Contents

Contributors vii
Preface and Acknowledgements viii

1. Studying Medieval Sea Fishing and Fish Trade: How and Why
   James H. Barrett 1

PART I: PERSPECTIVES FROM HISTORY AND SETTLEMENT ARCHAEOLOGY

2. Commercial Sea Fisheries in the Baltic Region c. AD 1000–1600
   Poul Holm 13
3. The Early Documentary Evidence for the Commercialisation of the Sea Fisheries in Medieval Britain
   Maryanne Kowaleski 23
4. Early Commercial Fisheries and the Interplay Among Farm, Fishing Station and Fishing Village in North Norway
   Alf Ragnar Nielsen 42
5. The Development of the Norwegian Long-distance Stockfish Trade
   Arnved Nedkvitne 50
6. The Birth of Commercial Fisheries and the Trade of Stockfish in the Borgundfjord, Norway
   Helge Sorheim 60
7. Commercial Fishing and the Political Economy of Medieval Iceland
   Orri Vésteinsson 71
8. The Character of Commercial Fishing in Icelandic Waters in the Fifteenth Century
   Mark Gardiner 80
9. Marine Fisheries and Society in Medieval Ireland
   Colin Breen 91
10. The Decline in the Consumption of Stored Cod and Herring in Post-medieval and Early Industrialised
    England: A Change in Food Culture
    Alison Locker 99

PART II: PERSPECTIVES FROM ZOOARCHAEOLOGY AND STABLE ISOPOE ANALYSIS

11. Fishing and Fish Trade During the Viking Age and Middle Ages in the Eastern and Western Baltic Sea Regions
    Lembi Lõugas 111
12. Cod and Herring in Medieval Poland
    Daniel Makowiecki, David C. Orton, and James H. Barrett 117
13. Herring and Cod in Denmark
    Inge Bødker Enghoff 133
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Authors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>The Rise of Sea-Fish Consumption in Inland Flanders, Belgium</td>
<td>Wim Van Neer and Anton Ervynck</td>
<td>156</td>
</tr>
<tr>
<td>15</td>
<td>Fishing and Fish Trade in Medieval York: The Zooarchaeological Evidence</td>
<td>Jennifer F. Harland, Andrew K. G. Jones, David C. Orton and James H. Barrett</td>
<td>172</td>
</tr>
<tr>
<td>16</td>
<td>Fish for London</td>
<td>David C. Orton, Alison Locker, James Morris and James H. Barrett</td>
<td>205</td>
</tr>
<tr>
<td>17</td>
<td>The Social Complexities of Early Marine Fish Consumption: New Evidence from Southeast England</td>
<td>Rebecca Reynolds</td>
<td>215</td>
</tr>
<tr>
<td>18</td>
<td>Fish Trade in Norway AD 800–1400: Zooarchaeological Evidence</td>
<td>Anne Karin Hufthammer</td>
<td>221</td>
</tr>
<tr>
<td>19</td>
<td>Exploring the Contrasts: Fish-Bone Assemblages from Medieval Ireland</td>
<td>Sheila Hamilton-Dyer</td>
<td>231</td>
</tr>
<tr>
<td>20</td>
<td>Marine Fish Consumption in Medieval Britain: The Isotope Perspective from Human Skeletal Remains</td>
<td>Gundula Müldner</td>
<td>239</td>
</tr>
<tr>
<td>21</td>
<td>Medieval Sea Fishing, AD 500–1550: Chronology, Causes and Consequences</td>
<td>James H. Barrett</td>
<td>250</td>
</tr>
</tbody>
</table>
Contributors

JAMES H. BARRETT, McDonald Institute for Archaeological Research, University of Cambridge, Cambridge, England

COLIN BREEN, School of Geography and Environmental Sciences, Ulster University, Coleraine, Northern Ireland

INGE BØDKER ENGHOFF, Natural History Museum of Denmark, University of Copenhagen, Copenhagen, Denmark

ANTON ERYNCK, Flemish Heritage Agency, Brussels, Belgium

MARK GARDNER, Archaeology, School of Geography, Archaeology and Palaeoecology, Queen’s University Belfast, Belfast, Northern Ireland

SHEILA HAMILTON-DYER, SH-D ArchaeoZooology, Southampton, England

JENNIFER HARLAND, Archaeology Institute, University of the Highlands and Islands, Orkney College, Kirkwall, Orkney, Scotland

