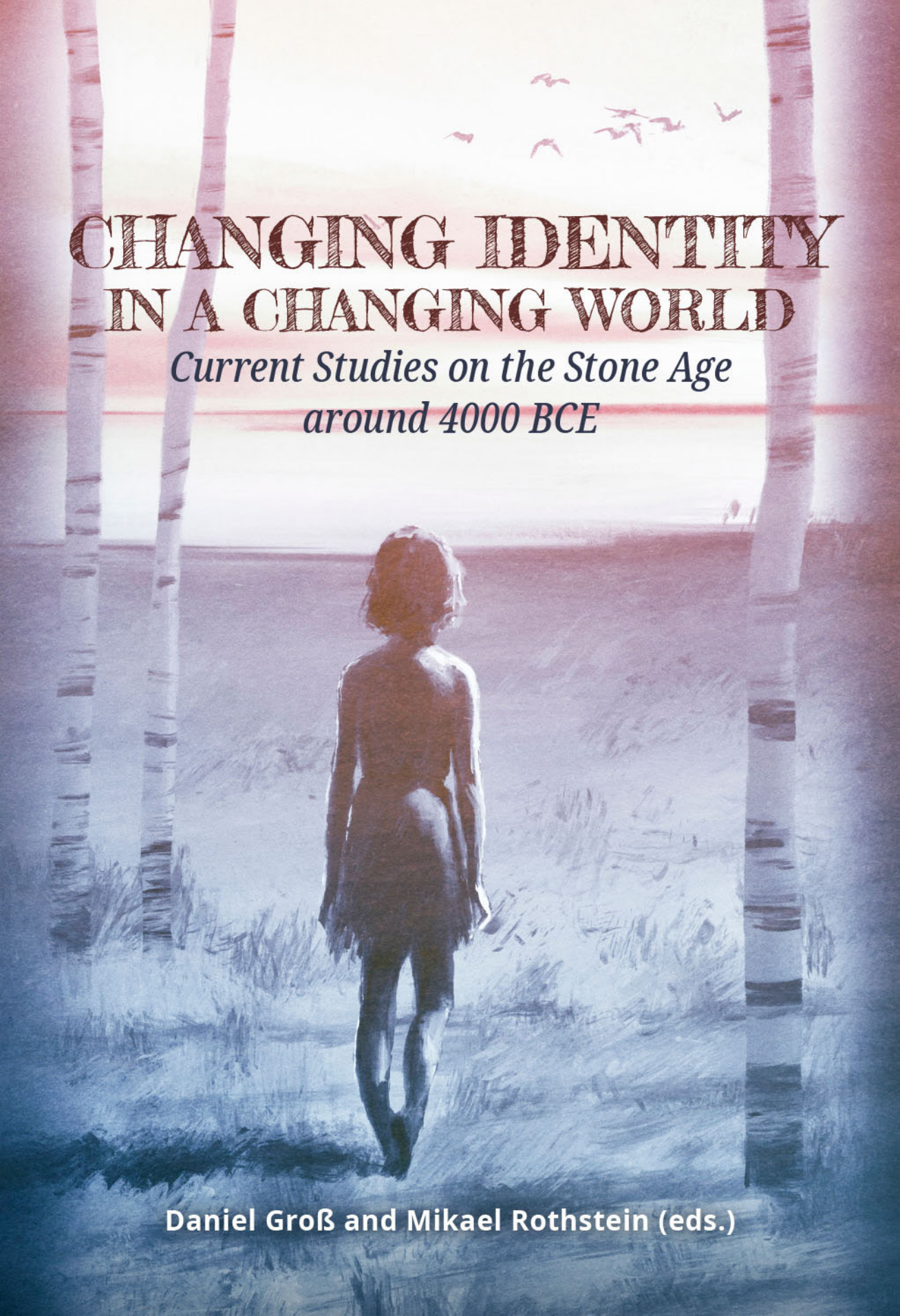
CHANGING IDENTITY
IN A CHANGING WORLD
Current Studies on the Stone Age
around 4000 BCE
Daniel Groß and Mikael Rothstein (eds.)

