From chiefly provisioning to commercial fishery: long-term economic change in Arctic Norway

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Abstract

Stratified farm mounds with excellent organic preservation in the Lofoten and Vesterålen islands in Arctic Norway provide a long-term record of changing human use of fish. In Arctic Norway, zooarchaeological signatures of intensive dried fish production extend back into the Iron Age, indicating a substantial role for cured cod prior to the beginning of the historical stockfish trade in *c.* AD 1200. North Norwegian chieftains of the late Iron Age and Viking periods clearly disposed of substantial staple surpluses of stockfish as well as the better documented prestige goods (furs and ivory). A comparative study of substantial collections spanning the Iron Age–Early Modern period underlines both continuity and change in the developing North Norwegian fisheries and suggests the complexity of interaction between subsistence and commercial fishing.

Keywords

Iron Age; chieftainship; cod fishery; medieval; zooarchaeology; Arctic Norway.

Introduction

This paper addresses economic development in the offshore islands of Arctic Norway (Fig. 1), from the Iron Age to medieval times. The role of cured fish, and the development of wealth and trade based on its exploitation, has been the focus of study for over two decades. Workers in many parts of the North Atlantic have searched for the beginnings of the modern cod fishery, now apparently on the verge of complete collapse (Amorosi 1991: 280–1; Amorosi et al. 1994; Barret 1993, 1995; Bigelow 1985; Heinrich 1986; Gelsinger 1981: 181–94; Urbanczyk 1992: 228–61). Recent research in North Norway has focused upon the origins of a commercial fishery usually placed at *c.* AD 1150–1200 (Bertelsen 1992; Perdikaris 1996a). By the thirteenth century the Lofoten and Vesterålen islands are known to have become the centre of a widespread trade that supplied preserved fish to urban and rural populations in much of northern and central Europe.

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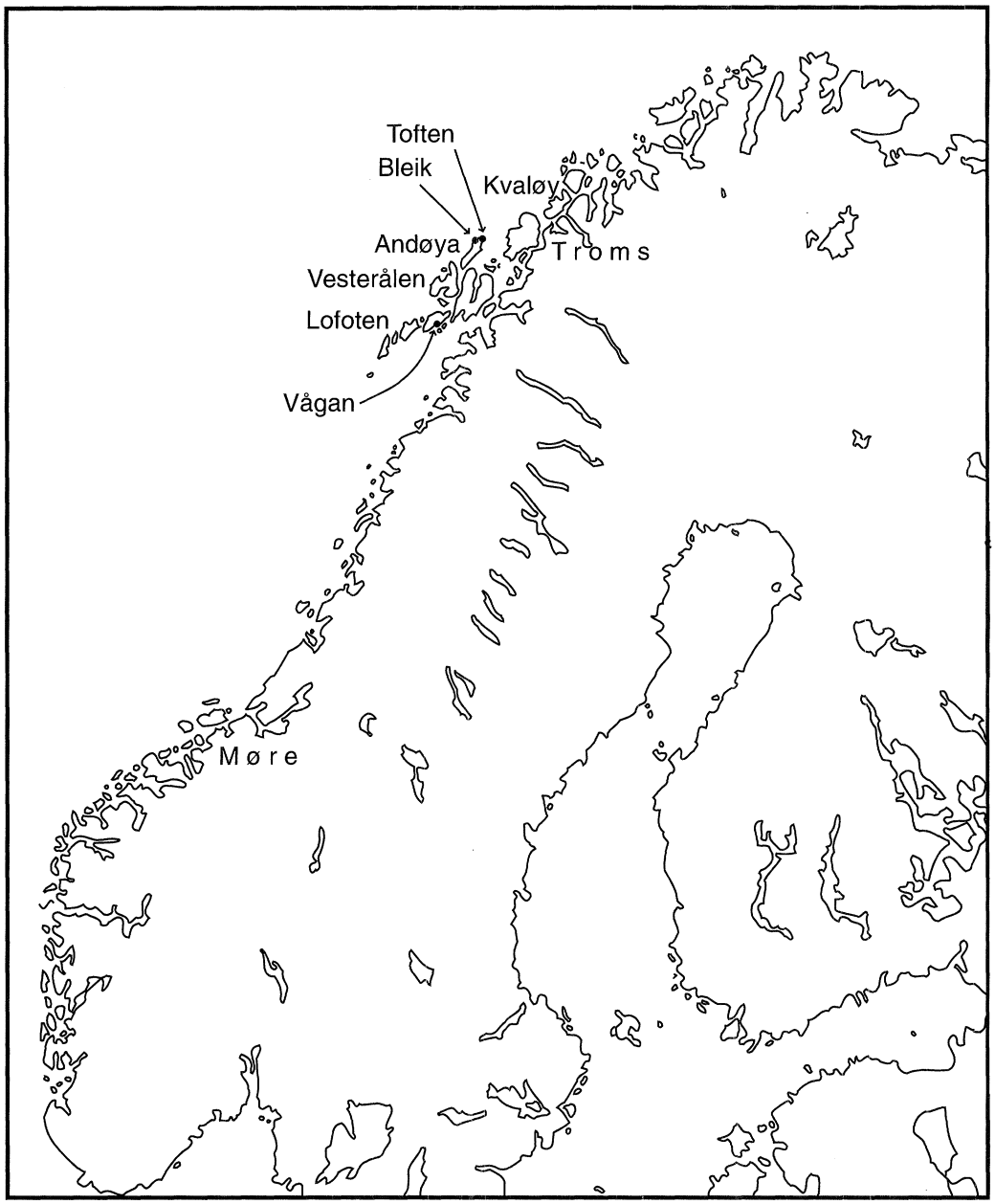