POUL HOLM, School of Histories and Humanities, Trinity College Dublin, Dublin, Ireland

ANNE KARIN HUFTHAMMER, Department of Natural History, The University Museum, University of Bergen, Bergen, Norway

ANDREW K. G. JONES, Department of Archaeology, University of York, York, England

MARYANNE KOWALESKI, Department of History, Fordham University, Bronx, New York, USA

ALISON LOCKER, Escaldes-Engordany, Andorra

LEMBI LÕUGAS, Archaeological Research Collection, Tallinn University, Tallinn, Estonia

DANIEL MAKOWIECKI, Laboratory for Natural Environment Reconstruction, Institute of Archaeology, Nicolaus Copernicus University, Toruń, Poland

JAMES MORRIS, School of Forensic and Applied Sciences, University of Central Lancashire, Preston, Lancashire, England

GUNDULA MÜLDNER, Department of Archaeology, University of Reading, Reading, England

ARNVED NEDKVITNE, Department of Archaeology and History, University of Oslo, Oslo, Norway

ALF RAGNAR NIELSSEN, University of Nordland, Bodo, Norway

DAVID C. ORTON, BioArCh, Department of Archaeology, University of York, York, England

REBECCA REYNOLDS, Department of Archaeology, University of Nottingham, Nottingham, England

HELGE SØRHEIM, Museum of Archaeology, University of Stavanger, Stavanger, Norway

WIM VAN NEER, Royal Belgian Institute of Natural Sciences, Brussels, Belgium; Laboratory of Biodiversity and Evolutionary Genomics, University of Leuven, Leuven, Belgium

ORRI VESTEINSSON, Department of Archaeology, University of Iceland, Reykjavik, Iceland
Preface and Acknowledgements

The analysis of fish bones from archaeological sites is a highly specialised and painstaking task, requiring an abundance of the time that is so rarely available in either academic or commercial archaeology. Moreover, study of fish remains has seldom been at the top of archaeological research priorities. Nevertheless, over the last 40 years a few specialists across Europe have dedicated themselves to work of this kind, and thus to discovering the outlines of medieval fishing history around the North Atlantic, and the Irish, North and Baltic seas. Although mutually informed in terms of methodology, this fundamental research has often been carried out in the framework of national institutions and agendas. Concurrently, historians have independently striven to systematise and analyse complex corpora of textual evidence regarding medieval fishing and fish trade. Once again this work has sometimes occurred within national or regional schools of research. The results of these zooarchaeological and historical efforts have often proven surprising and important, revealing remarkable evidence of continuity and change. Archaeologists of medieval coastal settlements have also contributed much to our understanding of the relationship between people and the sea.

The present volume is an effort to enhance the value of this past work by crossing boundaries – between regions and between disciplines. It also emerges from a time when traditional zooarchaeology (the identification, quantification and interpretation of skeletal remains) has increasingly benefited from integration with biomolecular approaches, such as stable isotope analysis and the study of ancient DNA. These latter methods are not the main focus of the book – they are changing far too quickly for this to have been helpful. Nevertheless, they inform many of its chapters and Gundula Müldner has taken up the challenge of surveying the extant stable isotope evidence regarding human skeletal remains from medieval Britain. Even in the fields of zooarchaeology and history it is recognised, even hoped, that this volume will quickly become outdated. It is our aspiration that the collaborative process of consolidating what is known and unknown may already have accelerated the pace of current research on medieval sea fishing.

The idea behind the book emerged from an interdisciplinary conference organised by one of us (JHB) in Westray, Orkney, Scotland, in June of 2008. It was several years, however, before the groundwork could be laid – including finishing the analysis of major collections and the synthesis of decades of fish-bone and historical research. The initial practicalities were skilfully managed by Cluny Johnstone, then a postdoctoral research fellow on the ‘Medieval Origins of Commercial Sea Fishing’ project funded by the Leverhulme Trust. After a period of maternity leave Cluny decided to be a full-time parent and editing became our responsibility. DCO began the process while a postdoctoral research fellow on the Leverhulme Trust project ‘Ancient DNA, Cod and the Origins of Commercial Trade in Medieval Europe’. JHB was then able to see it through to completion. This book is also based upon work from the COST Action Oceans Past Platform, supported by COST (European Cooperation in Science and Technology).

