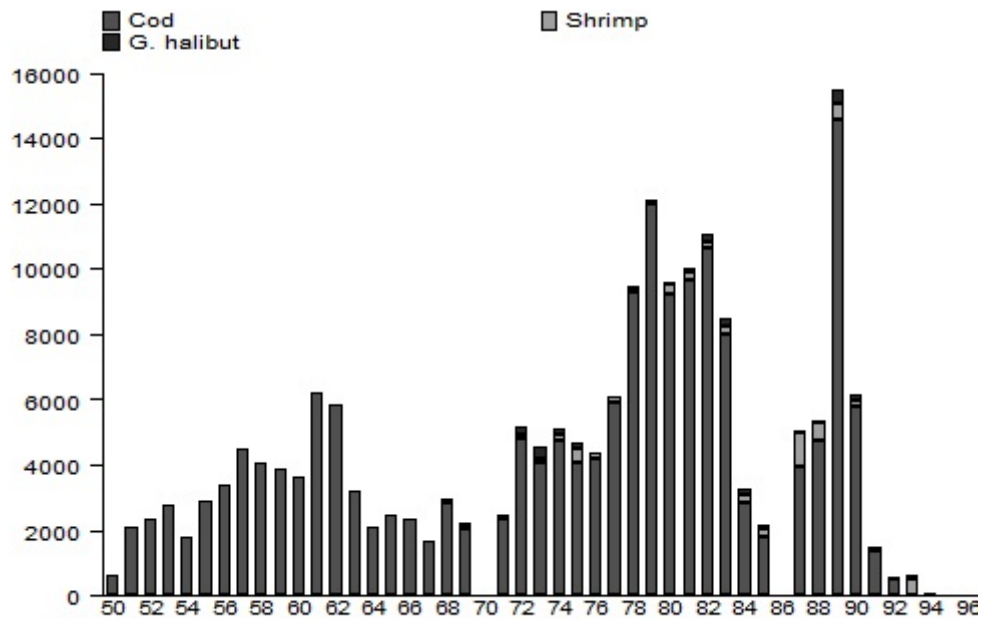


Figure 24: Trends in Paamiut municipality landings (metric tons) of cod, shrimp and Greenland halibut, 1950–1996. Dataset: *DOFGland*.

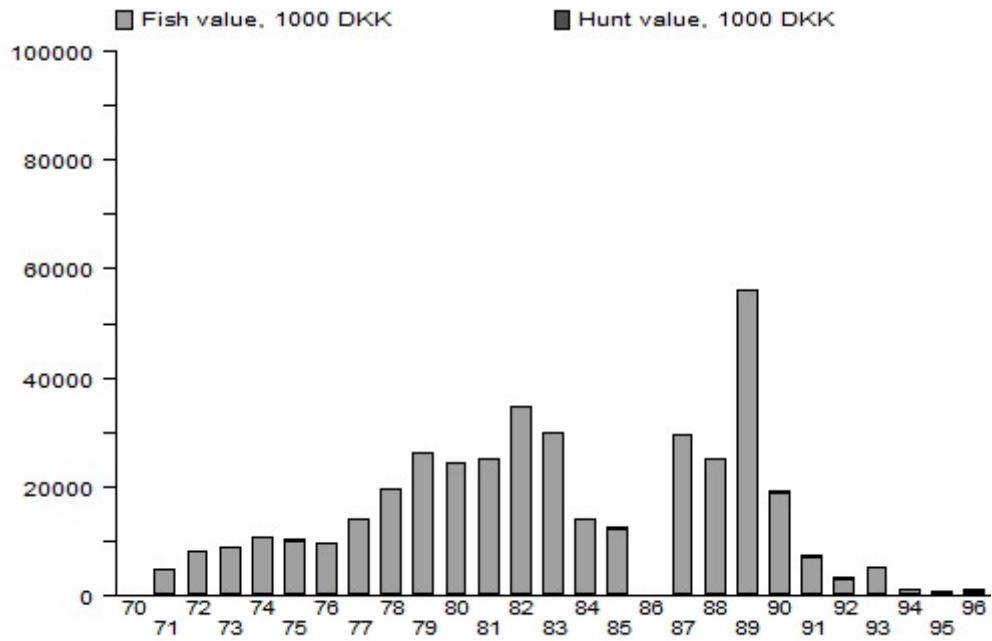


Figure 25: Total value of fishing and hunting products (thousands of Danish kroner) from Paamiut municipality, 1971–1996. Dataset: *DOFGland*.