Figure 1 Map of northern Scandinavia showing the islands and sites discussed in the text.

By the fourteenth and fifteenth centuries, the powerful Hanseatic league used the stockfish as its heraldic symbol, and monopolized its distribution (Bertelsen 1977, 1979, 1983, 1985, 1991). Stockfish prepared from the Atlantic cod thus played a major role in the economy and politics of medieval and early modern Europe. Promoted by the church as the lenten 'white food' and heavily used by the military as rations, this storable and highly transportable food connected this apparent periphery to the European core (Bertelsen

1991: 25–6; Bertelsen 1992; Gelsinger 1981: 181–94; Buckland et al. 1994; Urbanczyk 1992: 230–9). This paper uses zooarchaeology to address some key questions relating to its origins and changing economic role.

In Norway, the cod fisheries are of seasonal nature, concentrating on the spawning grounds from Troms to Møre (Sunnanå 1992). The cod is harvested along the Norwegian coast when it migrates south from the Barents Sea to spawn in the winter and early spring. The spawning grounds are not only rich but close to the shore (Nakken 1993). Consequently, great quantities of fish could be taken with small boats and inexpensive equipment by the Norwegian fisher/farmers along the northern coasts.

Stockfish is a cured cod product that is peculiar to the Lofoten and Vesterålen region, requiring very specific climatic parameters that make this part of Norway unique. Stockfish is the beheaded cod whose body is air dried in the round without the use of salt. Other fish preserving methods require large amounts of salt, and in early modern times Mediterranean and Caribbean salt producing areas supplied northern cod fishing areas. Stockfish did not require this long-distance trade, but did require special environmental conditions. Stockfish is produced only from spawning cod fished during the winter. The fish is hung to dry on racks from January to March/early April. Stockfish cannot be produced in summer because of both temperature and black fly infestation. The drying process is very gradual and is based on the small temperature fluctuations between night and day. The fish is frozen during the night but thaws slightly during the day to allow the flesh eventually to dry without spoiling. The minimum size of fish used in the modern industry is 60cm in length and 3–4kg in weight (Rørtveit pers. comm.). Fish smaller than this do not have enough flesh to be worthwhile and in modern times are used as dog food, but if they are much above 110cm they rot before they can dry. The finished product has a shelf life of over two years without refrigeration.

Climate and economy of northern Norway

In Norway the most significant contrasts in climate are between the eastern inland and western coastal areas, rather than along the north–south coastline. The coastal area has an oceanic climate, the inland a more continental contrast between summer and winter. The climate of the North Norwegian islands is abnormally mild for their latitude, due to the warm water of the North Atlantic Drift (Ryvarden 1991). Large deciduous trees grow in many parts of the region and pasture extends to over 300 metres in elevation. Lofoten and Vesterålen are also subject to rapid changes in weather. Snowfall, summer rain, storminess, and summer growing season can all show considerable interannual variability. In an early report in 1591, Schønnebøl (1895) seems to have experienced such changes when he wrote: 'apart from this, there is nothing to see but snow, frost, rain, hailstorms, storms and generally unfavourable weather. So, almighty God, be kind to those who have to spend their entire life here.'

Work by Johansen (1979) and Vorren (1979) supports the presence of pastoral and cereal agriculture north of the Arctic Circle during the Iron Age. Who these early farmers were has been long debated (Hultgreen et al. 1985; Johansen 1979; Vorren 1975, 1979). Whether there was a northward migration of iron-using, teutonic-speaking farmers

(Johansen 1979) or whether the similarities of artefactual data are the result of trade and diffusion (Rolfsen 1972, 1973) is still an open question. It is clear, however, that by *c.* AD 400 cereal agriculture was well established in the region, centring on barley production. Barley was probably consumed as porridge, bread, and beer.

