

# Fish on the Move: Transporting and Processing Fish as Part of the Castle Economy in the Northern Baltic Sea

HANNA KIVIKERO

*University of Helsinki, Finland*

*The importance of fish for the medieval and early modern economy in the Baltic Sea is known through separate studies by historians and archaeologists. This article aims to combine zooarchaeological data with account books from castles in Kastelholm (Åland Islands) and Raseborg (south-western coast of Finland) in order to understand the processing and transport of fish in the area. Fish was paid as tax by the peasants but was also fished by the castle fishermen and brought to the castles to be consumed there. Here, the preserved fish products are primarily studied through pike and cod, which represent the main economically important larger fish species in the Baltic Sea. The study reveals some differences between the castles studied and the importance of fish for the castle economy.*

*Keywords:* fish products, Baltic Sea, castles, economy, transport

## INTRODUCTION

Research into the fish trade has flourished in recent years. Many studies have examined Late Iron Age and early medieval fishing and trade in the Atlantic, with a special focus on osteoarchaeological finds of cod and herring (e.g. Heinrich, 1983; Barrett, 1997; Perdikaris, 1999; Barrett et al., 2004; Krivogorskaya et al., 2005; Perdikaris & McGovern, 2009; Orton et al., 2014). Fish products were also important for the economy in the Baltic Sea, and especially the late medieval (c. AD 1300–1520) and early modern (c. AD 1520–1600) economy of the Swedish Crown. However, few detailed studies have so far been published on fish and fish trade in this period. Peter Norman (1993; 2009) has investigated the development of fishing between the ninth and fifteenth centuries in the Baltic Sea area, mainly in

Sweden, based on archaeological studies of coastal fishing sites or camps. A few other studies have highlighted fishing in the Late Iron Age and the Early Middle Ages, such as at the fortification of Eketorp on Öland (Hallström, 1979) and the town of Birka (Löugas, 2008) in the light of zooarchaeological finds. Some studies of fish bones in late medieval and early modern Swedish towns have been conducted by Leif Jonsson (1986), Auli Tourunen (2004), Kristiina Mannermaa (2016), and Emma Maltin and Leif Jonsson (2018). Additionally, in an attempt to understand cod fisheries in the Baltic Sea region in early modern times up to the nineteenth century, MacKenzie et al. (2007) studied a variety of archival documents, including customs and tax accounts.

The archipelago of Sweden and Finland was already extensively exploited in the

Iron Age (e.g. Norman, 1993). But it was not until the medieval period that a more extensive trade in fish, among other commodities, can be linked to the networks of the Swedish Crown (Norman, 2009). Castles were important nodes in the networks, as they were responsible for the collection of taxes in each region. Information on the trade and transport of goods is found in different kinds of medieval documents, including letters and account books. This article discusses the importance of fish in the Baltic area between c. AD 1300 and 1600 in the light of account books and zooarchaeological finds from two castles, Kastelholm and Raseborg.

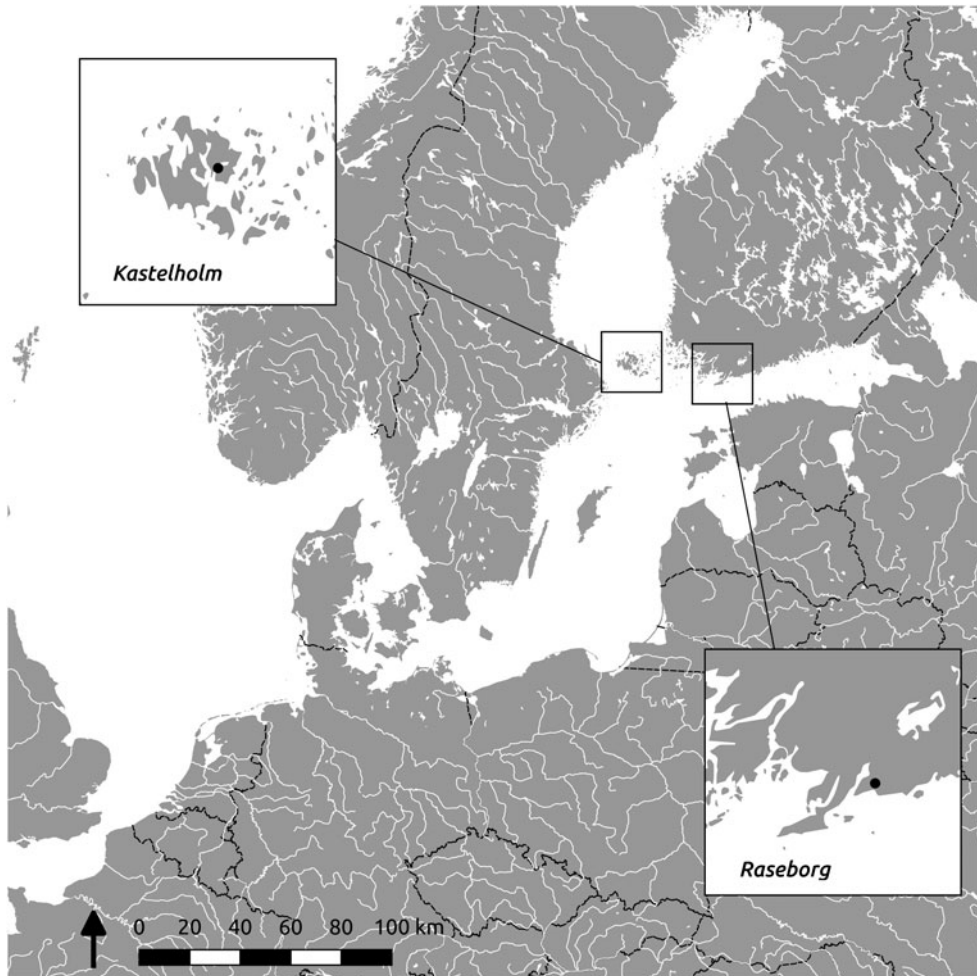
Fish had to be processed and preserved before transport. The most common way to preserve fish was to dry or salt it (e.g. Warg, 1755: 276–77; Williamson, 1948: 82). Smoking and souring are other ways of preserving fish, but they are not often mentioned in account books. Only fish that was transported during winter could be kept frozen and fresh (Storå, 2003: 23). This suggests that most of the fish transported to the castles and kept there was either salted or dried. There were at least two types of dried cod products in the northern Baltic Sea region: clipfish (*klippfisk*) and spitfish (*spettfisk*). Not much is known about the processing of these fish, only that clipfish is cod or other species of the cod family dried on cliffs or rocks. The fish was dry-salted and the bodies were split in the middle (Swedish Academy Dictionary, SAOB hereafter). This could be a kind of product resembling the smaller Atlantic cods, 40 to 70 cm in size, which were beheaded and flat-dried (Perdikaris & McGovern, 2009: 200). Spitfish is a term used to describe fish that was suspended to dry with the help of sticks or spits (SAOB). Another fish product, called *strefusz* in Polish texts and likely to be dried pike,

has been discussed by Richard Hoffmann (2009).