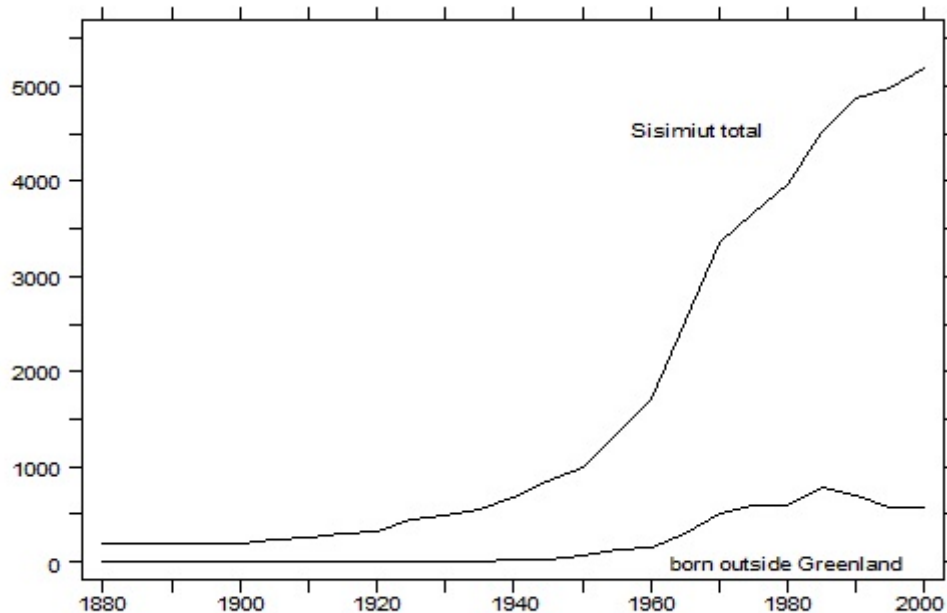


Figure 26: Total population, and population born outside Greenland, in Sisimiut municipality, 1880–2000. Dataset: *DOFGpop1*.

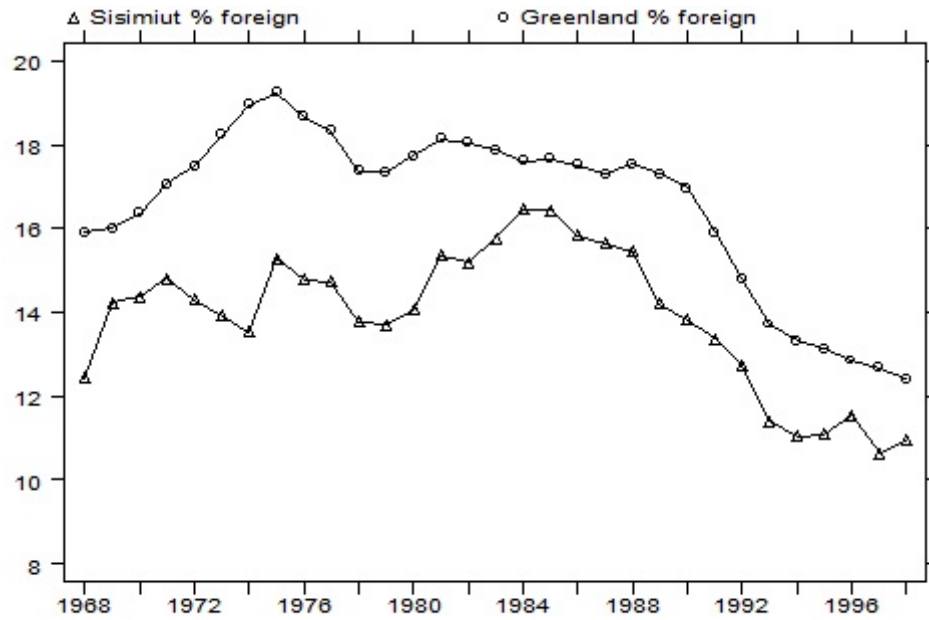


Figure 27: Percent foreign born in the population of Sisimiut municipality, and in Greenland as a whole, 1968–1997. Dataset: *DOFGpop2*.

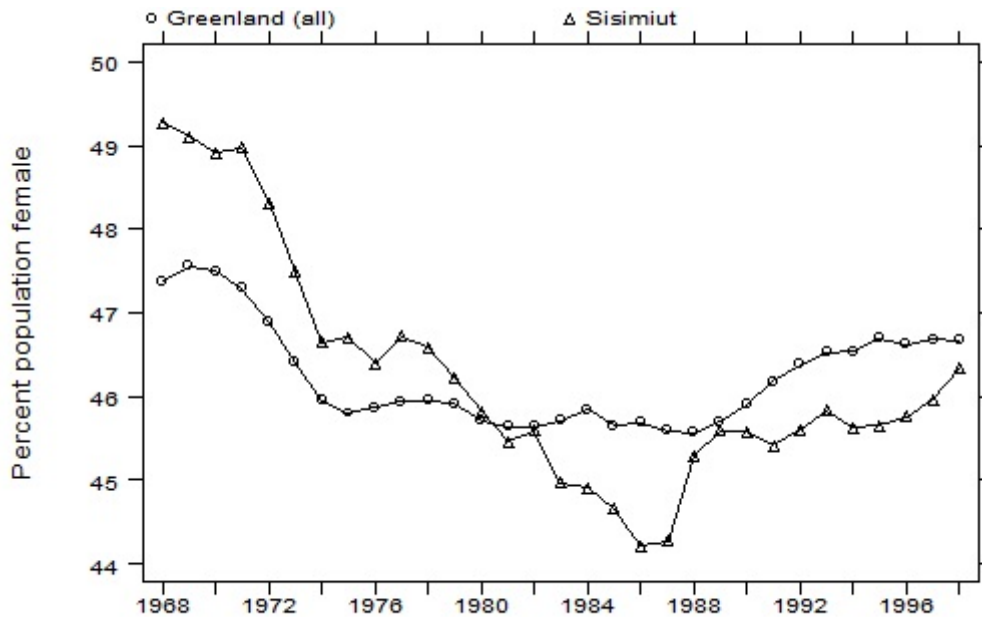


Figure 28: Percent population female in Sisimiut municipality and in Greenland as a whole, 1968–1997. Dataset: *DOFGpop2*.