We are grateful to Julie Gardiner of Oxbow Books for her helpfulness and patience during the book’s long gestation. Jennifer Harland (also a postdoctoral research fellow on the ‘Medieval Origins of Commercial Sea Fishing’ project) and Christine Harcus assisted with the original conference in Orkney, which was funded by the Leverhulme Trust, the McDonald Institute for Archaeological Research and the History of Marine Animal Populations project (supported by the Alfred P. Sloan Foundation). Many thanks are owed to Suzanne Needs-Howarth, who copy-edited the volume and helped compile Appendix 1.1, and to the McDonald Institute...
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James H. Barrett
University of Cambridge

David C. Orton
University of York

McDonald Institute for Archaeological Research

COST (European Cooperation in Science and Technology) is a pan-European intergovernmental framework. Its mission is to enable break-through scientific and technological developments leading to new concepts and products and thereby contribute to strengthening Europe’s research and innovation capacities. It allows researchers, engineers, and scholars to jointly develop their own ideas and take new initiatives across all fields of science and technology, while promoting multi- and interdisciplinary approaches. COST aims at fostering a better integration of less research-intensive countries to the knowledge hubs of the European Research Area. The COST Association, an international not-for-profit Association under Belgian Law, integrates all management, governing, and administrative functions necessary for the operation of the framework. The COST Association has currently 36 Member Countries.

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Introduction

Major changes in the importance of sea fishing and marine fish consumption during the Middle Ages were both punctuated and incremental. The trade in sea-fish was neither trivial nor static for European communities around the northern North Atlantic Ocean and the Baltic, North and Irish seas. Its volume could exceed that of the ever-important wine trade (Chapter 2). Its foci of production and transhipment shifted through time and space, with concomitant social, economic and political ramifications. Major regional differences were influenced by natural species distributions and a complex mix of socio-economic factors. Yet many temporal developments also followed similar trajectories in different locations. Others had very widespread influence, integrating much or all of northern and western Europe into the well-known exchange networks of the High Middle Ages – be it the trade of East Anglian herring (*Clupea harengus*) for Gascon wine or of Arctic Norwegian stockfish for English cloth, German beer and Baltic rye.

As is noted in Chapter 1, investigating the ebb and flow of different fisheries over the *longue durée* and large geographical distances comes with methodological complexities. Systematic and quantitative historical records only emerge in the fourteenth century – near the end of the study’s chronological range – and not all regions are equally well documented in all periods. Archaeological data from fishing gear (e.g. tidal traps), human skeletal remains (e.g. stable isotope values) and, most important, fish bones suffer less chronological bias. Nevertheless, the interpretation of this source material is complicated by a wide variety of other confounding factors, such as how well bones were preserved and how methodically they were recovered during excavation. The degree to which seemingly esoteric finds such as fish bones have been the focus of study and publication is also highly variable. In sum, it is likely that our archaeological evidence is based on only a tiny and biased sample of what was initially consigned to the earth and that many aspects of fishing (including most activities conducted at sea) will not have entered the ground in the first place.

Accepting these obvious limitations, this chapter aims to compare and contrast what we do know, based on the wealth of information from the contributions to this volume, in order to infer a plausible outline of the archaeology and history of medieval fishing in the north of Europe from AD 500 to 1550. In so doing, it may provide a starting point for a more comprehensive future understanding of the complex relationships between human societies and the sea.

Fifth to mid-seventh centuries AD

During the earliest years of the Middle Ages, considered prehistory in many parts of northern Europe, there is no reliable documentary evidence regarding sea fishing. The availability of relevant archaeological evidence is highly variable, but this evidence is nevertheless sufficient to show differing regional traditions. The recovery of sea-fish remains is rare among the former Roman provinces of the North Sea coast, in terms of both the number of known sites and the number of marine fish bones recovered. For example, Carlton Colville, a rural settlement of the sixth–early eighth centuries AD in Suffolk, England, yielded only 44 identified fish bones, of which nine were from obligate marine species (Parks and Barrett 2009). An additional 15 were of flatfish, probably plaice (*Pleuronectes platessa*) or flounder (*Platichthys flesus*). These flatfish may represent coastal fishing, but, as noted in Chapter 1, flounder can be caught in both fresh and
salt water. A small, early Anglo-Saxon (sixth to early seventh century) assemblage from Lyminge in Kent is also notable, having 118 herring bones among its 156 identified specimens (Chapter 17; Gabor Thomas pers. comm.). The neighbouring continental evidence tells a similar story. In Belgium, France and the Netherlands, marine fish bones are rarely found on settlements of this early date. When they do occur, it is either in coastal locations (as in a seventh-century context from The Hague: Magendans and Waasdorp 1989) or in assemblages where there is a strong possibility that they represent residual material of Roman date (as in sixth- to seventh-century contexts from Tournai: Chapter 14).