The castles at Kastelholm and Raseborg are located in different landscapes, Kastelholm being on the Åland Islands and Raseborg on the south-western coast of mainland Finland (Figure 1). Both castles were founded at the end of the fourteenth century (Hausen, 1934; Drake, 1991; Rask, 1991).

The castle of Kastelholm is situated in the Åland Islands, an island group in the northern Baltic Sea (Figure 1). It stands on the main island, which is surrounded by a large archipelago. The castle was almost destroyed by a fire in 1619–1620 but remained in use. It was finally abandoned after two more fires in the mid-eighteenth century (Palmaraz, 2004). Kastelholm had three landed estates. One, referred to as the landed estate of Kastelholm, was near the castle itself and was the oldest. The landed estate of Grelsby was founded in the first half of the sixteenth century, and the third estate, called Haga, is noted in accounts from 1556 onwards. All the hamlets in the islands would pay part of their tax in dried and salted fish (e.g. KA 2606, 2753). The species caught would vary from fresh water species, such as perch, roach and pike, to saltwater species, such as herring and cod. The livelihood of the peasants depended on where they lived. There was arable land on the main islands whereas good land for cultivation was scarce on the islands of the archipelago (Storå, 1985). In the outer archipelago, subsistence relied on fishing, fowling, hunting seals, and herding.

Raseborg is situated near the coast, by the river Raseborgs å. The river was shallow already in medieval times and could only be sailed by small ships. The county of Raseborg included a small archipelago (Knuutinen et al., 2018). Raseborg was abandoned after only a few decades of use, during the mid-sixteenth century



**Figure 1.** The castles of Kastelholm in the Åland Islands and Raseborg in south-western Finland (map by Rudolf Gustavsson).

(Haggrén, 2013). The castle had a landed estate located nearby. Livestock, fishing, fowling, and, in the case of the outer archipelago, seal hunting were the main ways of obtaining food. In the sixteenth century, some islets further away from the coast were regarded as hamlets in the tax accounts, and were obliged to pay tax in cod or seal blubber (e.g. Kerkkonen, 1959: 312–13; Lönnqvist, 2010: 131; KA 2963). The economy of the peasants in the larger islands and half-islands of the area was similar to that of the Archipelago Sea outside Turku, and the Åland Islands.

Some of the islands had no cereal production. The inland lakes and rivers around the castle of Raseborg would also be used for fishing. The peasants would use the catch from these waters to pay tax (so-called ‘taxfish’, e.g. KA 2939, 3014) which most probably consisted of pike, perch, and roach.

Both castles were administrative centres for the Swedish Crown; part of the function of these castles was to collect taxes from peasants in the surrounding areas. During the medieval period, taxes were mainly negotiated locally, which meant

that every parish had its own tax arrangements and regulations with the Crown. In the reign of Gustav I of Sweden (AD 1523–1560), this changed somewhat as the tax system was made more uniform (Hallenberg, 2001: 47–73; Seppälä, 2009: 36–37). Taxes would be collected in foodstuffs or in money (e.g. Seppälä, 2009: 31). Cereal, livestock, chicken, eggs, and fish seem to have been the most common taxes and could be compensated for with money if foodstuffs could not be delivered (Hallenberg, 2001; Seppälä, 2009). The castle bailiff was also required to deliver a certain amount of fish to Stockholm. If the quantities of fish collected from the peasants and the castle fisheries were insufficient, fish products could be bought for the castles in order to fulfil the quotas. Fish could also be purchased for consumption at the castle (e.g. KA 2608, 2945).

This article concentrates on understanding the fish products, mainly pike and cod, and their use at the two castle sites. This includes understanding what kind of fish products were consumed there and how they were processed. The investigation is based on zooarchaeological assemblages and account books by the castle bailiffs. The two sources offer important complementary perspectives on the topic and provide insights into the taxation system regarding fish and species representation and the transport routes to and from the castles. To achieve this, the distribution of skeletal elements and processing marks on the bones was used, leading to a discussion of the processes involved and how this relates to the transport of fish products.

### **HISTORICAL BACKGROUND, TAXES AND FISHING RIGHTS**

The oldest account books for castles in Sweden are in a fifteenth century-letter

from the bailiff to the King. Only a few such accounts have survived (Myrdal, 1996; Hammarström, 1956: 25–38). The earliest preserved accounts for the castles of Kastelholm and Raseborg have been transcribed and studied for this article. The period covered is 1540–1551 for Raseborg, and 1539–1551 and 1568–1569 for Kastelholm. The accounts from the landed estates of Grelsby and Haga, connected to Kastelholm, were also studied to increase our understanding of fishing on Åland. The accounts are based on records of income and expenditure in the castles and provide an overview of what the Crown required to be recorded. Not all foodstuffs, such as vegetables other than beans and peas, appear in the accounts, i.e. only products with an economic value were recorded in the accounts. Possibly not all animal or fish products are present in the accounts, while they may be present amongst the animal bone assemblages from the castles. Gustav I of Sweden introduced a booking system in which several accounts cover the same year, to prevent the castle's bailiffs from cheating and embezzling the Crown's property (e.g. Myrdal, 1999: 207–08). The castle fisheries were a source of fish products, delivering a variety of freshwater and saltwater species (Table 1) to the castles. Most of the products were the same as those provided by the peasants.

In the mid-sixteenth century, the peasants of the province of Raseborg paid most of their tax in cereal, livestock, chickens, and eggs. However, one part of the taxes was in dried foodfish or taxfish (e.g. KA 2939, 2963; Table 1). Salted cod was delivered to the castle as tax payments from the remote small islands in the archipelago (e.g. KA 2929, 2944). Our knowledge of the fishing rights in the Åland Islands is based on two preserved medieval letters (one dated 1348 and the other between 1412 and 1417). The rights seem

**Table 1.** Sources of preserved fish. The grey fields show taxes and tolls, the white field the castles' own fisheries. Sources: KA 2601, 2603, 2608, 2609, 2611, 2617, 2619, 2626, 2630, 2634, 2638, 2643, 2648, 2650, 2653, 2924, 2944, 2945, 2950, 2954, 2962, 2970, 2971, 3000.

Income	Kastelholm	Raseborg
Taxfish	Dried pike	Dried fish, salted cod
'huskasse' voluntary tax	All types of fish, salted mainly herring, perch, cod (also foodfish and pike)	
'hjälpgård' extra tax	Dried or salted pike, salted herring, salted cod, spitfish, small fish	Dried pike, dried fish, salted herring, salted cod
Kökar friary	Salted cod	
Mörskär	Salted cod, spitfish	
Fisheries	Dried common bream, dried ide, dried perch and roach, dried pike, dried Crucian carp, salted perch and roach, salted foodfish, salted herring, salted cod	Dried common bream, dried ide, dried roach, dried perch, smoked or dried pike, salted or dried herring

to have been written for inland lake settings and they state that the person owning the land and shore connected to the waters had the primary right of fishing in the waters (Nikander, 1932). Peasants could only fish in the waters they had access to, and, according to the letters, waters connected to land were owned by someone. When disputes arose, the rights seem to have been used for archipelago fishing (Nikander, 1932; Ahlbäck, 1951). Some waters and islands were owned by the Crown and it was a common right to fish in these areas, but a compensation fee had to be paid for the catch (e.g. KA 2650). At least according to twentieth-century ethnographical records of the Åland islands, cod was allowed to be fished everywhere, even in the archipelago (Ahlbäck, 1955: 114). In the Åland Islands, land was sold specifically including fishing waters (e.g. ÅMU I nos. 32, 331, 865).