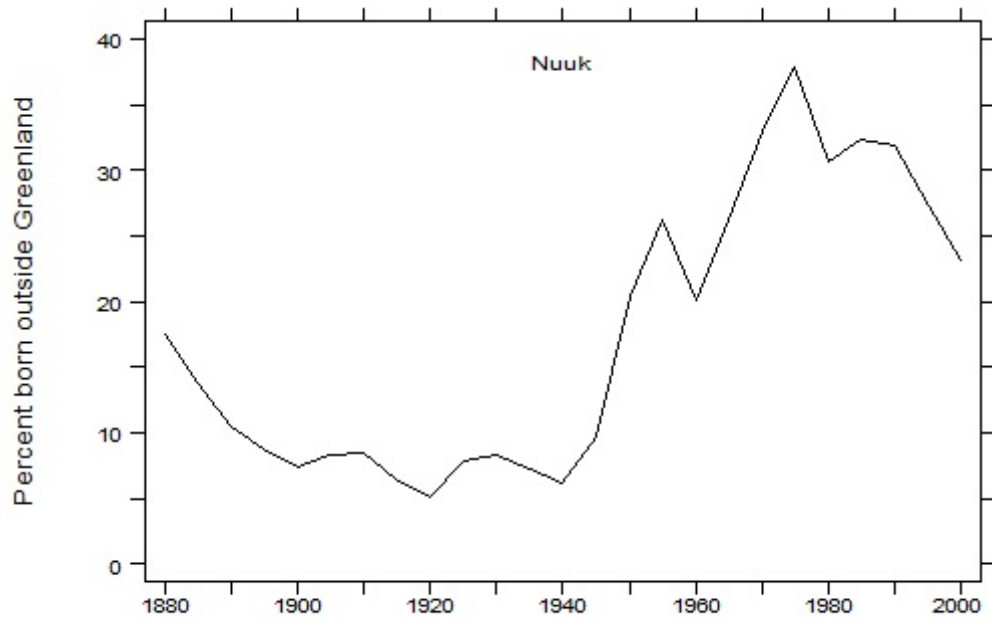


Figure 29: Nuuk—percent of population born outside Greenland, 1880–2000. Dataset: *DOFGpop1*.

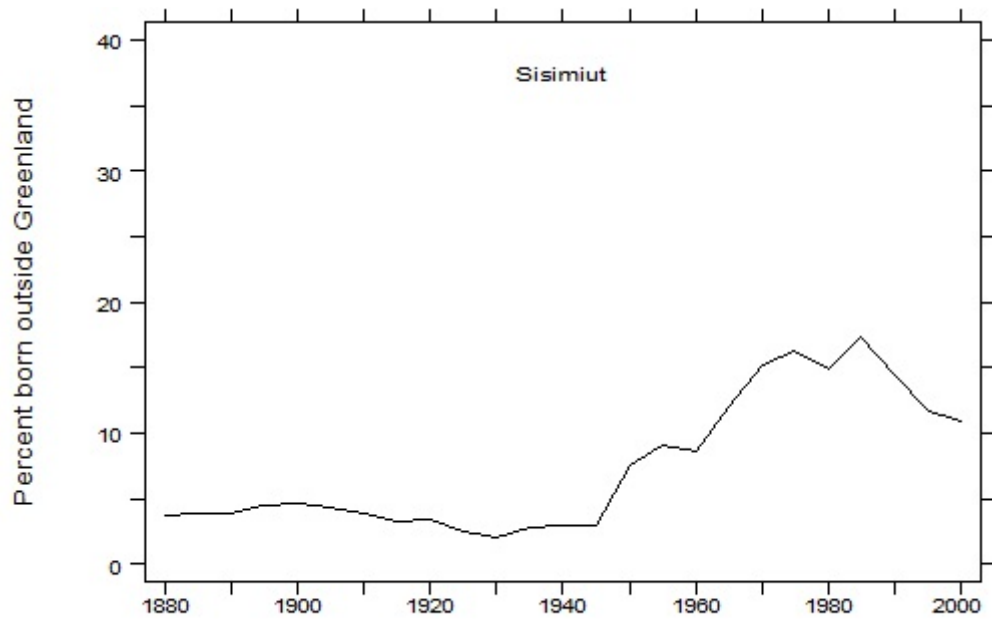


Figure 30: Sisimiut—percent of population born outside Greenland, 1880–2000. Dataset: *DOFGpop1*.