The limited importance of sea fishing during the fifth–mid-seventh centuries AD is also a feature of, on the one hand, coastal Scotland and Ireland and, on the other, the eastern Baltic lands of Poland and the Baltic states. In coastal Scotland there was some use of sea-fish, shellfish and cetaceans at this early date (e.g. Barrett et al. 1999; 2001; Cerón-Carrasco 2005; Hardy 2015; Harland 2006; Mulville 2002; Nicholson 2010; Sharples et al. 2015, 251–2), but their dearth in comparison with the very large quantities of herring (in the west) and cod family (Gadidae) fish (in the west, north and east) known from the Viking Age (c. 790–1050) and later is striking (e.g. Harland and Barrett 2012; Sharples et al. 2015). Assessment of human diet based on stable isotope analysis of human burials from Orkney in northern Scotland tells a similar story – the Pictish population of pre–Viking Age Scotland consumed marine protein on only a modest scale (Barrett and Richards 2004; Chapter 20). In Ireland, no marine fish bone assemblages of specifically fifth- to mid-seventh-century date are known (Chapter 19), but estuarine fish traps of this age suggest that at least migratory species were exploited (e.g. O’Sullivan 2001, 138; Chapter 9). Coastal shell middens of this early date are also known, although they are better represented in the following centuries (O’Sullivan et al. 2014, 116–19).

In the eastern Baltic, there is even less evidence for marine fish consumption in the middle centuries of the first millennium AD. Although sea fisheries had been important earlier in prehistory, especially during the Neolithic, fish such as cod (Gadus morhua) and herring do not reappear in the archaeological record of Poland until the eighth to ninth centuries AD (Chapter 12) and of Estonia until after AD 1000 (Chapter 11).

The reasons for this widespread avoidance of sea fishing must differ given that it occurs in locations as disparate as (for example) Estonia, Poland, Belgium, England, Scotland and Ireland. In the eastern Baltic, a reduction in salinity associated with postglacial changes in relative sea level may have contributed to the end of the Neolithic fishing boom (Chapter 11). In some regions bordering the North Sea it has been suggested that there was a culturally driven avoidance of fish amongst indigenous Iron Age peoples (Dobney and Eryvynck 2007; Chapter 14), a tradition that may have been reinvented in the wake of collapsing Roman influence in the west. Dio’s Roman History of the early third century AD actually claims that the Caledonians (residing in what is now Scotland) did not eat fish (Cary 1969, 263; but cf. Russ et al. 2012). Important factors in post-Roman Europe must have included limited urban and elite demand, the low cargo capacities of contemporary ships and a relative emphasis on the exchange of high-value rather than staple goods (Chapter 4; cf. Barrett et al. 2004a; Loveluck 2013; Wickham 2005). In Ireland, one might speculate that the key importance of pastoralism – particularly cattle husbandry – diverted labour from the sea (see McCormick 2008; 2014). Ultimately, however, all such interpretations are limited by the fact that they are arguments from absence, built on the paucity of available fish bone evidence.

Scandinavia provides a distinct contrast to the widespread pattern of limited sea fishing in the fifth–mid-seventh centuries AD. Here there is evidence that marine fishing, for cod family species (especially cod itself), herring, or both, was practiced during the Migration Period (AD 400–570), and in some cases even as early as the Bronze Age. Cod and related species were the most important taxa in Norway, whereas both gadids and herring (together, or at separate sites) played significant roles in the Danish and Swedish islands of the western Baltic (Chapter 13; Chapter 18). A particularly striking example is Sorte Muld on Bornholm, where more than 13,000 herring bones dating to the sixth–seventh centuries AD were recovered from a central-place settlement (Chapter 13). Looking west and north, seasonal fishing settlements dating to the Migration Period have been excavated at coastal locations in Hordaland in western Norway (Johannessen 1998, 43) and on the island of Flakstad in the Lofoten archipelago, a later focus of commercial stockfish production (Wickler and Narmo 2014, 84–5). Diverse environments and cultural contexts are represented by this early Scandinavian sea fishing. Nevertheless, they all shared an insular or coastal setting, access to abundant stocks of marine fish and – perhaps most important – a maritime-oriented culture, as known from material culture and rock art in addition to fish bone evidence (e.g. Crumlin-Pedersen 2010; Lødøen and Mandt 2010).

