

# FISHING SEASONALITY AND TECHNIQUES IN PREHISTORY: WHY FRESHWATER FISH ARE SPECIAL

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## Abstract

Freshwater fish could provide the stable resource base that made possible permanent settlement in lake basins during the Mesolithic and Neolithic in the eastern Baltic region, but the utilisation of this resource required the development of a body of cultural knowledge and techniques for fishing in different seasons, corresponding to the changes in environmental conditions and the behaviour of fish. This paper examines Stone Age fishing techniques from a seasonal aspect, in the light of ethnographic accounts of traditional fishing.

Key words: Mesolithic, Neolithic, fishing, seasonality, settlement, lakes.

A well-known characteristic of the Mesolithic and Neolithic in the eastern Baltic region is the concentration of settlements in major lake basins. For these areas, the high degree of settlement permanence (inferred from archaeological data) has been explained in terms of the relatively secure subsistence base provided by lacustrine resources. First and foremost, this means freshwater fish. Thus, Algirdas Girininkas, in his monograph on the Neolithic settlements around Lake Kretuonas in eastern Lithuania, emphasises that fishing provided a stable food source, less dependent on seasonal variations and other circumstances than hunting and gathering. In his view, the transition to a settled way of life was connected with the development of fishing, which made the population less vulnerable to food shortages (Girininkas 1990, p.37; Daugnora, Girininkas 2004, p.190).

This idea has been applied to the Mesolithic as well. Loze (1995, p.19) regards the Mesolithic occupations at Sūļagals and Zvidze in the Lake Lubāns area in eastern Latvia as permanently occupied sites, stressing the importance of the food resources provided by the adjacent rivers and lakes. In fact, she suggests that fishing may have provided the basis for permanent settlement at Lake Lubāns from the Final Palaeolithic (Loze 2001, p.45). Zagorska (2000) interprets some Middle Mesolithic sites in the eastern Baltic (Zvejnieki II, Kunda-Lammasmägi) as permanent, year-round settlements. Emphasising that fishing could be practised almost throughout the year, she argues that, in the eastern Baltic region, fishing was important for keeping people at one particular settlement location.

From a theoretical standpoint, we may indeed regard freshwater fish as a resource that could have been utilised practically all the year round. From this point of

view, freshwater fish can be contrasted with many other kinds of subsistence resources, whose seasonality of use by prehistoric communities was to a high degree biologically constrained. Thus, fish and birds migrating over long distances were simply 'out of reach' during much of the annual cycle. The same applies to marine fish that migrate coastwards to feed or reproduce, but spend much of the year in deep waters, where they are beyond the reach of communities without advanced seafaring capabilities. Other resources obtain the characteristics making them attractive for human consumption at certain times of the year: fruit and nuts ripen at the end of the vegetation season; herbivores accrue maximum fat reserves and grow new winter coats in the autumn.

Freshwater fish stand apart from the above-mentioned resources: they constitute a major food source that is potentially accessible and in good condition throughout the year.

On the other hand, and this is equally important, fishing for freshwater fish requires different methods, skills and techniques, and different levels of energy and time input, depending on the season. Fish will only be caught in a particular season if the catching methods are appropriate to the environmental conditions and to fish behaviour in that season. Hence, the seasonality of fish as a food source depended in large measure on the fisherman's knowledge of the behaviour of the various fish species, and on the application of diverse gear and techniques to match the changing conditions at the fishing grounds.

Vilkuna (1984) describes elegantly how, in the recent past, an anadromous fish resource, salmon, was exploited during the different stages of the migration season by employing a succession of fishing tech-

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niques to match the changes in water conditions and fish behaviour. The same is apparent from Wanatebe's (1973) description of Pacific salmon fishing by the Ainu. No studies of this kind on traditional fishing for freshwater species are known to the author, but in fact the principle of matching techniques to seasonal situations applies in even greater measure: since they are potentially available all year round, freshwater fish constitute a resource whose seasonality of extraction is 'technologically determined' to an even higher degree.