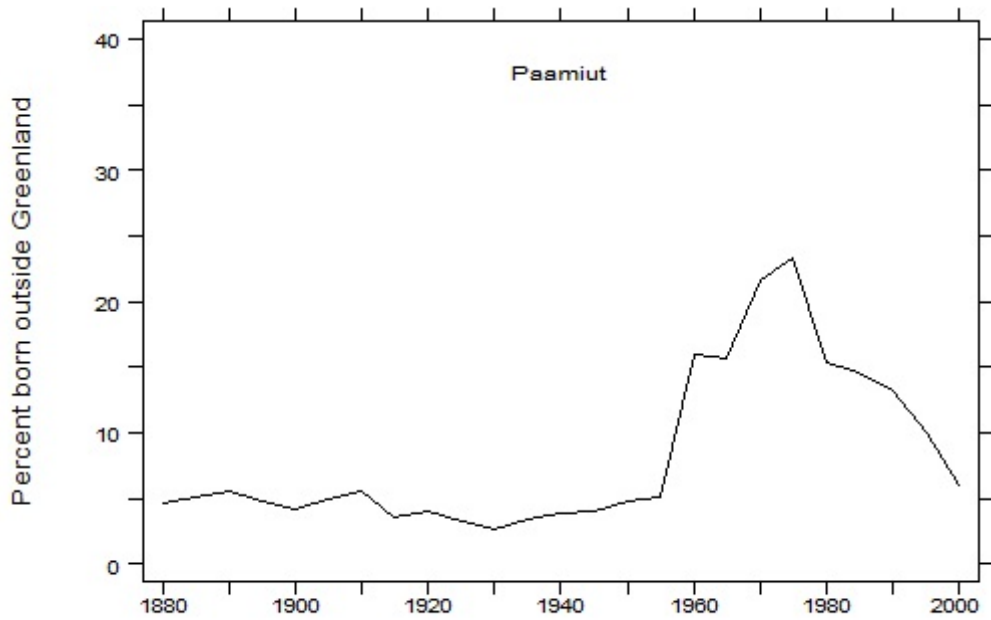


Figure 31: Paamiut—percent of population born outside Greenland, 1880–2000. Dataset: *DOFGpop1*.

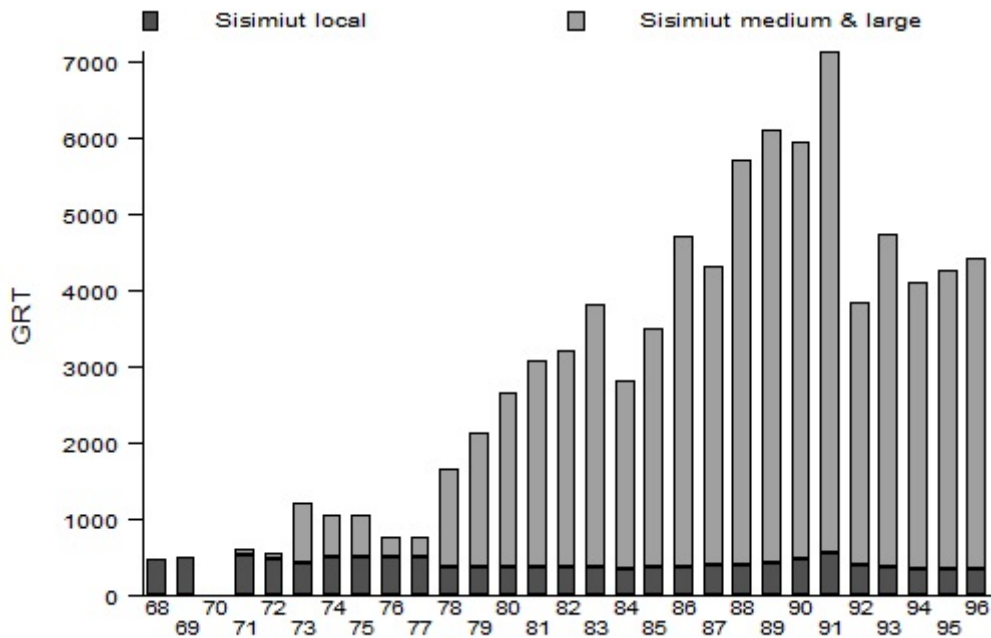


Figure 32: Combined tonnage of Sisimiut's local and medium/large vessel fishing fleets, 1968–1996. Dataset: *DOFGfle2*.