The peasants in the Åland Islands paid their tax in cereals, meat, seabirds, and fish, most often dried pike (e.g. KA 2604, 2624). There was also an extra tax in fish in the Åland Islands called 'huskassfish' (literally 'house bag fish'). The tax originally referred to fresh fish supposedly willingly given to the castle by the peasants

(Bertell, 1993: 154). The fish for this allegedly voluntary tax could, according to the accounts from 1539, be of any kind of fish, delivered to the castle ungutted and in bags made of bast (FC 6.1). The tax seems to have been paid during the winter by peasants mainly fishing with nets under the ice (Bertell, 1993: 153–54). The fish was primarily herring, perch and cod (e.g. KA 2606, 2615, 2624, 2633), which was then salted with salt provided by peasants (e.g. KA 2643, 2648).

The Swedish law required the Crown to be maintained with the income from the landed estates and manor houses, as well as from the collected taxes. The Crown could request extra taxes for a given reason, often because of a war (Seppälä, 2009: 221–22). Such a tax, called 'hjälpgård' ('helping deed'), appears in Kastelholm and Raseborg almost every year (Table 1). Peasants living in more remote islands could pay off the obligatory number of working days (*dagsverk*) they had to do to the castles with fish products. Between 1553 and 1556 salted cod, herring, and pike were paid as such a compensation to Kastelholm (KA 2638, 2648, 2650).

In the Late Middle Ages, a Franciscan friary established in Kökar owned land for

cultivation. When the Reformation reached Åland in the first half of the sixteenth century, the lands of the friary were confiscated by the Crown and then rented out to the peasants for a yearly fee of 2 barrels of salted cod (e.g. KA 2601, 2623, 2650; Table 1). In 1556 the peasants paid their rent for the friary land in salted herring because they did not have the means to pay it in cod (KA 2650). The friary was also managing a fishery south of Kökar, at Mörskär. The friars took a fee from the fishermen fishing in the area. After the Reformation, the fee for fishing on Mörskär was taken over by the Crown, with Kastelholm castle representing the Crown (Bertell, 1953: 83–85). Salted cod and spitfish (*spettfisk*) appear to have been the main products paid as a fee for the fishery (e.g. KA 2603, 2643, 2650; Table 1). It is probable that the spitfish was locally caught dried fish that was delivered as taxes. This would imply that spitfish from Mörskär was probably cod, as this was the species mainly caught in the fishery. Records also show that cod was fished in some other outer-archipelago fisheries, such as Enskär and Pattsjär (KA 2753).

#### ZOOARCHAEOLOGICAL ASSEMBLAGES: SPECIES REPRESENTATION AND SIZE

Many of the castles in Finland, including Raseborg, were excavated at the end of the nineteenth century in order to construct Romantic castle landscapes (Drake, 1991). Little interest in the finds assemblages was shown, especially the animal bones. From the 1930s onwards, there was plans to open the castle of Kastelholm as a museum, which resulted in extensive excavations in the area (Palmaraz, 2004: 76). The castle of Raseborg has also been at the centre of more recent studies from 2008 onwards (e.g. Haggrén et al., 2009;

Knuutinen et al., 2010; Knuutinen et al., 2016).

Assemblages of fish bones can potentially reveal aspects such as the use, handling, and transport of the fish. The skeletal element representation may help to understand the processing techniques, as has been demonstrated for Atlantic cod (e.g. Barrett, 1997; Perdikaris, 1999; Barrett et al., 2004; Krivogorskaya et al., 2005; Perdikaris & McGovern, 2009; Orton et al., 2014; Hufthammer, 2016). The Atlantic cod products and their processing have been described in detail in historical and ethnographic sources, which has helped to interpret fish remains at archaeological production and consumption sites. In order to keep the dried cod product together, bones from, -the cranium, the pectoral grid, the vertebrae or a combination of these was left in the fish. In general, cranial elements appear to accumulate at the processing sites (e.g. Barrett, 1997). Leif Jonsson (1986) suggests in his study of the fish products from the town of Uppsala that the large number of cranial elements from pike indicates the presence of dried imported fish and that the cuts to the dentary bone were specific for dried pike from Finland.

The studied assemblages come from waste deposits, most from food consumption. The bone assemblage in Raseborg was mainly sieved through 5 mm meshes and samples were wet-sieved in 2 mm meshes (Haggrén et al., 2009; Knuutinen et al., 2010; Kivikero, 2014). The material from Kastelholm was mainly collected by hand and only a small part of it was sieved through 10 mm meshes (Törnblom, 1980; Carlsson, 1987; Elfwendahl & Åqvist, 1987; Elfwendahl, 1988). Hand-collecting tends to affect the recovery of small bones and the species composition of the fish (e.g. Olson & Walther, 2007). The assemblages date roughly to between AD 1380 and 1600.

The animal bone assemblages selected for this study consist of 143 kg from Kastelholm and 87 kg from Raseborg. Out of this, 1.2 kg of bone from Kastelholm and 0.9 kg from Raseborg were identified as fish. The fish bone assemblages were analysed for identification of species, anatomical distribution, and size estimation. The carp family (*Cyprinidae*) were identified to species only from pharyngeal bones, basioccipital bone, and occasionally first vertebrae. Cod size was estimated from the first and second vertebra and otoliths according to formulas presented in Enghoff (1994) and Olson & Walther (2007). Pike size was estimated from dental bone according to Enghoff (1994).

Most of the fish species identified in the two assemblages were freshwater species, primarily pike (*Esox lucius*), perch (*Perca fluviatilis*) and the carp family (*Cyprinidae*), as well as roach (*Rutilus rutilus*), ide (*Leuciscus idus*), common bream (*Abramis brama*) and tench (*Tinca tinca*) (Table 2). Cod (*Gadus morhua*) is the only saltwater species identified in larger numbers. The brackish waters of the Baltic Sea make it possible for saltwater and freshwater species to co-exist and to be caught in more or less the same waters (Voipio, 1981; Björck, 1995). There is a difference in the number of identified species at Kastelholm through time. The frequency of pike bones increases from the fourteenth to the seventeenth century. At the same time, the number of perch bones decreases while the quantity of cod fragments remains more or less constant.

Pike and cod are relatively small at both Kastelholm and Raseborg. Most of the pike were between 40 to 70 cm in length while the cod were between 30 and 70 cm. No large cod was recorded in either of the assemblages. Old pikes can grow to be over 130 cm in size (Korhonen, 1961). As for cod, it can grow up to 150 cm in size in the Atlantic Ocean (Bergman, 1961)

but in the Baltic Sea cod is usually smaller, mainly between 30 and 60 cm (Svedäng & Hornborg, 2017).