Despite the influence of the North Atlantic Drift, cereal production so far above the Arctic Circle is somewhat marginal. A simple sensitivity model shows the options and possibilities of grain and pasture production. The modern international convention for the total weather experience at any place is normally thirty years (Lamb 1995: 8). While this approach obscures the effect of extreme years, it serves as a baseline for simple environmental modelling. Using a modelling approach based on work by Parry (1978), and modules of the NABO FARMPACT package (McGovern 1996), we can use monthly average temperature data published by Det Norske Meteorologiske Institutt for the thirty years 1961–90 for Andøya, Vesterålen and Lofoten. Using the modern average growth temperature of grass and barley as the mean, FARMPACT then roughly models the growth potential of these areas if the temperature were to remain the same, or change by either +1°C or –1°C. Table 1 presents the modelled accumulated temperature for seven North Norwegian stations, and provides comparative data from Unst in Shetland, Vik in Iceland, lgaliko in S. Greenland, and Kapisiliit in W. Greenland. Positive numbers indicate a growing season warm enough to assure a successful crop, though the model probably underestimates the potential for producing a crop through intensive fertilization or particular microclimate (McGovern 1998). These accumulated temperature figures suggest that while Shetlanders could expect a successful barley crop in many years under a modern temperature regime, and might see significant production under a slightly warmer climate, the Icelanders would be likely to have little success under modern conditions, and the Greenlanders would have been effectively out of the range of barley agriculture under all modelled conditions. The North Norwegian stations appear very marginal for barley production in most modern years, with the best possibilities in Lofoten and southern Vesterålen, while Andøya and northern Vesterålen appear sub-marginal. The same model also estimates pasture plant community sensitivity, suggesting that all stations except the Greenlandic ones would not be strongly impacted by the modelled climate variations. Allowing for the conservative tendencies of the model, it is probably fair to say that while barley production in some areas could be reasonably productive (especially in better years), it would be difficult consistently to produce significant and reliable surpluses.

A full range of domestic mammals was present in the area since at least the Iron Age. These include caprines (sheep and goats), cattle, pig, horse and dog. The wild mammals include whales, seals, reindeer, and assorted rodents with otter, red fox, ermine, bear and squirrel being present as trace species (Fig. 2); some were traditionally hunted for meat, others for furs. Sea birds were also taken in large numbers. The fish present include various gadids: North Atlantic cod (*Gadus morhua*), saithe (*Pollachius virens*), pollack (*Pollachius pollachius*), haddock (*Melanogrammus aegilfinus*), ling (*Lange lange*), torsk (*Brosme brosme*); and also flounders (Pleuronectidae), halibut (*Hippoglossus hippoglossus*), wolf fish (*Anarchichas lupus*), redfish (*Sebastes marinus*) and herring (*Clupea harengus*). There is a trace element of salmonids (Salmonidae) in some of the collections.

Table 1 Accumulated temperature in day degrees at seven Norwegian stations, compared to other locations. Positive numbers indicate a growing season warm enough to assure a successful crop.

Station	*Barley*			*Pasture grasses*		
	present	*−1°c*	*+1°c*	*present*	*−1°c*	*+1°c*
Svolvær (Lofoten)	−38	−216	146	466	313	656
Bo i Vesterålen II (Lofoten)	−148	−345	36	367	212	545
Kvalnes (Lofoten)	−124	−308	60	386	211	569
Kleiva i Sortland (Vesterålen)	−115	−274	69	407	254	579
Sortland (Vesterålen)	−192	−348	−7.5	334	180	502
Andenes (Andoya)	−268	−431	−84	247	116	425
Andoya	−311	−458	−133	217	89	376
Beltasound, Unst	49	−198	348	600	380	865
Vik, S. Iceland	−226	−410	−18	364	192	548
Igaliko, S. Greenland	−406	−574	−253	122	−42.2	276
Kapisiliit, W. Greenland	−565	−657	−433	80	−12	181