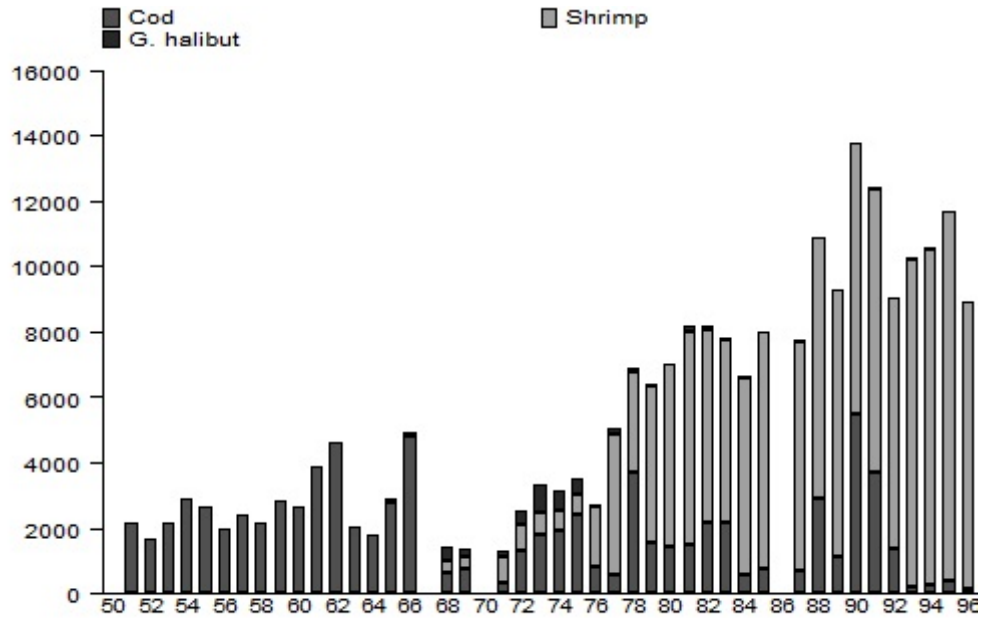


Figure 33: Trends in Sisimiut municipality landings (metric tons) of cod, shrimp and Greenland halibut, 1950–1996. Dataset: *DOFGland*.

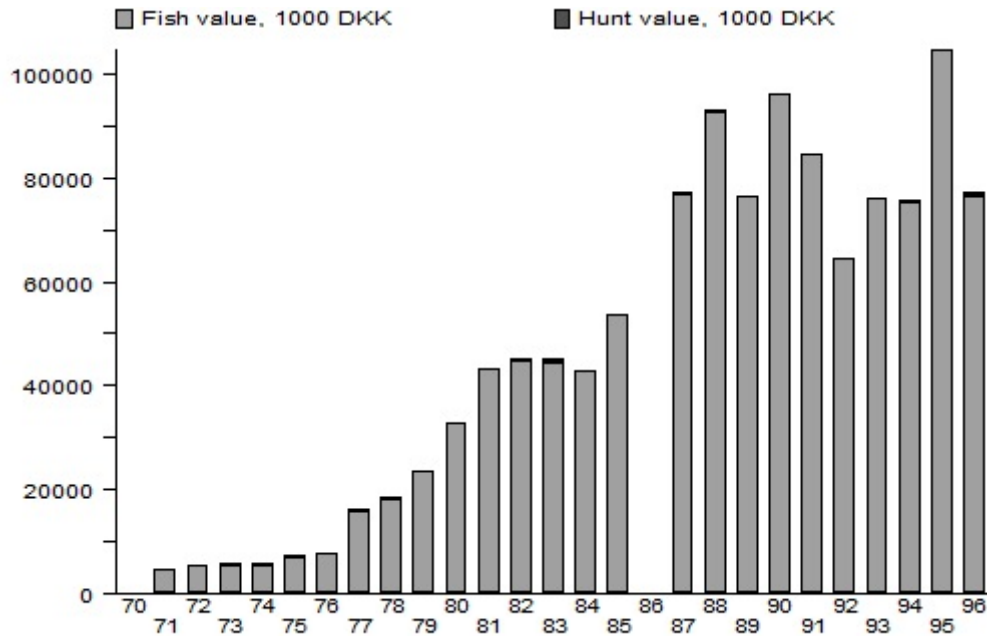


Figure 34: Total value of fishing and hunting products (thousands of Danish kroner) from Sisimiut municipality, 1971–1996. Dataset: *DOFGland*.

7. TABLES

Table 1: The development of Home Rule Government in Greenland	
Year	Type of responsibility taken over by the Home Rule Government (Breinholt Larsen (1994) and Martens (1992))
1979	Organization of Home Rule, Local government and the Greenland Parliament
1980	<ul style="list-style-type: none"> - Direct and indirect taxes - Fishing in the territory, hunting, agriculture and reindeer breeding (partly), including Regulation of commercial fishery and hunting - Labor market affairs including Employment services, vocational guidance, regulation of influx of foreign labor - Education and cultural affairs (partly), including Primary School education and Teacher's training, Radio and television, libraries, sport and recreation - Social welfare, including Social security and training in Social work - The established Church and dissenting religious communities.
1981	<ul style="list-style-type: none"> - Vocational training, - Folk high schools and museums, - Assistance to Greenlanders in Denmark - Preservation of wildlife including nature conservation - Area planning including country planning, town planning and regulation of building and construction - Legislation governing trade and competition including legislation on restaurant and hotel business, regulations concerning alcoholic beverages and regulations concerning closing hours of shops.
1982	- Competence to intervene in lawfully called strikes and lockouts concerning working conditions and salaries of journalists
1984	- Place names in Greenland
1985	<ul style="list-style-type: none"> - Regulation of the remaining part of the commercial fisheries sector including the State-conducted fishing, production and sale activities of the Royal Greenland Trade Department - Regulation of access to production and sale of Greenland products - Industrial support schemes, - Legislation relating to trade - Legal status of students attending basic vocational education - Rules regulating flying the Greenland flag - Competence to intervene in lawfully called strikes and lockouts, - Competence to lay down provisions regulation wages/salaries and terms of employment
1986	<ul style="list-style-type: none"> - The remaining part of the Royal Greenland Trade Department, including the responsibility for supply of commodities - Internal transport of passengers and goods, - Airports and airfields, - Subsidizing of internal air traffic, - Postal services, - Legislation, - Navigation, Signing on of seafarers
1987	- Rent legislation, rent support, and housing sector, - Technical Organization of Greenland
1989	- Protection of the environment
1992	- Health services
1997	- Administration of the shared ownership of mineral resources
Areas where Home Rule Government has only participatory rights: <ul style="list-style-type: none"> - Ownership of mineral resources of the underground - Foreign affairs of the Realm - Rules of fundamental principles regarding the laws of persons, inheritance law, family law and property law 	

Table 2: An overview of 20th century fishing technologies used in Greenland waters.