#### SPECIES REPRESENTATION IN CASTLE ACCOUNTS *VERSUS* ZOOARCHAEOLOGY

There are some species that occur in the accounts that were not seen in the zooarchaeological material (Table 3). At Kastelholm, some local species, such as Crucian carp (*Carassius carassius*), European smelt (*Osmerus eperlanus* L.), and eel (*Anguilla anguilla*), were mainly identified in the accounts (e.g. KA 2612, 2626, 2644, 2651, 2663). According to the accounts, ling (*Molva molva*) was bought to the castle in 1539 (FC 6.1). Dried rays (Swedish *torra rockor*, Latin *Batoidea* sp.) are mentioned in one account for the landed estate of Grelsby from the year 1556. This was the year in which Gustav I of Sweden visited Åland. The rays were a donation from a nearby estate (KA 2650) but the origin cannot be traced further. In Raseborg common bream (*Abramis brama*) was found in the accounts in addition to the species found in the zooarchaeological material (e.g. KA 2921; 2938).

Most of the fish species found among the fish bones also feature in the bailiffs' accounts for the two castles (Table 3). Generally, the fish species represented in the castle accounts are fish that could be caught quite easily and in large numbers. They could be used for large scale-consumption and transported further afield to other castles and manors as part of the taxation system. This also covers the more unusual species, namely ray and ling, which were fished in the Atlantic Ocean and preserved in large numbers. The origin of these species could well be the western coast of Sweden, or Norway. Even though Atlantic cod is mentioned in

**Table 2.** Number of identified fish bones (NISP) from Kastelholm and Raseborg, and number of chop marks identified on the bones.

Taxon	Kastelholm				Raseborg			
	NISP	% NISP	%NISP group	Bones with chop marks	NISP	% NISP	%NISP group	Bones with chop marks
<b>Freshwater species</b>	<b>3131</b>	<b>44.19</b>	<b>100.00</b>	<b>151</b>	<b>5388</b>	<b>41.32</b>	<b>100.00</b>	<b>45</b>
Pike ( <i>Esox lucius</i> )	1646	23.23	52.57	138	1353	10.38	25.11	39
Perch ( <i>Perca fluviatilis</i> )	923	13.03	29.48	6	2574	19.74	47.77	4
Pikeperch ( <i>Sander lucioperca</i> )	5	0.07	0.16		32	0.25	0.59	
Ruffe ( <i>Gymnocephalus cernuus</i> )					1	0.01	0.02	
Roach ( <i>Rutilus rutilus</i> )	20	0.28	0.64	2	65	0.50	1.21	
Ide ( <i>Leuciscus idus</i> )	30	0.4	0.96	1	31	0.24	0.58	
Common bream ( <i>Abramis brama</i> )	1	0.01	0.03					
Tench ( <i>Tinca tinca</i> )					2	0.02	0.04	
Carp family (Cyprinidae)	495	6.99	15.81	4	1319	10.12	24.48	2
Burbot ( <i>Lota lota</i> )	3	0.04	0.10		1	0.01	0.02	
Whitefish ( <i>Coregonus</i> sp.)	8	0.11	0.26		10	0.08	0.19	
<b>Saltwater species</b>	<b>446</b>	<b>6.29</b>	<b>100.00</b>	<b>24</b>	<b>1636</b>	<b>12.55</b>	<b>100.00</b>	<b>83</b>
Cod ( <i>Gadus morhua</i> )	437	6.17	97.98	22	1441	11.05	88.08	83
Herring ( <i>Clupea</i> sp.)	4	0.06	0.90		193	1.48	11.80	
Fourhorn sculpin ( <i>Myoxocephalus quadricornis</i> )	3	0.04	0.67		1	0.01	0.06	
Sturgeon ( <i>Acipenser sturio</i> )	2	0.03	0.45	2	1	0.01	0.06	
<b>Migratory fishes</b>	<b>16</b>	<b>0.23</b>	<b>100.00</b>	<b>2</b>	<b>3</b>	<b>0.03</b>	<b>100.00</b>	
Salmon ( <i>Salmo salar</i> )	16	0.23	100.00	2	2	0.02	66.67	
Eel ( <i>Anguilla anguilla</i> )					1	0.01	33.33	
<b>Fish</b>	<b>3492</b>	<b>49.29</b>	<b>100.00</b>	<b>11</b>	<b>6010</b>	<b>46.10</b>	<b>100.00</b>	<b>1</b>
Bonefish (Teleostei)	3492	49.29	100.00	11	6010	46.10	100.00	1
<b>Total</b>	<b>7085</b>	<b>100.00</b>		<b>188</b>	<b>13037</b>	<b>100.00</b>		<b>34</b>

the Kastelholm accounts, and the fish has been found in other medieval sites in Sweden (e.g. the town of Sigtuna; Hårding, 1990), no large cod bones typical of the Atlantic cod were found in either of the castle assemblages.

The species identified only in the zooarchaeological assemblages could be fish that were not specifically named in the accounts but present as (preserved)

foodfish or taxed fish. They could also have been a highly valued luxury, such as sturgeon, but with a value that was insufficient in terms of economic bulk value figure in the accounts. Only a few bones of sturgeon are present, implying that the fish was caught only occasionally. Fourhorn sculpin (*Trigloporus quadricornis*) seems to have had some economic value: Per Brahe, a sixteenth-century count and



**Table 3.** Species representation in the castles based on different sources.

Species	Kastelholm		Raseborg	
	Zooarchaeological assemblages	Account books	Zooarchaeological assemblages	Account books
Pike ( <i>Esox lucius</i> )	x	x	x	x
Perch ( <i>Perca fluviatilis</i> )	x	x	x	x
Pike-perch ( <i>Sander lucioperca</i> )	x		x	
Ruffe ( <i>Gymnocephalus cernuus</i> )			x	
Roach ( <i>Rutilus rutilus</i> )	x	x	x	x
Ide ( <i>Leuciscus idus</i> )	x	x	x	x
Common bream ( <i>Abramis brama</i> )	x	x		x
Tench ( <i>Tinca tinca</i> )			x	
Burbot ( <i>Lota lota</i> )	x		x	
White fish ( <i>Coregonus laveretus</i> )	x	x	x	
Cod ( <i>Gadus morhua</i> )	x	x	x	x
Herring ( <i>Clupea sp.</i> )	x	x	x	x
Fourhorn sculpin ( <i>Myoxocephalus quadricornis</i> )	x		x	
Sturgeon ( <i>Acipenser sturio</i> )	x		x	
Ray ( <i>Batoidea sp.</i> )		x		
Ling ( <i>Molva molva</i> )		x		
Salmon ( <i>Salmo salar</i> )	x	x	x	x
Eel ( <i>Anguilla anguilla</i> )		x	x	
Crucian carp ( <i>Carassius carassius</i> )		x		
European smelt ( <i>Osmerus eperlanus L.</i> )		x		

higher official in Sweden, writes in his 1581 book on economy that sculpins should be caught in November (Brahe, 1581: 113). However, sculpins do not seem to be involved in larger-scale trade. In 1492, a peasant from an island on Åland (Vårdö) was fined for trying to sell sculpins among his dry fish (FMU V: 349). Some mentions of sculpins can be found in cookbooks, such as sculpin stew (e.g. Valleria, 1700: recipe on p. 112; Warg, 1755: 289; Elzberg, 1759: 92).