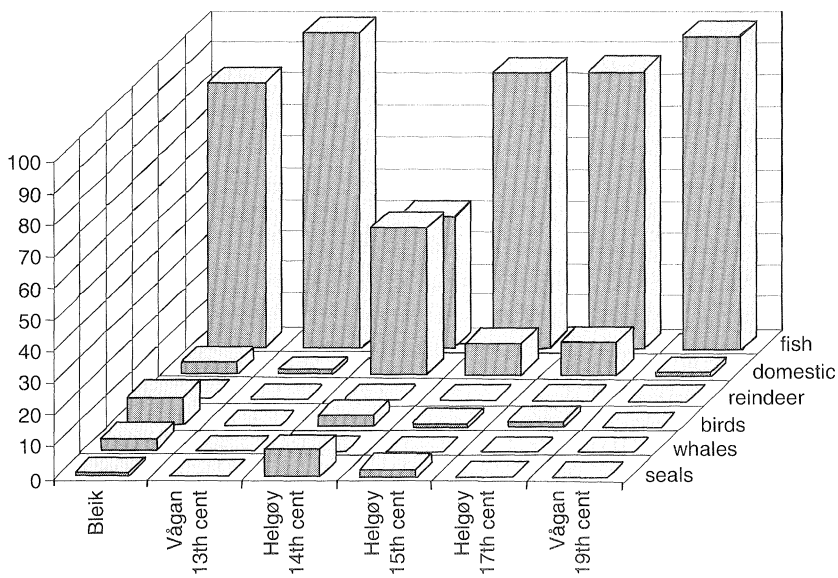

Figure 2 Proportions of major animal groups at various sites.

Historical background and analysed sites

(a) The Iron Age

Farm mounds are built up from debris connected with human occupation resulting from continuous settlement for a minimum of 400–500 years (Bertelsen 1979). Many radiocarbon age determinations have shown that they extend at least from the early Iron Age (*c.* AD 50) to the seventeenth century, but the majority are medieval. They become larger after the twelfth century (Bertelsen 1979; Jørgensen 1984). In northern Norway there may be 2,000 farm mounds, but only 25–30 have been investigated (Holm-Olsen 1981). Brox (1965) suggested that the accumulation of the farm mounds started as late as the thirteenth

century, due to the commercialization of the fisheries. Cereal cultivation was considered unreliable and was abandoned when grain could be bought in from abroad. Fertilization of the fields therefore ceased to be necessary, and the cool wet climate led to slow deterioration of organic matter which thus built up into a mound. More recent work cast doubt on Brox's hypothesis (Bertelsen 1973, 1979; Holm-Olsen 1978, 1979, 1981). In several cases the basal layers were much older than the thirteenth century, and dung was not always part of the accumulation which instead consisted mostly of remains of buildings and general household debris. This was also supported by soil and plant macrofossil analysis (Griffin 1985).

Bleik and Toften are typical Iron Age farm mounds, the bones from which will be discussed later in this paper. They are located in Andøya and were investigated in 1980–1 by R. Jørgesen. The original analysis of the faunal material for Bleik, Toften and the medieval sites of Helgøy was performed by Pirjo Lahtipera of the Zoological Museum of Bergen (Osteology Unit). A re-examination was performed by the author during the summer of 1994 and all measurements used for comparative purposes were taken at that point. Bleik is one of the oldest farm mounds known, dates of the basal layers falling around AD 50 (Jørgesen 1983, 1984). The farm mound is situated in an old cultural landscape with pollen evidence of cereal cultivation as early as 1400 ± 90 BC (Vorren 1975; Griffin 1985).

Deeply stratified farm mounds are not the only Iron Age sites in the area. The others include enigmatic courtyard structures (Urbanczyk 1992), large boat houses, feasting halls, smithies and rich graves. Archaeological evidence of the importance and power of the chieftains of the Iron Age is particularly common on Vestvagøy (one of the Lofoten Islands). The chieftain's hall at Borg is 80m long and is one of the largest known (Johansen 1982a, 1982b). It lies on top of a hill, not an ideal location for shelter but the broad viewshed may be an indicator of the area controlled from this point. Borg also has an unobstructed view to the harbour where large boat houses are still visible today, and to areas on the surrounding hills where there are known to be graves. The boat houses would have housed ships up to 25–30 meters long, and were highly visible markers of the wealth of seagoing chieftains. Rich, massive, stone graves are found in Vestvagøy; one particularly massive grave is believed to be that of a high status female (Johansen 1982b). Both the great hall at Borg and the richer graves include substantial amounts of imported glassware, beads, and gold, often incorporated in artefacts of high artistic quality. These finds have been interpreted as evidence of a ranked, chiefly society (Urbanczyk 1992). In the Iron Age we have evidence of settlements combining farming with marine hunting and fishing and in contact with the resident Sami population (Johansen 1979).

By the end of the Iron Age, the North Norwegian islands were thus apparently home to a set of extremely rich and powerful chieftainships, with a major investment in seagoing vessels of considerable size and sophistication, and with well-developed exchange links to the south and north. The division between the Iron Age and Viking period is somewhat artificial (Myhre in press), and it would appear that these patterns continued into the eighth to tenth centuries.