The author has considered ethnographic descriptions of fishing techniques and equipment (mainly from the eastern Baltic region): although these accounts seldom focus explicitly on the seasonality of the use of fishing methods, it is nevertheless quite apparent that one of the main factors behind the diversity of equipment represented in the ethnographic record is the seasonal rotation of techniques and equipment to match changing requirements, thus providing a sequence of different fishing opportunities over the course of the year.

Because of this, predictive models that simply take into account the likely or confirmed presence of freshwater fish in an area of prehistoric settlement are of limited value in themselves for assessing the seasonality of fishing activities. For example, if we want to factor salmon fishing into a model of the annual subsistence cycle of a past riverine community, then basically all we need do is to estimate the season of the salmon run, since this must have been the period of utilisation of this resource. For freshwater fish, the seasonality of utilisation is much more difficult to assess. This means that direct evidence from the study of annual growth increments on fish otoliths and vertebrae is very important, and also that we must consider the seasonality of fishing techniques.

The ethnographic material affirms what archaeologists generally tend to assume, namely that fish spawning times were traditionally very important for fishing. During the spawning, fish tend to be very active in shallow waters, and moreover become less wary of danger, permitting the application of fishing methods that would be less effective or quite useless at other times of the year. However, there is no such thing as the fish spawning season. Different freshwater species breed in different seasons, together providing an annual cycle of fishing opportunities connected with the spawn (depending, of course, on the range of species actually present in the area).

By far the most commonly represented species in archaeofaunal collections of the eastern Baltic is pike (*Esox lucius*). Pike spawn in the early spring in very shallow water, where they are particularly vulnerable. The common assumption that pike fishing was

connected with the spawning period is supported by some direct evidence: studies of annuli on pike vertebrae from a mixed Mesolithic-Neolithic layer at Kunda Lammasmägi and the Early Neolithic site of Kõpu I in Estonia indicate that these fish really were caught in the spring (Moora, Lõugas 1995, p.479; Lõugas 1996a, p.288).

Many other species spawn in the spring and early summer, when the water reaches the right temperature. These include ecologically tolerant species inhabiting a wide range of environments, such as perch (*Perca fluviatilis*), roach (*Rutilus rutilus*), bream (*Abramis brama*) and white bream (*Blicca bjoerkna*), as well as characteristic river species, such as grayling (*Thymallus thymallus*), chub (*Leuciscus cephalus*) and dace (*Leuciscus leuciscus*). Tench (*Tinca tinca*) and crucian carp (*Carassius carassius*) spawn at higher water temperatures, mainly in the summer months; pike-perch (*Stizostedion lucioperca*) and wels (*Silurus glanis*) likewise need warm conditions. Autumn is the spawning season, and also the season of the most intensive fishing, for the lake fish vendace (*Coregonus albula*), whereas the upstream spawning migration of burbot (*Lota lota*) occurs in mid-winter (Priedītis 1951, p.22ff; Plikšs, Aleksejevs 1998).

In other words, the fishing cycle for spawning fish, at least in the eastern Baltic region, covers practically the whole year, although the greatest opportunities were in the spring and early summer.

Autumn provided another window of opportunity for the fisherman, because in that season many freshwater fish (bream, white bream, roach, rudd [*Scardinius erythrophthalmus*], chub and other species) tend to congregate before migrating to the deepwater locations where they spend the winter.

Although most species retreat to deep waters and remain inactive during the winter, traditional fishing included a variety of special winter techniques that could provide plentiful catches. Finds of bone tools interpreted as ice-picks suggest that winter fishing was also practised in the Stone Age (Lõugas 1996b, p.107). Palaeopathological evidence has also been obtained indicating that people may have been active in winter on the ice: three cases of fractured lumbar vertebrae were recorded on male skeletons from the Mesolithic/Neolithic cemetery of Zvejnieki in northern Latvia. These rather unusual fractures are thought to have resulted from falls on the ice during fishing (Jankauskas, Palubeckaitė 2006, p.156).