		1900-	1910-	1920-	1930-	1940-	1950-	1960-	1970-	1980-	1990-
		1910	1920	1930	1940	1950	1960	1970	1980	1990	
OFF-SHORE											
Foreign	Long-line						x	x			
	Trawl						x	x	x	x	x
Denmark	Long-line						x	x			
	Trawl						x	x	x	x	x
Greenland	Long-line						x	x			
	Trawl						x	x	x	x	x
MIXED											
Foreign	Dory / Jig			x	x	x	x	x			
	Long line			x	x	x					
	Trawl				x	x	x	x	x		
Denmark	Dory / Jig			x	x						
	Long line				x	x					
	Trawl					x	x	x			
Greenland	Dory / Jig		x	x	x	x					
	Long line			x	x	x					
	Trawl				x	x	x	x	x	x	x
LOCAL											
Denmark	Jig										
	Long-line				x	x					
	Bottom-traps					x	x				
	Gill-net							x			
	Trawl					x	x	x			
Greenland	Jig		x	x	x	x	x	x	x	x	x
	Long-line			x	x	x	x	x	x	x	x
	Bottom-traps					x	x	x	x	x	x
	Gill-net							x	x		
	Trawl				x	x	x	x	x	x	x

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9. SOURCES OF DATA

The data used for the statistical presentation are based on a variety of sources, requiring some remarks regarding their structure and contents. For full references to the mentioned sources, consult section 6 above.

Where nothing else is specified, data are from the statistical yearbook “Grønland,” published since 1968. Until 1987 this was published by the Danish government, the Ministry of Greenland. In 1987, 1988 and 1989 it was published by the State Department. Since 1990 it has been published by Statistics Greenland, under the Greenland Home Rule government.

Data regarding international fisheries in Greenland waters are from NAFO (westcoast) and ICES (eastcoast) databases.

In 1973 a change in registration regarding population in Greenland takes place. Before 1973 the registration date is December 31. After 1973 the population is for January 1. Consequently the 1972 population data refer to December 31, while the 1974 data refer to January 1. There are no raw data for 1973, so for our purposes these values were calculated as a the mean of 1972 and 1974.

Data regarding value of fisheries 1951–1966 are from Mattox (1973). Data regarding volume of fisheries are from the following sources:

From Mattox 1973:

- Value of fisheries 1951–1966;
- Greenland cod fisheries 1953–1963
- Cod fisheries in Sisimiut and Paamiut 1951–1966
- International cod fisheries 1952–1966
- International shrimp fisheries 1954–1966
- International other fisheries 1952–1966

From “Beretninger vedr. Grønlands Styrkelse - Sammendrag af statistiske oplysninger om Grønland. III”:

- International Cod fisheries 1925–1938

From “Statistiske oplysninger om udviklingen i Grønland 1948–1958”:

- Greenland Shrimp fisheries 1948–1958
- Greenland salmon fisheries 1948–1958
- Greenland seawolf fisheries 1952–1958

From NAFO registrations of fisheries in area I:

- International cod fisheries 1967–1994
- International shrimp fisheries 1967–1994
- International salmon fisheries 1960–1994
- International wolffish fisheries 1960–1994
- International halibut fisheries 1959–1994
- International other fisheries 1967–1994

A few data have been read from a graph in “Statistiske oplysninger om udviklingen i Grønland 1948–1958,” and are therefore not as precise as the digital information:

- International cod fisheries 1939–1951

Tax was introduced in Greenland in 1975, so before this year there is no registration of taxable income. There are differences in the type of registration from 1975 to 1977, and after 1977. Before 1978 the registration contains information regarding the total tax revenue and the tax percentage, so the taxable income is determined as tax divided by tax percentage. For each of the municipalities local tax percentages have been used. For Greenland an average percentage for all municipalities has been used.

Due to changes in management after Home Rule took over the investment activities, it has only been possible to have data regarding public investments until 1985.

Home Rule's takeover of responsibility for fisheries, and subsequently for the statistical registration of fisheries, caused some uncertainty with data in the transition period from one authority to the other. Data regarding fisheries for 1986 are not available in some cases, while there is some uncertainty connected to the available data for 1987.

10. DATASETS

Data from a variety of sources, described in the previous section, were combined into Stata-format datasets used to generate the graphs and other analyses in this report. The caption for each figure identifies the corresponding dataset, which have names of the form *DOFGxxxx* (for *Development of Fisheries in Greenland*). These datasets are publically available through the North Atlantic Arc (NAArc) project Web site. Below is a list of the variables included in each dataset.