(b) The Viking Age

Local élites were able to mobilize the surpluses generated by a mixed herding and maritime hunting/fishing economy despite the secondary role of cereal agriculture. Trade and tribute connection to northern and interior peoples were also major sources of wealth. The

northern chieftains considered the Swedish Norrland, Kola and the entire northern coast as their trading area. One of the earliest written sources is the account of the travels of Ottar (Ohthere). Ottar was a chieftain from Kvaløy near modern day Tromsø, and his story was inserted by King Alfred of Wessex into his edition of *Orosius* in the early 890s (Lund 1984):

> Ohthere told his lord, King Alfred, that he lived the furthest north of all Norwegians. He said that he lived in the north of Norway on the coast of the Atlantic. . . . He told how he once wished to find out how far the land extended due north, or whether anyone lived to the north of the unpopulated area. He went due north along the coast, keeping the uninhabited land to starboard and the open sea to port continuously for three days. He was then as far north as the whale hunters go at their furthest. His main reason for going there, apart from exploring the land, was for the walruses, because they have very fine ivory in their tusks. . . . He was a very rich man in those possessions which their riches consist of, that is in wild deer. . . . These deer they call reindeer. . . . He was among the chief men in that country, but he had not more than twenty cattle, twenty sheep and twenty pigs, and the little that he ploughed he ploughed with horses. . . . Their wealth, however, is mostly in the tribute which the Finnas pay them. That tribute consists of the skins of beasts, the feathers of birds, whale-bone, and ship-ropes made from whale-hide and sealskin.

Ottar's wealth in terms of domestic animals was insignificant for a chieftain by the standards of Anglo-Saxon Wessex, and it appears that a further explanation was demanded. There seems to have followed a discussion in which fish, whales and walrus were confused, and in which there was no mention of stockfish or codfishing. The Ottar account is invaluable but is in need of independent testing (Lund 1984).

(c) Medieval and post-medieval

The commercial revolution and growing urbanism of 1100–1350 opened up European markets for Scandinavian fish. According to Nedkvitne (1993), the Lofoten cod was the first fishery in northern Europe to acquire an international market. By 1300, stockfish production spread southward to the coast of Møre. Barret (1997) and Bigelow (1985) both argue for an intensification of fishing and possible commercialization associated with the transition from Viking period to 'Late Norse' patterns in Orkney, Caithness and Shetland *c.* AD 1100–1200. In England, Holland, Flanders and Germany, commercial fisheries were organized after 1370 by town merchants sending large fishing vessels out in the North Sea and to Icelandic waters on long voyages that lasted several weeks at a time (Nedkvitne 1993: 194–7).

About 1450, stockfish production in North Norway also spread to northern Troms and Finnmark. Earlier there seem to have been no Norwegians living permanently so far north. Norwegian fishermen settled in fishing villages on the outer coast close to the best fishing grounds. In 1520 there were fishing villages all along the coast to Vadsø with a total population of 2–3,000. By the sixteenth century the trade in preserved cod had spread across the North Atlantic to Newfoundland and New England (Innis 1940; Kurlansky 1997). This high medieval product, so important for the entry of Norway into European markets, was also central to European settlement and exploitation of northeastern North America.

In Norway, stockfish was a vital source of income for the king and church. Profits from intensified fishing (often from specialized seasonal settlements) became a domain of the new centralized government. The fledgling state already owed large debts to the church and was in desperate need of new revenues. 'Lofot-fish even before the middle of the 11th century had reached a volume which became economically interesting for regular tax policy of the kingdom' (Bjørgo 1986: 42).

Vågan in Lofoten, the third site from which the bones are examined, is one such early fishing village. The zooarchaeological data from Vågan come from rich stratified deposits dating from the tenth to the nineteenth centuries, which produced *c.* 35,000 identifiable bone fragments. This paper concentrates upon two horizons: the thirteenth-century fully commercial seasonal fishery, and the well-documented nineteenth-century layers which represent a domestic subsistence deposit.

The introduction of a market economy in the medieval period made it possible for farmers to give up marginal agriculture and exchange the abundant cod for imported cereals. Stockfish in the medieval and early modern periods was clearly transformational for the North Atlantic settlement and economy. However, the origins, role and significance of stockfish in Norway prior to the medieval period has remained unclear.

Alternative models and zooarchaeological signatures

The central question of this paper concerns the origins of the stockfish trade. Two competing models can be posed from the current archaeological and documentary evidence.

1 The twelfth to fifteenth-century medieval stockfish trade was wholly a creation of high medieval economy and royal authority. Commercial fishery was largely imposed from the south.
2 Stockfish production had prehistoric roots in North Norway and was a major element in the chiefly staple goods economy prior to the twelfth century.