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Contents

Estuary and lacustrine fishing with stationary wooden structures in Neolithic Finland

Evidence from waterlogged sites

Satu Koivisto

Abstract

Fish have constituted an essential part of subsistence and diet among prehistoric foragers and the even later farming populations of Fennoscandia. Northern hunter-fisher-gatherers have often adapted their site location strategies to maximise fishing at favourable fishery locations, such as river estuaries, coastal areas and inland lakes. Changes in the settlement patterns of the fourth millennium BCE estuary populations of coastal northern Ostrobothnia, northwest Finland, have been seen as reflecting increased social communality. This also allowed joint initiatives in resource procurement, for instance, mass fishing with stationary wooden structures, which have been found in abundance in waterlogged conditions in the area. Riverbank housepit villages, especially the ones located by the rapids and islands, may be assumed to have been associated with the mass-harvesting and/or processing locations of seasonally and spatially aggregated fish resources. During the early Neolithic, the settlement pattern of the lake populations of southern Finland may be suggested to have been mobile and periodic, and the economy related to seasonally abundant lake resources, freshwater fish (*e.g.* pike and cyprinids) and nutrient-rich plants (water chestnut and hazel) in particular. Wooden stationary structures were frequently used in lake fishing practises and, through time, more permanent habitation at profitable fishing grounds increased. More active and long-term use of lake settlements in the northeast Baltic, starting in the mid-fifth millennium BCE, may be linked to the economic shift towards a more intensive utilisation of freshwater resources, as has been observed at waterlogged lake sites with good preservation of organic materials.

Fennoscandia; hunter-fisher-gatherers; fishing techniques; waterlogged sites

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Introduction

The identification of direct evidence for prehistoric fish consumption in Finland is usually problematic because fish remains at archaeological sites are poorly preserved. The degradation of organic materials within acidic podzol soils, the fragmentation and brittleness of burnt bones, and the excavation and recovery methods used all hinder the taphonomic and taxonomic study of fish remains (*e.g.* Nurminen 2020). In addition, fishing-related artefacts are relatively rare in the archaeological collections (*e.g.* Minkkinen 2000), thus suggesting that they were mainly manufactured from organic materials, such as bone, antler, wood, and various plant and animal fibres and have decomposed over time (Koivisto 2017).

The shore-bound settlement pattern of the Mesolithic and Neolithic populations of boreal Fennoscandia (*c.* 9000–2000 BCE) resulted in the extensive utilisation of various coastal, riverine, and lacustrine landscapes (*e.g.* Bergsvik *et al.* 2021; Ekholm 2016; Mjærum and Mansrud 2020), which also served as suitable fishing grounds. Human occupation was not restricted solely to drylands, and nearby waterways, waterfronts and wetlands constituted an essential part of the living space and were used for various everyday activities, such as transportation, resource procurement, water supply, washing, and discarding of waste, as well as for ritual practices.

Stationary wooden structures associated with fisheries represent the most numerous wetland archaeological site type in Finland (Koivisto 2017). Approximately 100 such sites are currently known from peatlands, shallow waterways and alluvial landscapes, and they are most typically found through drainage operations. Until recently, fishing structures have not aroused much archaeological interest in Finland, and the find spot locations have not been inspected or included in the registers of protected archaeological sites. However, the gradually increasing research has enabled us to enhance our understanding of these previously inadequately explored wetland archaeological resources, which contain a huge potential for various scientific and multidisciplinary investigations (*e.g.* Koivisto 2017; Koivisto *et al.* 2018).

Fishing with stationary structures in the northeast Baltic

A stationary wooden fishing structure refers to a wooden structure associated with passive fishing, which takes advantage of the regular movements of fish in both running and still water (Koivisto 2017). They include fish traps and weirs manufactured of wood that have been set and anchored firmly in favourable fishing locations, such as rivers, estuaries, inlets, coves, fjords, lagoons, and lakes. The term 'lath screen fishing structure' refers to a long fence-like construction manufactured from narrowly split pinewood laths, bound together with ties made of birch bark, roots, twigs or tree bast (fig. 1). The lath screen modules were supported by piles and stakes of varying dimensions and installed firmly on the sea floor or lakebed. Typically, the lath screen modules were arranged to form one or several circular or heart-shaped trap nests, on average a few metres across, and guiding fences several tens of metres long, which channelled the fish towards the trapping arrangements. Separate traps, such as basketry traps and nets, were also attached to the openings on the weir walls.