The proportion of freshwater and salt-water species is quite even between the two castles, but there are some differences within the two categories, e.g. in the frequency of pike, perch, and carp. At Raseborg the frequency of perch and fish

belonging to the carp family is higher while pike is more common at Kastelholm (Table 2). This probably reflects the different character of the fishing waters near the castle, but we should bear in mind that the recovery method used at Kastelholm has negatively influenced the recovery of fish bone.

#### PROCESSING FISH: ANATOMY OF COD AND PIKE BONES AND EVIDENCE OF PROCESSING

For the purpose of understanding the preservation process of the fish, the identified skeletal elements were divided into groups of cranial bones, cleithrum,

precaudal, and caudal vertebrae. The cod bones from Kastelholm show a clear dominance of cranial bones, whereas the cod from Raseborg have more vertebrae. Cranial bones and cleithrum are clearly dominant in the anatomical distribution of cod bones at Kastelholm in all the periods examined in this study (Figure 2). Vertebrae comprise 1–13 per cent of the bones. By contrast, the anatomical distribution of cod bones at Raseborg contains mostly vertebrae (89 per cent). The anatomical distribution of pike in both Kastelholm and Raseborg show a clear dominance of cranial bones and cleithrum (between 56 and 80 per cent for cranium and 10 to 20 per cent for cleithrum).

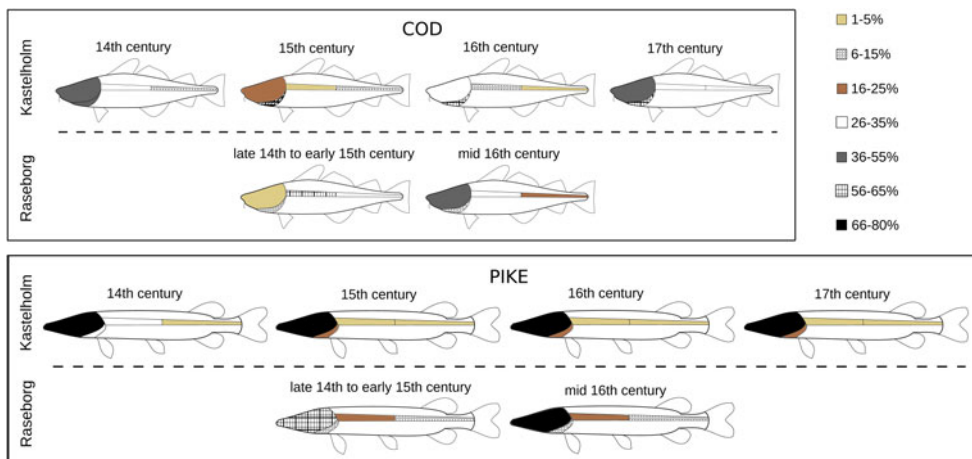
The anatomical distribution of cod and pike bones in Kastelholm is similar in the different excavation areas, both inside and outside the castle walls. The fish are small cod, most probably from the Baltic Sea, and apparently brought to the castles mainly by peasants. Kastelholm seems to have had small-scale cod fishing of its own employing fishermen (e.g. KA 2799) but mostly the fish represents tax income or purchase. The size of the cod vertebrae is large enough not to be missed in the hand recovery of bones in Kastelholm. The bones possibly missed would have been from even smaller cod, not larger (possibly Atlantic) cod. A kind of anatomical distribution similar to that of pike, can be seen for perch. Bones from the carp family have a relatively even anatomical distribution between the different skeletal elements at both sites.

Some bones in the studied assemblages have chop marks which may be connected to the processing of the fish. Most chop marks occur in pike or cod bones: 3 to 8 per cent depending on the element (Table 2). Thus, emphasis has been put on understanding the processing of these species. Most chop marks for cod at Kastelholm were found on the cleithrum

while in Raseborg the chop marks were more common on the parasphenoid bone and vertebrae (Figure 3). Chop marks on precaudal vertebrae in Raseborg were found on the right side of the haemal arch, possibly connected to the splitting of the fish for preservation. Most of the chop marks for pike are on the dentary bone and cleithrum (Figure 3). Chop marks were identified in 24 per cent of all dentary bones from Kastelholm and in 13 per cent at Raseborg. Chop marks were recorded in several regions of the dentary, and equally frequently on the left and right side. The same dentary bone could also exhibit several chop marks, operated from the inside (i.e. medially). Several cranial elements at Kastelholm have chop marks whereas chop marks are concentrated on only five elements at Raseborg.

The difference in the anatomical distribution of cod bones in Kastelholm and Raseborg is interesting. Only salted cod seems to have been brought to Raseborg (e.g. KA 2938, 2939) while Kastelholm had both salted and dried cod (e.g. KA 2753). A kind of anatomical distribution of pike and cod bones similar to that of Kastelholm can be seen in the medieval and early modern town of Uppsala (Jonsson, 1986) and at the site of Tartu Road in Tallinn (Russow et al., 2007). Cranial bones of pike were also dominant in an early medieval Sámi site in Lapland (Hedman et al., 2015), as well as in a shipwreck off the coast of Estonia (Roio et al., 2015).

The fish bones in both castle sites come from waste deposits where mammal and bird bone assemblages point to food waste (Kivikero, 2017, 2019). In this context, the dominance of cranial elements could be the result of only heads being left on the fish when processing them (as Jonsson, 1986 suggests for pike). Alternatively, the fish may have been processed in the castle area and only heads