If the first model is correct we should find little evidence for systematic large-scale production of stockfish prior to the Late Viking Age. If the second model is correct we should see important continuities between the Iron Age and medieval use of fish. Available documentary and archaeological evidence cannot effectively test either model, but new zooarchaeological data can offer some fresh possibilities.

If we are to use the animal bone evidence, we must define the zooarchaeological signatures of the different types of fisheries. Many scholars have based arguments for commercialization in their particular area on sheer numbers of fish (Amorosi 1991), cutmarks (Barret 1994, 1995, 1997), and fish size and ratios (Bigelow 1985, 1991; Amorosi et al. 1994). These have led to convincing arguments for specific cases, but fail to provide a set of generalized signatures that can be widely applied. Ultimately no one measure by or in itself can produce a signature for a commercial site.

(a) Number of fish bones

One indicator used for commercial fishery has been the sheer number of fish bones (Amorosi 1991). When comparing the Iron Age Bleik and Toften with the medieval sites

of the Helgøy region and Vågan, Bleik is as dominated by fish as are the medieval and early modern collections (Fig. 2). Both Bleik and Toften have large collections in the range of 30,000 to 75,000 identified bones and are dominated by fish. If we were to argue on the basis of fish bone numbers alone, all these sites appear equally commercial, medieval and Iron Age alike.

(b) Ratio of head to body

Another approach is to compare skeletal element ratios in different collections. This may differentiate processing for export from local consumption of fresh fish. The head is usually discarded at the processing point while the cleithrum and vertebra often remain in the prepared fish. We can therefore examine the percentages of cranial and postcranial elements (heads and bodies) (Fig. 3).

All sufficiently large assemblages are separated into heads and bodies by the Minimum Analytical Unit method (MAU). MAU is the number of excavated fragments of each element, divided by the number of that element in the fish skeleton. In Figure 3, there is some evidence of stockfish production at all sites. At Iron Age Toften there is a slight overrepresentation of cranial elements, suggesting that some stockfish was produced but that most fish were eaten fresh. The early medieval deposit of thirteenth-century Vågan has the best evidence: there are considerably more cranial elements, indicating major stockfish production. The nineteenth-century deposit from the same site has the opposite pattern, suggesting consumption of whole fish locally and only some processing for stockfish.

Figure 3 also illustrates the pattern of processing for another gadid, the saithe. This fish is of similar size, fat content, and availability to the cod and is most likely to have been similarly processed. The saithe pattern is, however, drastically different from that of cod.

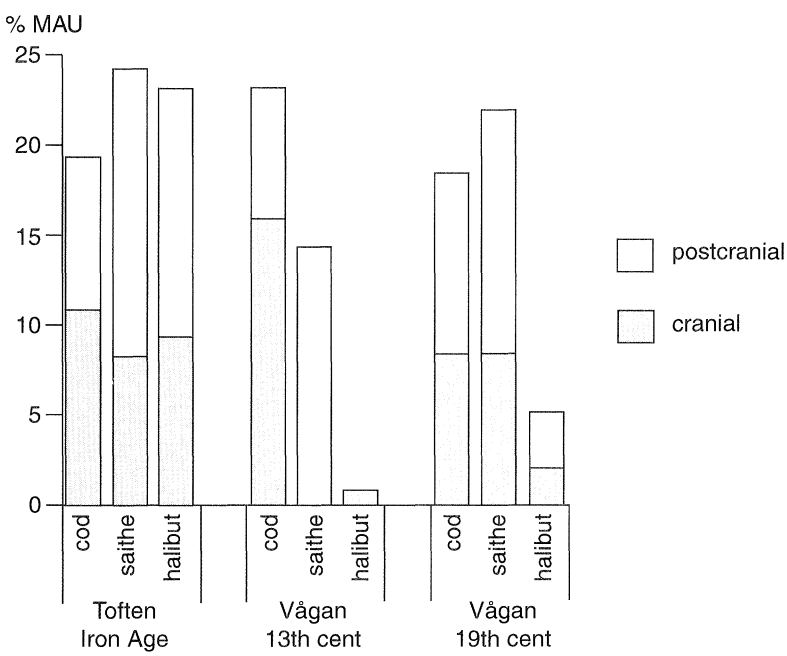

Figure 3 Proportions of cranial and postcranial parts of cod, saithe and halibut in the assemblages from Toften and Vågan.