Both archaeological and ethnographic records demonstrate that nearly similar designs were in use for several millennia, as fishing gear was designed to target certain species

Figure 1. Early modern (above) and Neolithic (*c.* 3400 BCE) (below) lath screen fishing structures bear many similarities in design and construction (photos: Eino Nikkilä 1935, Finnish Heritage Agency (KK1739:705) and Satu Koivisto 2012).

in a specific habitat (Koivisto and Nurminen 2015). The majority of the securely dated examples from Finland have yielded prehistoric dates, ranging from the Neolithic to the early Iron Age, between *c.* 4000–100 BCE (Koivisto 2017). A few medieval and early modern

datings are also known, falling approximately between the 14th and 19th centuries CE. Based on ethnographic accounts, spawn fishing in lakes with stationary wooden structures that targeted northern pike (*Esox lucius*), European perch (*Perca fluviatilis*), burbot (*Lota lota*), and common roach (*Rutilus rutilus*), provided a profitable and reliable livelihood, alongside other economies, in the historic period. The Neolithic examples further suggest that very similar structure types were utilised in both estuary and lacustrine fishing.

In addition to Finland, pine lath fishing structures represent a relatively common type of wetland archaeological resource in the northeast Baltic (and northwest Russia). Laths of pinewood and bindings made of tree bast, wicker and birch bark were the most typical stationary fishing structure materials in this region (*e.g.* Bērziņš *et al.* 2016; Piezonka *et al.* 2020; Piličiauskas *et al.* 2020; Vankina 1970). The ages of the securely dated structures range from the Mesolithic to the Bronze Age, *c.* 6000–1000 BCE. For example, at the lakeside settlement of Sārnate, western Latvia, several rolled-up lath screen modules have been dated to the settlement phases between *c.* 4000–3000 BCE (Bērziņš 2008; Vankina 1970). The Neolithic fish weirs and trap panels in the Lake Lubāna valley, eastern Latvia, were manufactured from narrow pine laths bound with willow twigs and tree bast (Loze 1988). The fishing gear at the Neolithic and Early Bronze Age coastal sites of Šventoji, western Lithuania, also includes several weirs and panels made from pine laths (*e.g.* Piličiauskas *et al.* 2020). To sum up, pine lath fishing structures in northeast Europe in the Mesolithic, Neolithic and Early Bronze Age are usually found associated with occupation and fishery sites, or they are deposited in nearby waterways.

Partially comparable designs made of other wood species are known worldwide, signifying the huge importance of passive fishing with stationary structures, for instance, the Mesolithic and Neolithic hazel rod, wattle-work and wicker screens of northern Europe (*e.g.* Hansson *et al.* 2018), such as those at Syltholm (Sørensen 2016), and the fish weirs of the Ob-Ugrian Khanty and the Mansi of western Siberia (Sirelius 1906). Many similarities can also be found in the wooden tidal weirs by the Tlingit, Haida and Chinook groups on the Northwest Coast of North America (*e.g.* Moss and Erlandson 1998; Stewart 1977).

Case studies

Estuary fishing on the Bothnian coast in the Neolithic

Major rivers, especially those that drain into the Gulf of Bothnia in the northern Baltic, have been used as routes of communication and exchange between coastal and inland areas for millennia (*e.g.* Mökkönen 2011). The emergence of nutrient-rich wetlands due to a strong isostatic rebound in this area has affected the concentration of resources that were widely utilised by prehistoric and later historic populations. The dynamic landscape was susceptible to flooding, and archaeological organic materials were occasionally preserved at waterlogged sites under thick layers of alluvial sediments and peat (Koivisto 2012). The local topography and environmental circumstances provided advantageous conditions for developing a Neolithic procurement strategy that utilised stationary wooden structures, *c.* 4000–2500 BCE (Butler *et al.* 2019; Koivisto and Nurminen 2015).

The Neolithic settlement complex of Kierikki by the estuary of the Iijoki river (*c.* 4000–2800 BCE) is unique in Fennoscandia in many respects. The estuary of the Iijoki river is one of the largest Stone Age housepit concentrations in northern Europe, and