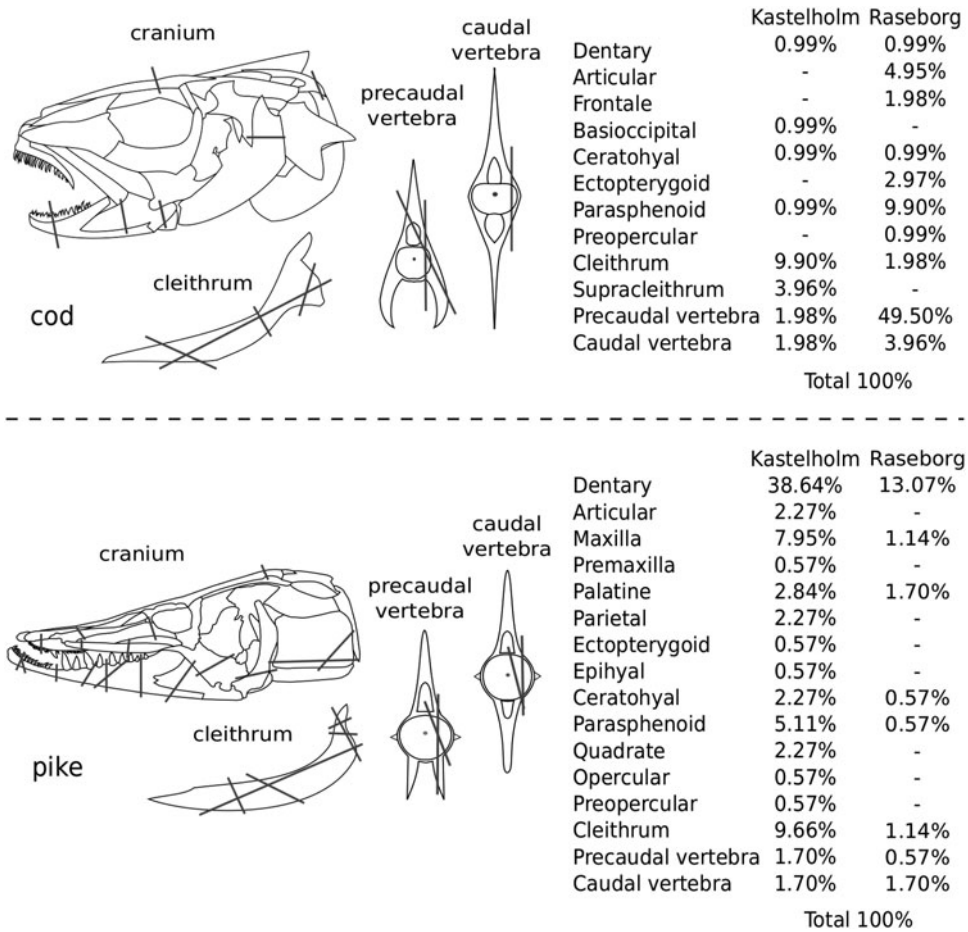
**Figure 2.** Anatomical distribution of cod and pike bones (based on NISP) in Kastelholm and Raseborg.

deposited at the refuse site (as would be the case for Atlantic cod processing sites). It is also possible that the heads were used in cooking. Ethnographic accounts of fishermen eating fish heads and liver in fish camps (Ahlbäck, 1955: 110) makes it possible that the heads were consumed. It is however highly unlikely that only fish heads were consumed in Kastelholm, as the heads consumed in fish camps most probably refer to fresh, not preserved, fish.

The ethnographic and historical texts are largely silent on the specific processing of dried and salted fish. Leif Jonsson (1986) has suggested that the pike found in zooarchaeological assemblages in Uppsala were dried without the vertebrae and the cranium keeping the fish together. Cajsa Warg (1755) describes the drying of pike in her book. The back of the fish was split open, the vertebrae taken out, and then the fish was beheaded (Warg, 1755: 276–77). According to a Royal decree of 1735, preserved fish intended for the domestic market should be sold beheaded as the cranium was not seen as good food and cost more to the consumer; the head had to be discarded when the fish was prepared for food. Heads of fresh fish, on the

other hand, were regarded as nutritious (Kongl. Maj:ts Nådige Förordning, 1735).

Cut marks and chop marks on bones provide clues about how the fish were handled. Cod vertebrae at Raseborg have a large number of lateral chop marks. This could be the result of splitting the fish in the middle to flat-dry them like clipfish. This indicates the presence of dried fish at Raseborg, although not present in the accounts. Most of the chop marks on cod at Kastelholm are to the cranium and cleithrum, as most of the bones come from these skeletal elements. It is possible that cod products delivered to Kastelholm were preserved in a manner that was slightly different to those found at Raseborg. It has been suggested that chop marks that are directed from the inside of the dentary bone of pike are associated with the cooking process of the fish, since the fish is easier to split open if the dentary bones are cut off (Vretemark, 1982: 292). The same technique could be used in the drying process (Hedman et al., 2015). Another interpretation of the cuts is that they were made during the drying process. The gills had to be taken out after the gill attachment was chopped off near the



**Figure 3.** Location of chop marks on cod and pike bones. The %NISP of the total number of bones with chop marks and the bones in relation to it are shown on the right-hand side.

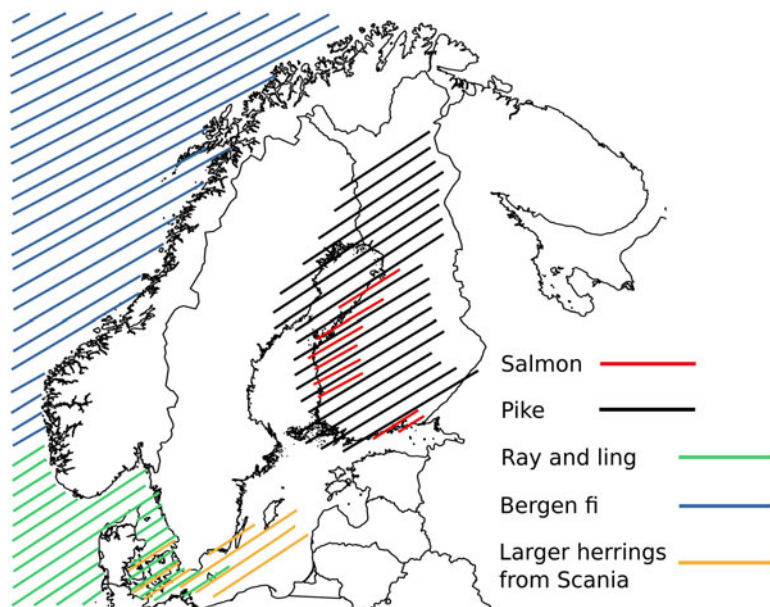
tongue. The cut was made from the inside and could be vigorous enough to leave marks on the dentary bone (Jonsson, 1986: 131–33). The chop marks on the dental bones at Raseborg and at Kastelholm occur in various parts of the bone, and equally on both sides. As, occasionally, there were several cuts to the same dental bone, it is possible that there was some reason for the cuts other than that suggested by Jonsson.

The dominance of cranial elements for pike may suggest that dried and salted products were processed without the vertebrae, as depicted in Cajsa Warg’s

cookbook and as Jonsson has suggested. On the other hand, more data from historical texts and fish bone assemblages must be collected and analysed before we can distinguish what kind of anatomical distribution and chop marks are related to the processing of cod and pike and how cooking processes affected the assemblages.

### TRANSPORT AND CONSUMPTION OF FISH PRODUCTS

Fish was not only transported to the castles from the local region but also imported



**Figure 4.** Areas of origin of some of the fish species found in the castles.

from other areas (Figure 4). The accounts show that fish from Bergen in Norway (*Bergen fisk*) were purchased by Kastelholm over at least five years, in 1543–1544, 1546–1547, and 1556 (KA 2601, 2603, 2608, 2612, 2650). This was probably stockfish, as Bergen was one of the towns where stockfish was sold and distributed to Europe (e.g. Gardiner, 2016; Hufthammer, 2016). Herring was purchased for Raseborg at least in 1545 (KA 2934, 2945), and larger herrings from Scania (*Skåne sill*) were brought to Kastelholm in 1543 (KA 2601). The accounts rarely mention the geographic origin of salmon products (e.g. KA 2601, 2611, 2630). In 1544 saltgreen (i.e. lightly salted) salmon was purchased by Kastelholm from Stockholm (KA 2603), and in 1569 salmon was transported from Pori manor in Satakunta (KA 2799). Fisheries connected to the Helsinki manor provided salmon to Raseborg in 1553 (KA 3010). Dried pikes were sometimes purchased by the castles (Figure 4).