There are more bodies than heads at Iron Age Toften, no heads at all in the thirteenth-century Vågan deposit, and a pattern like the Iron Age one in the nineteenth-century Vågan material. Halibut (not a gadid) is also investigated. This is a very large fish with fatty flesh and is unsuitable for drying. Figure 3 shows that the representation of halibut heads and bodies is similar in the Iron Age and nineteenth-century deposits (there are none in the thirteenth-century material). Thirteenth-century Vågan was thus closely focused on cod, and in processing cod to produce stockfish. Both Iron Age and post-medieval contexts show a greater diversity of fish processing techniques.

The complete absence of heads and the presence of articulated sections of vertebrae can be indicators that stockfish were imported and consumed (Heinrich 1986). Local and imported fish must be separated, and that is a site specific process. Recent research by Mia Vretemark (pers. comm. 1995) provides an example. She analysed the material from Skara in Sweden and observed a change in the size and element distribution of cod in the late twelfth century. Baltic cod are smaller than those in the North Atlantic. Before 1160 the Skara assemblage contained an even distribution of head and body elements from small cod. After 1160 many much larger cod are found, measuring up to a metre in length; only the bodies of these large fish are found, probably indicating the import of stockfish.

(c) Species proportions

Today cod and halibut are of the best quality in winter, while saithe is a summer food. While cod is predominant in all time periods, saithe, ling, halibut and torsk are also present in the Iron Age (Fig. 4), indicating year round subsistence fishing as well as stock-fish preparation. In the thirteenth century cod is the only targeted species, probably an indicator of a seasonal winter fishery. In nineteenth-century Vågan diversity increases somewhat, apparently reflecting the change from seasonal commercial fishing to year round householding with subsistence fishing.

(d) Fish size

Various formulae are available for estimating live length from fish bones (Wheeler and Jones 1981). Given the narrow size 'window' in which fish are suitable for stockfish production, a commercial site should show a concentration of fish between 60 and 110cm in length.

Figure 5 plots cod length from Iron Age Toften and Bleik, thirteenth-century Vågan (the medieval peak of commercial fishing by specialist seasonal fishers), and nineteenth-century Vågan (a more mixed residential period). In all periods the graph is effectively unimodal, with the peak squarely in the modern stockfish 'window'. The thirteenth-century Vågan specialist seasonal fishing deposits however include *only* fish in this range, while both the earlier and later assemblages include a substantial number of larger and smaller fish. In all time periods the preferred size is thus the one that is the best for stockfish, but the breadth or narrowness of the size range may contain a message about the intensity of focus on specialized stockfish production.

In conclusion, the zooarchaeological data suggest that stockfish production did indeed have prehistoric roots in northern Norway and probably did influence the chiefly economy.

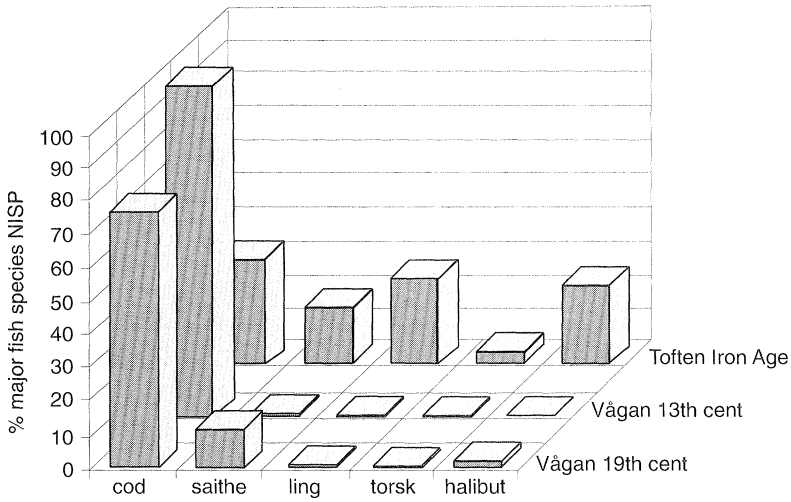

Figure 4 Proportions of fish species in the assemblages from Toften and Vågan.