DOFGage

obs:	15		Greenland age/sex distribution
			1965 & 1998
vars:	5		28 Aug 2000 11:37

1. agegroup	str5	%9s	age group
2. male65	int	%9.0g	Males 1965
3. female65	int	%9.0g	Females 1965
4. male98	int	%9.0g	Males 1998
5. female98	int	%9.0g	Females 1998

DOFGecon

obs:	3		Economic activities (%) in
			Greenland settlements
vars:	7		4 Sep 2000 11:02

1. settype	str6	%9s	Small, medium or large settlement
2. set2	str15	%15s	Settlement type
3. formal	byte	%9.0g	Formal
4. transfer	byte	%9.0g	Transfer
5. informal	byte	%9.0g	Informal
6. subsist	byte	%9.0g	Subsistence
7. sequence	byte	%9.0g	

DOFGemp

obs:	7		Greenland employed persons by
			sector
vars:	4		4 Sep 2000 10:16

1. sector	str33	%33s	Sector (full name)
2. sec2	str7	%9s	Sector
3. peop74	int	%9.0g	People employed 1974
4. peop96	int	%9.0g	People employed 1996

DOFGexp

obs: 28

vars: 17

**Greenland fish products exports
1970-97**

4 Sep 2000 10:19

1. year	float	%9.0g	Year
2. shelledt	float	%9.0g	Shelled shrimp exports, 1000 tons
3. wholet	float	%9.0g	Whole shrimp exports, 1000 tons
4. frozcodt	float	%9.0g	Frozen cod exports, 1000 tons
5. saltcodt	float	%9.0g	Salted cod exports, 1000 tons
6. fillcodt	float	%9.0g	Fillets cod exports, 1000 tons
7. halibutt	float	%9.0g	G. halibut exports, 1000 tons
8. othert	float	%9.0g	other fish exports, 1000 tons
9. totalt	float	%9.0g	total fish exports, 1000 tons
10. shelledk	float	%9.0g	Shelled shrimp exports, million DKK
11. wholek	float	%9.0g	Whole shrimp exports, million DKK
12. frozcodk	float	%9.0g	Frozen cod exports, million DKK
13. saltcodk	float	%9.0g	Salted cod exports, million DKK
14. fillcodk	float	%9.0g	Fillets cod exports, million DKK
15. halibutk	float	%9.0g	G. halibut exports, million DKK
16. otherk	float	%9.0g	other fish exports, million DKK
17. totalk	float	%9.0g	total fish exports, million DKK

DOFGfish

obs: 88

vars: 22

Greenland waters fish catches

4 Sep 2000 10:40

1. year	int	%9.0g	Year
2. gcod	float	%9.0g	Greenland cod catch, 1000 tons
3. fcod	float	%9.0g	Foreign cod catch, 1000 tons
4. tcod	float	%9.0g	total cod catch, 1000 tons
5. gshrimp	float	%9.0g	Greenland shrimp catch, 1000 tons
6. fshrimp	float	%9.0g	Foreign shrimp catch, 1000 tons
7. tshrimp	float	%9.0g	total shrimp catch, 1000 tons
8. gsalmon	float	%9.0g	Greenland salmon catch, 1000 tons
9. fsalmon	float	%9.0g	Foreign salmon catch, 1000 tons
10. tsalmon	float	%9.0g	total salmon catch, 1000 tons
11. gwolf	float	%9.0g	Greenland wolffish catch, 1000 tons
12. fwolf	float	%9.0g	Foreign wolffish catch, 1000 tons
13. twolf	float	%9.0g	total wolffish catch, 1000 tons
14. ghalibut	float	%9.0g	Greenland G. halibut catch, 1000 tons
15. fhalibut	float	%9.0g	Foreign G. halibut catch, 1000 tons
16. thalibut	float	%9.0g	total G. halibut catch, 1000 tons
17. gother	float	%9.0g	Greenland other species catch, 1000 tons
18. fother	float	%9.0g	Foreign other species catch, 1000 tons
19. tother	float	%9.0g	total other species catch, 1000 tons
20. gtotal	float	%9.0g	Greenland catch all species, 1000 tons
21. ftotal	float	%9.0g	Foreign catch all species, 1000 tons
22. total	float	%9.0g	total catch all species, 1000 tons

DOFGfle1

obs: 32
vars: 6

Greenland fishing fleet
4 Sep 2000 11:56

1. year	byte	%9.0g	Year
2. n05_49	int	%9.0g	Number of boats 5-49 GRT
3. n50_99	byte	%9.0g	Number of boats 50-99 GRT
4. n100p	byte	%9.0g	Number of boats >=100 GRT
5. tlocal	int	%9.0g	Tonnage of inshore fleet
6. toffshor	float	%9.0g	Tonnage of offshore fleet

DOFGfle2

obs: 29
vars: 16

Paamiut & Sisimiut fleet structures
4 Sep 2000 10:17

1. year	int	%9.0g	Year
2. grnlocal	byte	%9.0g	Greenland local fleet, GRT
3. grn50_99	byte	%9.0g	Greenland fleet, 50-99 GRT
4. grn100p	int	%9.0g	Greenland fleet, 100+ GRT
5. paa5_49	byte	%9.0g	Paamiut fleet, 5-49 GRT
6. paa50_99	byte	%9.0g	Paamiut fleet, 50-99 GRT
7. paa100p	byte	%9.0g	Paamiut fleet, 100+ GRT
8. paalocal	int	%9.0g	Paamiut local fleet, GRT
9. paamedlg	int	%9.0g	Paamiut medium & large fleet, GRT
10. paatotal	int	%9.0g	Paamiut total fleet, GRT
11. sis5_49	byte	%9.0g	Sisimiut fleet, 5-49 GRT
12. sis50_99	byte	%9.0g	Sisimiut fleet, 50-99 GRT
13. sis100p	byte	%9.0g	Sisimiut fleet, 100+ GRT
14. sislocal	int	%9.0g	Sisimiut local fleet, GRT
15. sismedlg	int	%9.0g	Sisimiut medium & large fleet, GRT
16. sistotal	int	%9.0g	Sisimiut total fleet, GRT