In the accounts, the fish could be described as pike from Finland (*finske gäddor*, e.g. KA 2626, 2635, 2650, 2963) but in 1552 they appeared in the accounts as ‘*bottne gäddor*’ (KA 2634), which probably refers to their origin in areas surrounding the Gulf of Bothnia (i.e. West Bothnia, North Bothnia or Ostrobothnia; Figure 4). In 1547 pike was bought from Norrbotten (KA 2613) and in 1556 pike is mentioned as coming from Lappland (*lappe gäddor*, KA 2650).

The accounts show that several fish products, mostly salted cod, herring, and dried fish, were transported to Stockholm (Figure 5). Herring and cod were typically shipped as salted products, while other fish such as pike and ide were more often dried (e.g. KA 2620, 2626, 2783, 2972, 2979, 3000). Dried pike were the most important Finnish fish export during the sixteenth century (Seppälä, 2009: 136). Raseborg also sent fish products, mainly to Stockholm but occasionally to the Helsinki and Porvoo manors. Stockholm

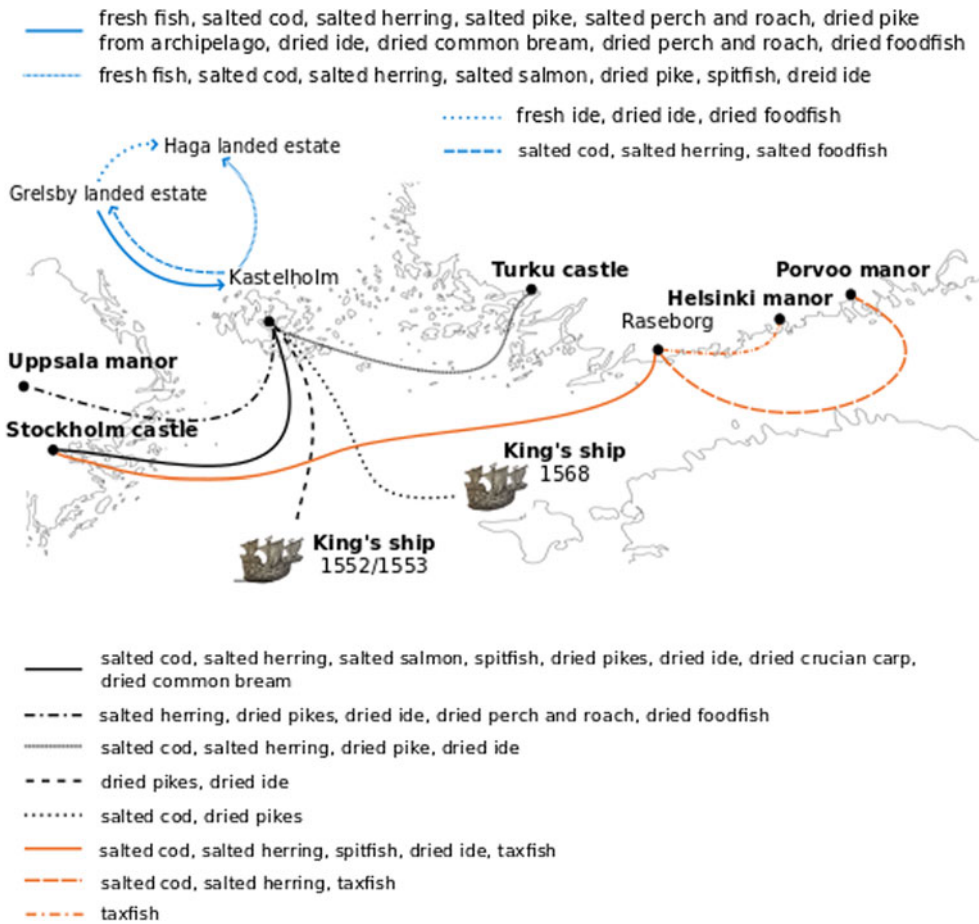


Figure 5. Fish products transported from Kastelholm and Raseborg.

and Turku castles, Uppsala manor and the Kings ships were also some of the recipients of Kastelholm fish.

The transport of food between castles and their landed estates is also attested (Figure 5). This is especially evident in the Åland Islands, where the landed estates of Grelsby and Haga are at some distance from Kastelholm. Some of the fish from fisheries of the landed estates would either be transported to the castle or from the castle to the landed estates. Most of the fish products taken from Kastelholm to the landed estates were for consumption by the workers of the landed estates.

Fish was moved over various distances for consumption. Kastelholm seems to have had more numerous and different fish products compared to Raseborg (Table 4). The most commonly consumed fish products at both castles were dried ide, salted herring, salted cod, and spitfish. The accounts also mention some unspecified fish products. Foodfish (*matfisk*) was more common at Kastelholm than at Raseborg (Table 4). There is poor information on taxfish (*skattefisk*): it refers to fish paid as tax but no specific information on the species or size is given. It is however likely that foodfish and taxfish

**Table 4.** Fish products consumed in the castles. *K* = Kastelholm and *R* = Raseborg. Sources: KA 2601, 2603, 2609, 2612, 2613, 2618, 2620, 2623, 2626, 2630, 2635, 2638, 2643, 2651, 2653, 2661, 2663, 2783, 2799, 2918, 2921, 2923, 2929, 2934, 2937, 2938, 2946, 2954, 2970, 2972, 2979, 2989, 3000, 3013.

Fish product	1540	1541	1542	1543	1544	1545	1547	1549	1550	1551	1552	1553	1554	1556	1557	1568	1569
Dried common bream			R	R	R	R	KR	KR	KR	KR	K					K	
Dried ide	R	R	R	KR	KR	R	KR	KR	KR	KR	K			K	K	K	K
Dried roach	R	R	R	R		R	R	R	R	R	KR						
Dried perch and roach							K				K	K			K		
Salted perch and roach							K	K		K	K	K			K		
Dried perch							R					K					
Salted perch									K								
Dried pike				K	K		KR	KR	KR	K	K	K	K	K	K	K	K
Salted pike										K	K	K	K	K	K		
Saltgreen pike							K										
Dried European smelt							K	K	K	K	K				K	K	
Salted European smelt										K					K		
Herring from Scania				K													
Dried herring	R		R	R	R	R	R	R	R	R				K			
Salted herring	R	R	R	KR	KR	R	KR	KR	KR	KR	KR	K	K	K	K	K	K
Lightly salted herring							R	R									
Herring		R															
Bergen fish				K	K		K							K			
Salted cod	R	R	R	KR	KR	R	KR	KR	KR	KR	KR	K	K	K	K	K	K
Spitfish	R	R		K	KR	R	K	KR	KR	K	K	K	K	K	K	K	K
Saltgreen salmon					K		K										
Salted salmon				K					K	K				K	K	K	K
Dried white fish														K	K	K	K
Salted eel														K	K		
Fresh fish							K	K	K	K	K	K	K	K		K	K

Table 4. (Cont.)