Finds of actual fishing equipment are likewise very important for interpreting the seasonality of fishing activities. Researchers in the eastern Baltic are most

fortunate in that fishing gear made of organic materials has been preserved at a number of Stone Age sites. Compared with many other regions, we have a rich picture of the repertoire of Mesolithic and Neolithic fishing gear. Just as with the ethnographic material, so too for the Stone Age, the fisherman's need to apply methods appropriate to the behaviour of the fish species and to the conditions at the fishing location in that particular season goes a long way towards explaining the diversity of fishing equipment represented. The challenge is to interpret this valuable body of material in terms of its technical significance as a toolkit for a range of fishing methods applied in particular seasons and situations. Some of the Stone Age fishing gear is difficult to interpret in functional terms, because of the lack of analogies in recent material, and because of the fragmentary condition of the finds. Nevertheless, it is possible to form at least an approximate idea of the kinds of gear used in particular seasons and particular fishing conditions. A brief overview is given in the remainder of this paper.

Bone fish spears have been found in fairly large numbers at Mesolithic and Neolithic sites, and as stray finds (sometimes in truly vast numbers, for example at Lake Lubāns: Vankina 1999). This attests to the importance of spearing as a fishing method. However, ethnographic accounts demonstrate that fish spearing was only possible under very specific conditions. In fact, several quite distinct techniques can be identified, applied to catching particular species in particular seasons and conditions. Moreover, there is ethnographic evidence that certain forms of iron fish spears and leisters were adapted for particular techniques (for example, very broad, lightweight leisters attached to a very long, but light shaft used specifically for pike-spearing during the spawn: Sabaneev 1911, p.318). Presumably, the diversity of Stone Age fish spears made of bone and antler likewise has a great deal of functional significance.

One of these techniques is daytime spearing during the spawning, most famously for catching pike in flooded meadows (Sabaneev 1911, p.318; Sirelius 1934, p.97; Ligers 1942, p.24; Cimermanis 1962, p.168ff), but also for bream and tench (Sirelius 1934, p.97; Cimermanis 1963, p.90). In the past, the technique could also conceivably have been used against other species, such as pike-perch and wels (Sloka 1986, p.130). There is also plenty of ethnographic data on night-time spearing with a light source, which not only served to illuminate the water, but also attracted the fish and temporarily dazzled them. This method requires good visibility, so it could have been used later in the spring, once the floodwaters had subsided and the water was clear again, but only before the new growth of aquatic plants obscured the view. However, it is most commonly identified as

an autumn activity, practised after the aquatic vegetation had died back, and was usually carried out from a boat. Various species of large fish were speared by this method, including tench, pike, bream, burbot and wels (Sabaneev 1911, pp.102, 477, 988-990; Sirelius 1934, Fig. 174; Ligers 1942, p.25ff; Cimermanis 1962, p.169). Winter spearing through holes in the ice is also recorded, particularly for burbot, attracted by means of lures (Manninen 1931, p.119ff; Benecke 1881, p.90).

Shooting fish with a bow may be regarded as an alternative to spearing, and would probably have been practised in similar conditions. It seems that needle-shaped bone arrowheads would have been particularly well suited for this purpose (Zagorska 1991, p.47). At the Mesolithic sites of Ivanovsko 3 and 7, in central Russia, needle-shaped bone arrowheads and an unserially barbed arrowhead have been found sticking into the former lake bed at a steep angle. Presumably, these were lost in the course of shooting fish (Zhilin 2004, p.56).

Stunning fish through the first, thin autumn ice was a special technique for this season, when conditions were unfavourable for other fishing methods (Manninen 1931, p.107; Ligers 1942, p.9ff). A heavy, long-handled wooden club, which would have been suitable for the purpose, has been found at Šventoji site 2B in western Lithuania (Rimantienė 1979, p.24, Fig. 47.2).