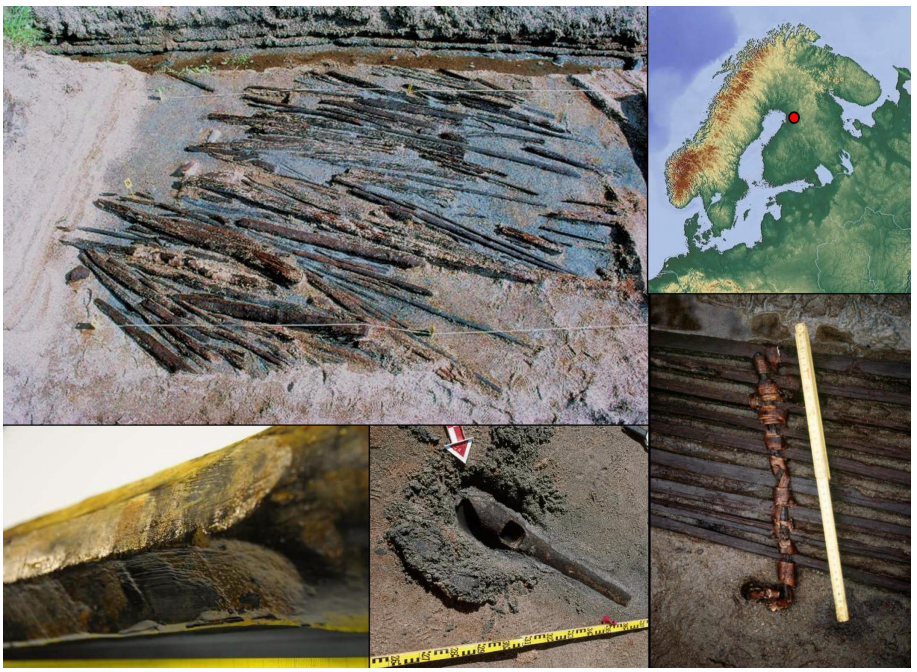

Figure 2. Wooden materials from the Neolithic fishery of Purkajasuo (photos: Satu Koivisto and Finnish Heritage Agency).

hundreds of housepits in village-like clusters have provided the basis for multiple studies concerning, *e.g.* the settlement pattern, social dynamics, environmental conditions and other characteristics of this area (*e.g.* Butler *et al.* 2019; Koivisto and Nurminen 2015; Mökkönen 2011; Núñez and Okkonen 2005). It has also been suggested that the long multi-room houses at Kierikki indicate increased communality and demonstrate the possibility that the idea of a longhouse was borrowed from the contemporaneous Neolithic cultures in the south (Mökkönen 2011).

The wetland site of Purkajasuo by the Kierikki settlement site complex is topical for the prehistoric fishery studies in this region (fig. 2). The site's well-preserved organic materials suggest the utilisation of both active and passive fishing techniques in a sheltered lagoonal landscape *c.* 3900–2700 BCE: (1) weir fishing with lath screen structures, (2) net fishing, and (3) leister fishing (Koivisto 2012). Based on the palynological and dendrochronological evidence, the wood for manufacturing the weirs was collected from nearby forests during winter for 19 years (Koivisto 2012 and references therein). The shallow lagoon served as a productive fishing ground all year round; filled with brackish water and rich in aquatic vegetation, it was an ideal spawning arena for several local and migratory fish species. Furthermore, in a low-lying estuary habitat, the spring and early summer flooding seasons may already have been utilised in the Neolithic estuarine fishing techniques.

Changes in fishing techniques may reflect shifts in the abundance of certain fish species, and people may have created a well-designed strategy to extend the use of seasonally abundant resources, including adequate harvesting and storage adaptations

(Koivisto 2017). The prime resource for the coastal population equipped with the necessary mass harvesting technologies was presumably migratory fish, such as Atlantic salmon (*Salmo salar*) and whitefish (*Coregonus lavaretus*) (Butler *et al.* 2019; Koivisto 2017). The productive fishing grounds were probably the prime motive for the initiation of settlement in the estuary habitat, *c.* 5000 BCE, and later (by *c.* 3500 BCE) the settlement approached semi- or full sedentism. Collaborative labour and organisation were needed to collect all the wood and to construct and maintain the fishing facilities, and to conduct fishing with all its procedures. However, the economic importance of other estuary resources, *e.g.* seals, land mammals and waterfowl, cannot be excluded. Climatic conditions were especially advantageous for the application of highly advanced fishing strategies during this period (*e.g.* Koivisto 2017).

Neolithic lake fishing in the hinterlands

Small, shallow lakes near the coastal zone constituted important environments and provided a broad spectrum of resources all year round. Archaeological data suggests that spawn fishing in shallow lakes was a productive and significant form of subsistence among the Neolithic hunter-fisher-gatherers in southern and southwest Finland (*e.g.* Koivisto 2021; Siiriäinen 2004). The microclimatic conditions were attractive to human habitation and allowed the procurement of various freshwater fish (*e.g.* pike, cyprinids) and nutrient-rich plants, for example, hazel (*Corylus avellana*) and water chestnuts (*Trapa natans*) (*e.g.* Vanhanen and Pesonen 2016). The environmental and climatic factors also produced a vegetation composition that attracted land mammals and waterfowl, among many other species. It has been suggested that lake sites were used as long-term periodic procurement camps for the seasonal utilisation of nearby resources (*e.g.* Koivisto 2021). Annual lake level fluctuations, transgressions and regressions have resulted in formation processes that have occasionally affected the sedimentation and preservation of organic materials. Many smaller lakes have turned eutrophic and been paludified.