Fish product	1540	1541	1542	1543	1544	1545	1547	1549	1550	1551	1552	1553	1554	1556	1557	1568	1569
Dried fish	R	R															
Salted fish																	
Small fish			K		K												
Fresh foodfish											K			K			
Dried foodfish							K			K	R			K			K
Salted foodfish								K						K			K
Foodfish				R													
Dried taxfish		R															
Taxfish			R	R	R	R	R	R	R	R	R						

were mainly smaller fish, such as perch and roach. Whitefish (*vitfisk*) in the accounts is most likely to apply to unspecified species of fish with white meat, such as common bream or roach (SAOB). The bailiffs' table would in general have a larger variety of fish products than the workers' table. The latter would mainly consume salted herring, salted or dried foodfish, or salted cod (KA 2609, 2613, 2979, 2989). Fresh fish, salted salmon, salted eel, and dried European smelt were mostly reserved for the bailiffs' table (KA 2613, 2635, 2783).

### THE IMPORTANCE OF FISH IN THE CASTLE ECONOMY

The accounts books and the zooarchaeological assemblages have provided information on different aspects of the utilisation of fish and fish resources at the Kastelholm and Raseborg castles. It is clear that fish was an important source of nutrition as well as an economically important product. Based on the large number of fish products consumed at Kastelholm and the numerous fish taxes, fish was probably of greater importance in the Åland Islands than in the province of Raseborg.

This importance is also reflected in the location of the castles. Fish resources around the Åland Islands were plentiful and variable compared to the more terrestrial resources of the province of Raseborg. Most of the species, both freshwater and saltwater species, identified in the zooarchaeological assemblages and accounts could be caught locally from the brackish waters of the Baltic Sea. The castles' need, or perhaps interest, to import more 'exotic' fish products, such as ling and rays, suggest that some fish products were probably regarded as high-status food. Sturgeon is most likely to belong to this group, although it rarely appears in fish bone assemblages near the castles and is not



mentioned in the accounts. One exception is the Franciscan friary on Kökar, near the fishery of Mörskär, where sturgeon bones have been identified (Krooks, 2016: 35).

A bias in the recovery of fish bones is most probably responsible for some bones from smaller fish being lost at Kastelholm and to some extent also at Raseborg. However, it does not affect the general outcome of the analyses. It would mostly affect the interpretation of herring and eel fishing, and herring fishing is described quite well in the account books.

The anatomical distribution of pike and cod bones can be interpreted in different ways. The possibility that Baltic Sea cod and Atlantic Ocean cod were processed differently could affect the interpretation of the fish bone assemblages. The processing of pike also seems to differ from the processing of Atlantic cod. Smaller fish, such as perch and roach, are more likely to be salted and dried whole. In any case, more studies on the processing of these species are needed.

Transport included moving fish, butter, meat, and other foodstuffs from the castles to other sites owned by the Crown. The castle of Stockholm received most goods as they were needed for the upkeep of the King and the court as well as the vast number of other castle residents (e.g. Hammarström, 1956: 85–91; Kivikero, 2019). As more fish products were exported from Kastelholm and the associated landed estates to Stockholm, fish arguably had a greater impact on the economy of Kastelholm than on that of Raseborg. It is also worth noting that the fish products were transported to the castle by peasants, but that they were also moved between the castle and the landed estates on the Åland Islands. Not all fish that was transported to the castles was consumed there. This also applies to fish purchased to the castles that could be transported almost directly somewhere else.

The comparison of the zooarchaeological assemblages and bailiffs' accounts have provided valuable and complementary information about fish species, fish products, and the system the Crown employed to transport its goods. It can be concluded that fish and fish products were an important aspect of the castle, and Crown, economy but more detailed studies on the fish species of the Baltic Sea and on the distribution of their anatomical parts are required to fully understand the processing of fish in the area.

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## BIOGRAPHICAL NOTES

Hanna Kivikero is a PhD student at the University of Helsinki. She has expertise in zooarchaeology and has a specific interest in the Medieval and early modern periods.

*Address:* Department of Culture (Archaeology), University of Helsinki, P. O. Box 59, 00014 Helsinki, Finland. [email: [hanna.kivikero@helsinki.fi](mailto:hanna.kivikero@helsinki.fi)]

## Des poissons en mouvement : transport et traitement des poissons dans l'économie des châteaux de la Baltique du nord

*Les historiens et les archéologues, quoique travaillant séparément, ont depuis longtemps établi que le poisson avait une grande importance dans l'économie médiévale et des débuts de l'époque moderne dans les régions de la Baltique. Dans cet article, l'auteur cherche à combiner les données fournies par l'archéozoologie et celles que l'on retrouve dans les livres de comptes des châteaux de Kastelholm (îles d'Åland) et de Raseborg (sur la côte sud-ouest de la Finlande) afin de mieux comprendre le traitement et le transport des poissons dans cette région. Les paysans payaient leurs impôts en partie en poisson mais on pêchait aussi le poisson autour des châteaux et on approvisionnait ces châteaux pour sa consommation. L'étude présentée ici se concentre sur les produits conservés de la pêche à la morue et au brochet, les deux espèces majeures les plus importantes dans l'économie de la Baltique. On remarque certaines différences entre les deux châteaux et on constate l'importance que le poisson avait pour l'économie des châteaux en général.* Translation by Madeleine Hummler

*Mots-clés:* produits de la pêche, mer baltique, châteaux, économie, transport

## Fisch in Bewegung: Transport und Verarbeitung von Fisch in der Schlosswirtschaft im nördlichen Ostseeraum

*Die unterschiedlichen Untersuchungen der Historiker und Archäologen haben uns längst gezeigt, dass Fisch eine wichtige Rolle in der mittelalterlichen und frühneuzeitlichen Wirtschaft im Ostseeraum*

gespielt hat. In diesem Artikel werden die zooarchäologischen Daten aus den Schlössern von Kastelholm (auf den Åland Inseln) und Raseborg (an der südwestlichen Küste von Finnland) mit den Eintragungen in den Geschäftsbüchern dieser Schlösser verbunden, um die Verarbeitung und den Transport von Fisch in dieser Gegend besser zu verstehen. Die Bauern zahlten ihre Steuern mit Fisch, aber es gab auch Fischer in den Schlossgütern; Fish wurde vor allem zum Schloss gebracht und dort konsumiert. In der vorliegenden Untersuchung sind die konservierten Fische oder Fischerzeugnisse hauptsächlich Hechte und Dorsche, da diese Fische die wirtschaftlich bedeutendsten größere Fischarten in der Ostsee sind. Die Analyse weist auf einige Unterschiede zwischen den zwei Schlössern hin und betont, dass die Fischerei eine wesentliche Rolle in der Schlosswirtschaft spielte. Translation by Madeleine Hummler

*Stichworte:* Fischerzeugnisse, Ostsee, Schlösser, Wirtschaft, Transport