Angling would have been primarily a method for catching large carnivorous fish, such as pike, perch, wels and burbot (Cimermanis 1973, p.121; Lōugas 1996b, p.105; Sloka 1979, p.69). Large numbers of single-piece bone fish-hooks, as well as bone points and bone or slate shanks of composite fish-hooks, and some bone gorges and sinkers, have been recovered at archaeological sites, and particularly as stray finds. Several kinds of fish-hooks can be dated to the Neolithic. They show a range of forms and sizes, and would have been suitable for catching particular species of fish (Zagorska 1977; 1994). Angling is effective at times when the fish are actively feeding. As the wealth of angling literature explains, the seasonal feeding periods differ for each species (Āķītis 2002).

So far in the eastern Baltic, remains of weirs, traps and components of other semi-permanent barriers have only been found at some Neolithic sites with outstanding preservation conditions (Loze 2001, p.33ff; Rimantienė 2005, p.72ff, pp.192-193 and pp.408-409; Bērziņš 2006, p.51ff). However, the presence of remains from small fish in screened samples from the Mesolithic site of Vendzavas in western Latvia indicates that nets or traps were already used at this time (Lōugas 2002, p.50). In any case, net techniques were already in use in the Baltic Sea region at the begin-

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ning of the Mesolithic, as we know from the Antrea Korpilahti find in Karelia (Pälsi 1920; Sirelius 1934, p.127; Miettinen *et al.* 2008). In many cases, fragmentary remains are very difficult to categorise functionally, as deriving from gill nets (stationary nets designed to catch fish behind their gills), seine nets (nets used to surround fish) or other kinds of nets, since floats, sinkers and remains of the mesh are in many cases not diagnostic (Bērziņš 2008, Chapter 6). One group of finds indicating the use of gill nets in the Stone Age in northern and eastern Europe are wooden or bark discs with a central perforation (Bērziņš 2008, p.227ff): at least some of these objects may be regarded as having fitted on to the ends of poles used to drive fish into gill nets by beating the water, as described, for example, by Ligiers (1942, pp.75, 77).

Ethnographic accounts describe how weirs or separate fish-traps were used to catch pike, perch and roach in the spring in spawning grounds, or along the routes taken by fish to reach these locations (Benecke 1881, pp.392-393; Ligiers 1942, pp.45-46; Cimermanis 1962, p.175; 1963, pp.104, 106). The Early Neolithic weir at Zvidze in the Lake Lubāns area has been interpreted in this manner: it is thought to have been used at the time of the pike spawning, when the water level in the lake rose. The pike, swimming to the shallows to spawn, would be caught in the traps of the weir (Loze 2001, p.33ff). This is the principle of operation for the weirs erected in the seasonally flooded meadows around the lake in the recent past (Cimermanis 1973, p.122). Passive fishing gear, such as traps, fences and gill nets, is also important for fishing species that spawn in the summer in waters thick with aquatic vegetation (such as tench and crucian carp), since the vegetation greatly impedes the use of active gear (Benecke 1881, p.112; Anonymous 1892, pp.10-11; Sabaneev 1911, pp.471, 474-475; Manninen 1931, p.193). In the winter, when the construction of permanent barriers was problematic because of the ice cover, gill nets could be inserted through holes in the ice and extended between the holes by means of long poles, after which the fish were driven into the nets (Ligiers 1942, p.80ff, Figs. 91-107). A characteristic location for placing winter nets is across river inlets or outlets from lakes, since these are routes by which fish migrate in order to escape the stagnant, oxygen-deficient conditions under the ice (Anonymous 1892, pp.4, 6-7).

There is some evidence, at least, of Stone Age seine nets. One artefact form commonly linked to seines is a wooden pole with knobs at both ends: such finds are regarded as end-sticks for seines. It has to be said that examples of such poles found at sites in the coastal belt,

namely Sārnate and Šventoji (Vankina 1970, p.95, Fig. XXI. 8, 9; Rimantienė 2005, pp.70, 312, 453, Fig. 178. 8, 9, Fig. 346.1), cannot be regarded unequivocally as seine components, since we know from ethnographic examples that similar poles were attached to set nets used in coastal fisheries in order to prevent the net from twisting under the influence of the wind and the motion of the sea (Heinemann 1905, Fig. 1; Šulcs 1961, p.161, Fig. 16). More securely identifiable as end-sticks for seines are those examples found far inland, such as the pieces from Gorbunovo Bog in Russia (Eding 1940, Fig. 1. 3; Raushenbakh 1956, Fig. 10.10) and a fragment from the Early Neolithic stratum at Zvidze, near Lake Lubāns (Loze 1988, p.41, Fig. XXXVII.7). Seining is greatly hampered by aquatic vegetation, so it tends to be a distinctly seasonal activity: the best conditions are in the spring, before the vegetation has grown, and again in the autumn, after it has died back (Seligo 1926, pp.92, 93).