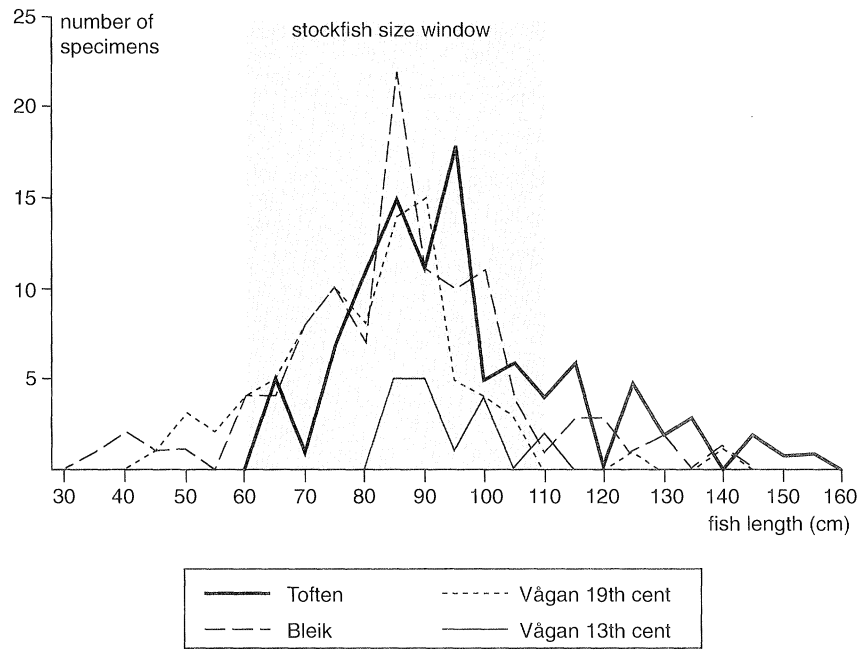

Figure 5 Lengths of cod at various sites, estimated using the formula of Wheeler and Jones (1981), compared to the optimal size 'window' for stockfish production.

However, this Iron Age production was critically different from the international, monetized seasonal fishery under direct royal and ecclesiastical control seen in the thirteenth-century deposits at Vågan. The difference between the two eras lies in a changed political economy. Stockfish is a resource that could provide the basic fuel for both chiefly ambition and royal profits (Perdikaris 1996b: 23). In the Iron Age and Viking chiefly societies, it was prestige rather than monetary profit that drove the political economy of northern Norway,

and in these periods stockfish may have been critical for the enhancement of chiefly prestige. But from the thirteenth century fish generated cash that enriched the distant mercantile cities of the Hansa.

Stockfish, barley, climate and chieftainship

Scales, weights and Arabic coins appeared in northern Norway in the Viking Age (Stenvik 1979: 135; Storli 1985: 136; Skåre 1976), when contacts with continental markets increased (Keller 1976: 100ff.). Many have seen this development in trade as the reason for the economic rise of Arctic Norway, while the south was in crisis (Magnus and Myhre 1976: 422ff.; Farbregd 1979: 74). The role of hunting products versus land ownership as the basis for chiefly power has been debated (Holmsen 1971: 78; Storli 1985: 43ff.; Herteig 1989: 14). These arguments tend to concentrate upon traditional artefactual data. As is evident from this paper, there is, however, one more factor to be considered. The political economy of northern Norway was underwritten by a silent player: stockfish.

The key is the interaction between barley and stockfish. Beer was a key to successful feasting; even in a good year when barley was produced, any bread or porridge eaten meant less beer to be drunk. The critical importance of barley to aspiring chieftains is revealed by the thirteenth-century Icelandic saga author, Snorri Sturluson, retelling a story of Sigurd Toreson, a chief from Trondenes (Snorri 1988: 199–207). The chief describes an incident that happened to his son Asbjørn, who continued the pagan feasting tradition in the Christian period. One year bad crops forced him to obtain the barley he needed from friends. The king's officer Tore Sel of Agdenes however intercepted and took all the barley, so Asbjørn could not arrange a winter feast. The powerful chieftain Tore Hund of Bjarkøy heard of Asbjørn's predicament and invited him to join his feast, but Asbjørn could not accept because this would effectively mean giving up his title as an independent leader. Later in the same saga it is noted that King Olav the Saint manipulated the redistributive chiefly economy to his own benefit by preventing cereals, malt and flour from being shipped northwards.

In Iceland and Greenland substantial Scandinavian populations could and did survive without any barley production at all. The Lofoten chieftains could probably have provisioned their clients entirely from pastoralism and marine hunting but chose not to risk the dissatisfaction produced by sober feasting. As we have seen, barley was chronically unreliable in Lofoten; while more could be purchased from abroad the story of Asbjørn illustrates the dangers of leaving it in the control of potential rivals. Stock raising was important but the total area available for pasturage and winter fodder production was limited. Seals and sea birds were regularly exploited but any significant intensification would tend to reduce returns. By contrast, cod exploitation could be limitlessly intensified until the appearance of modern technology. By using stockfish for food, more barley was available for beer, but it also could be used to trade with southern grain producing areas. Whether Ottar mentioned it or not, stockfish clearly was the enabler for many chiefly strategies, and could balance limitations or failures in barley, pasture, trading or raiding. Stockfish therefore underwrote not just subsistence, but also political power.

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