DOFGinv

obs: 35

Greenland public investments in fishing fleet

vars: 3

4 Sep 2000 11:01

1. year int %9.0g
 2. pinvill float %9.0g
 3. pinvtown float %9.0g

Year
 Public investment in villages,
 millions DKK
 Public investment in towns,
 millions DKK

DOFGland

obs: 47

Paamiut & Sisimiut fisheries landings

vars: 17

4 Sep 2000 10:41

1. year int %9.0g
 2. paacod int %9.0g
 3. paashp int %9.0g
 4. paasal int %9.0g
 5. paawol int %9.0g
 6. paagha int %9.0g
 7. paaoth int %9.0g
 8. paahunt int %9.0g
 9. paafish float %9.0g
 10. siscod int %9.0g
 11. sisshp int %9.0g
 12. sissal byte %9.0g
 13. siswol int %9.0g
 14. sisgha int %9.0g
 15. sisoth int %9.0g
 16. sishunt int %9.0g
 17. sisfish float %9.0g

Year
 Paamiut cod landings, tons
 Paamiut shrimp landings, tons
 Paamiut Salmon landings, tons
 Paamiut wolffish landings, tons
 Paamiut Greenland halibut
 landings, tons
 Paamiut other landings, tons
 Paamiut hunting value, 1000 DKK
 Paamiut fishing value, 1000 DKK
 Sisimiut cod landings, tons
 Sisimiut shrimp landings, tons
 Sisimiut Salmon landings, tons
 Sisimiut wolffish landings, tons
 Sisimiut Greenland halibut
 landings, tons
 Sisimiut other landings, tons
 Sisimiut hunting value, 1000 DKK
 Sisimiut fishing value, 1000 DKK

DOFGmig

obs: 25

Greenland migration

vars: 8

4 Sep 2000 15:05

1. year int %9.0g
 2. births int %9.0g
 3. deaths int %9.0g
 4. inmig int %9.0g
 5. outmig int %9.0g
 6. natinc int %9.0g
 7. netmig int %9.0g
 8. change int %9.0g

Year
 Births
 Deaths
 In-migration
 Out-migration
 Natural increase:
 (births-deaths)
 Net migration: (in-out)
 Net change:
 (births-deaths)+(in-out)

DOFGpop1

obs: 69
 vars: 18

Greenland population 1781-1996
 4 Sep 2000 11:15

1. year	int	%9.0g	Year
2. grnpop	float	%9.0g	Greenland population total
3. grnfem	int	%9.0g	Female population of Greenland
4. grnmale	int	%9.0g	Male population of Greenland
5. grnfemp	float	%9.0g	Percent Greenland population female
6. grnvill	int	%9.0g	Greenland population in villages
7. grntown	float	%9.0g	Greenland population in towns
8. grnnat	float	%9.0g	Greenland population born in Greenland
9. grnfor	int	%9.0g	Greenland population born outside
10. nuupop	int	%9.0g	Nuuk population total
11. nuunat	int	%9.0g	Nuuk population born in Greenland
12. nuufor	int	%9.0g	Nuuk population born outside
13. paapop	int	%9.0g	Paamiut population total
14. paanat	int	%9.0g	Paamiut population born in Greenland
15. paafor	int	%9.0g	Paamiut population born outside
16. sispop	int	%9.0g	Sisimiut population total
17. sisnat	int	%9.0g	Sisimiut population born in Greenland
18. sisfor	int	%9.0g	Sisimiut population born outside

DOFGpop2

obs: 31
 vars: 22

Greenland population 1968-1998
 4 Sep 2000 12:09

1. year	int	%9.0g	Year
2. grnpop	float	%9.0g	Greenland population
3. grntown	float	%9.0g	Greenland population in towns
4. grnvill	int	%9.0g	Greenland population in villages
5. grnfor	float	%9.0g	Greenland population born outside
6. grnfem	int	%9.0g	Greenland female population
7. grnfemp	float	%9.0g	Greenland (all) percent female
8. paapop	float	%9.0g	Paamiut population
9. paatown	int	%9.0g	Population in Paamiut town
10. paavill	float	%9.0g	Population in villages
11. paafor	float	%9.0g	Paamiut population born outside
12. paafem	int	%9.0g	Paamiut female population
13. paafemp	float	%9.0g	Paamiut (all) percent female
14. sispop	float	%9.0g	Sisimiut population
15. sistown	float	%9.0g	Population in Sisimiut town
16. sisvill	float	%9.0g	Population in villages
17. sisfor	float	%9.0g	Sisimiut population born outside
18. sisfem	float	%9.0g	Sisimiut female population
19. sisfemp	float	%9.0g	Sisimiut (all) percent female
20. paaforp	float	%9.0g	Paamiut percent born outside Greenland
21. sisforp	float	%9.0g	Sisimiut percent born outside Greenland
22. grnforp	float	%9.0g	Greenland percent born outside Greenland