Thus, the people of the Mesolithic and Neolithic were familiar with many of the elements constituting the arsenal of seasonally and locationally adapted fishing gear used by freshwater fishermen of the recent past. Such a versatile repertoire of fishing methods really was necessary for the comprehensive utilisation of the year-round resource potential of freshwater fish. The development of this body of cultural knowledge was without doubt particularly important for the emergence of settlement centres by major lake basins during the Mesolithic and Neolithic.

Written in English by Valdis Bērziņš

#### Abbreviation

AE – Arheoloģija un etnogrāfija (Rīga from 1957).

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## PRIEŠISTORINĖS ŽVEJYBOS SEZONIŠKUMAS IR ŽVEJYBOS TECHNOLOGIJOS: KODĖL GĖLAVANDENĖS ŽUVYS YRA YPAČ SVARBIOS

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#### Santrauka

Stabilus pragyvenimo pagrindas, kurį suteikė ežerų išteklių – visų pirma gėlavandenės žuvys – sudarė Rytų Baltijos ežerų regionų mezolito ir neolito gyvenviečių koncentracijos galimybę. Gėlavandenių žuvų išteklių galbūt buvo naudojami ištiesus metus ir skyrėsi nuo daugelio kitų pragyvenimo išteklių, kurių naudojimo sezoniškumas labai varžė priešistorinių bendruomenių biologines galimybes. Tačiau gėlavandenių žuvų žvejybai būdingi skirtingi įgūdžiai ir būdai, atitinkantys aplinkos ir žuvų elgesio pokyčius.

Etnografinių duomenų studijos patvirtina, kad žuvų nerštas tradiciškai buvo labai svarbus žvejybai. Skirtingos gėlavandenių žuvų rūšys neršia skirtingu laiku, tuo užtikrinamos metinį neršto laikotarpio žvejybos galimybių ciklą, nors didžiausios galimybės buvo pa-

vasarį ir vasaros pradžioje. Žuvų susibūrimo vietas prieš keliones į žiemojimo vietas sudarė kitą galimybę, be to, žiemos žvejybos technika galėjo būti žinoma ir akmens amžiuje.

Etnografinės žinios liudija kelis žuvų badymo sezoninius būdus. Šaudymas iš lanko gali būti vertinamas kaip alternatyvus žeberklavimui būdas. Žuvies apsvaigimas smūgiu per ledą yra ypatingas vėlyvo rudens žvejybos metodas. Meškeriojimas efektyvus tuo metu, kai žuvys aktyviai maitinasi. Stacionarūs žvejybos įrenginiai (spąstai, užtvankos, žiauniniai tinklai) galėjo būti naudojami pavasarį neršto ir migracijų į nerštavietes vietose, bet ypač aktyviai naudoti vasarą neršiančių žuvų rūšių žūklei, kai vandens augmenija trukdė žvejoti aktyvios žūklės būdais. Žiauniniai tinklai galėjo būti naudojami žiemą po ledu. Gaubiamieji tinklai daugiausia buvo naudojami pavasarį ir rudenį, kadangi vasarą tokiam žvejybos būdai trukdydavo gausi vandens augmenija.

Mezolito ir neolito žmonės buvo gerai įvaldę sezoninių ir migracinių žvejybos technikų, kurias dar visai neseniai naudojo gėlavandenių žuvų žvejai. Tokia būdų įvairovė buvo būtina ištiesus metus naudojant gėlavandenių žuvų išteklius ir buvo labai svarbi ežerų baseinų centrų susidarymui.

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