The lake settlement of Järvensuo 1 in Humppila, southwest Finland, is an excellent example of such a site (fig. 3). It was a chance discovery via drainage operations in the 1950s when a well-preserved wooden paddle was revealed in one of the drainage ditches. The artefact yielded a Late Neolithic dating, and more artefacts, including a wooden scoop with a bear-head handle, fishing implements, and pottery, were later found in the same ditch (Koivisto 2021). The site is located at the foot of a moraine hill that rises in the middle of a large peatland plateau, where archaeological horizons resulting from human occupation and resource procurement (*c.* 6000–2000 BCE) lie within peat and gyttja. The water-level fluctuation and sedimentation have resulted in formation processes that have aided the extraordinary preservation of organic archaeological remains.

Recent excavations at the site in 2020 and 2021 yielded rich evidence of sedimentation, environmental conditions and anthropogenic activities from the Late Mesolithic and Neolithic. The high number of fishing-related artefacts suggest economic activities, yet with a possible ritual element related to the use of the lakeshore (Koivisto and Lahelma 2021). The majority of the archaeological assemblage comprises organic materials including, for instance, wooden tools, utensils and figurines (*e.g.* the life-sized wooden snake figurine), piles, net floats and sinker stones, and fragments of lath screen fishing structures, along with pottery, lithics and bone. Most of the bark artefacts represent pine and birch bark fishnet

Figure 3. Organic artefacts from the Neolithic lake settlement of Järvensuo 1 (photos: Satu Koivisto).

floats, and small sinker stones with birch bark sheeting and plant cordage, along with tiny fragments of fishnets, have also been preserved (Koivisto *et al.* in prep.). The remaining (fragmentary) wood materials include pieces of pine laths representing fragmentary parts of lath screen fishing structures, which were set on the waterfront during periods of lower lake levels, especially during the Late and Final Neolithic settlement phases of the site (*c.* 2500–2000 BCE). No binding materials from the lath screens have been preserved, but a number of vertical and oblique piles in their vicinity may have supported the lath screen modules. Interestingly, fishnets may have been attached to the lath screen structures.

In addition to the material culture record, there are certain similarities in the settings and long-term use of the northeast Baltic lake sites, which were located by the shores of shallow, smaller lakes with fluctuating water levels, which could be associated with particular economic and cultural traditions. Their utilisation has been identified as beginning in the Late Mesolithic, flourishing especially in the Mid and Late Neolithic and continuing into the Early Metal Age and Bronze Age (*e.g.* Koivisto 2021 and references therein). Many eastern Baltic sites have also yielded

evidence of pile dwellings, and their construction was more active during periods of lower lake levels. The more active and long-term use of similar lake habitats may be linked to the economic shift towards a more intensive utilisation of freshwater resources, which began to increase in the mid-5th millennium BCE, as is also supported by the organic residue studies of Neolithic pottery in the region (*e.g.* Mökkönen and Nordqvist 2019).

Conclusions

Today, studies focusing on stationary wooden fishing structures published in the Baltic Sea region are increasing (*e.g.* Bērziņš *et al.* 2016; Piezonka *et al.* 2022; see also Jørgensen *et al.* 2022). Ethnographic materials have been found useful when exploring the functions, designs, and characteristics of the fishing structures, and have allowed us to project the technologies back into prehistory and evaluate their significance. A balanced subsistence strategy based on fishing was dependent on several ecological, physical, and biological factors. These were governed by climatic and environmental circumstances, such as the abundance of certain species in a given habitat, procurement seasonality, preservation technology, and storage adaptations. Environmental changes may have affected the subsistence subsystems, which may be mirrored in the archaeological record – for example in fishing techniques. Here, the well-preserved organic materials preserved in the boreal wetlands provide us with rare opportunities to explore the development and changes in subsistence strategies. In addition, fishing techniques are topical from an ecological viewpoint, as changes in fishing patterns may be assumed to be closely related to changes in fish abundance and affected the livelihoods of the shore-bound Stone Age populations of the Baltic Sea region.

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