The ‘long eighth century’ AD

There is evidence that patterns of sea fishing began to change in what may usefully be called the ‘long eighth century’, from the middle of the 600s to the early years of the 800s. This period shows emerging – albeit still small-scale – use of sea-fish in a number of regions where it was previously very difficult to detect. In England, the evidence comes from the earliest post-Roman towns (sometimes referred to collectively as wics, a term of convenience that will be adopted here) at what are now York, Ipswich, London and
Southampton (Barrett et al. 2004a); a salt-production site at Fishthoef in Lincolnshire (Locke 2012); a beach market at Sandton on the English Channel coast (Hamilton-Dyer 2001); and – in the case of southern England – high-status central places (Chapter 17). It is also relevant that radiocarbon dates on intertidal fish traps, especially along the Essex, Suffolk and Norfolk coasts of eastern England, cluster between AD 600 and 900 (Murphy 2009, 48). Moreover, assessment of human diet using stable isotope analysis suggests small-scale consumption of marine protein as early as the seventh–tenth centuries AD on the eastern coast of Norfolk, a region famous for its abundant herring in later centuries (Hull and O’Connell 2011; Chapter 20).

A variety of marine taxa were caught in England during this developmental phase. In most cases, however, bones of flatfish and herring are the most abundant finds, with smaller numbers of other species, such as cod and/or whiting (Merlangius merlangus). The significance of the flatfish is a little ambiguous. Many were presumably caught in coastal and estuarine waters to be used as food. As is noted above, however, flounder are also found in fresh water. Moreover, small flounder are often eaten by eels (Maitland and Campbell 1992, 248), a migratory species that is abundantly represented in English sites of the late seventh–early ninth centuries AD (and later). Thus some of the small flatfish bones that comprise the majority of potentially marine fish remains at eighth–ninth-century Fishthoef could conceivably have arrived onsite in the stomachs of eels – given that the latter are the most abundant taxon in the assemblage (Locke 2012). A similar explanation may apply to the smallest flatfish recovered from broadly contemporary phases of the elite settlement of Flixborough near the Humber estuary, where very few other bones of marine fish were found despite extensive sieving with fine mesh (Dobney et al. 2007, 40–1).

Regardless of what proportion of flatfish remains represent fish caught in the sea rather than in fresh water, and the food of people rather than eels, it is clear that the herring and (in lesser quantities) cod bones found in England’s earliest trading sites represent the emergence of a small-scale fishery supplying town-dwellers. It is not yet possible to tell whether this development represents commercialisation, or instead indicates provisioning by elite patrons using renders of sea-fish from coastal estates. This is an important question at the core of debate regarding the nature of England’s early medieval trading settlements (cf. Crabtree 2010; Hammerow 2007; Holmes 2014, 15; O’Connor 2001). Regardless, it is probable that the sea-fish found at elite centres such as Bishopstone and Lyminge, near the Channel coast of England, derived from estate holdings – possibly even Sandtun in the case of Lyminge, although there is uncertainty regarding the location indicated by the relevant charter (Chapter 17). By the mid-ninth century, coastal fisheries belonging to ecclesiastical estates elsewhere in England are also known from the textual record (e.g. Fox 2001, 47).

The neighbouring continental evidence tells a similar story. In Belgium, France and the Netherlands, bones of sea-fish (especially herring) begin to occur in very small numbers from the eighth century onwards, at urban or elite sites upriver from their marine source. Examples include herring bones of eighth-century date from Paris, Reims and Compiègne in northern France (Clavel and Yvinec 2010), of eighth–ninth-century date from Namur in Belgium and of eighth–ninth-century date at Dorestad in the Netherlands (Chapter 14). Small numbers of plaice and haddock (Melanogrammus aeglefinus) bones were also found at the latter site (Prummel 1983, 90, 94). A very small number of cod bones dating to the eighth century have also been recovered from an excavation along the Oude Rijn (Old Rhine) river near Utrecht (Beerentnout 2009). All of these species were probably caught at coastal settlements that combined diverse economic activities; specialist fishing villages are not known at this date (Chapter 14).

In the case of both the continent and England, the earliest, small-scale growth of medieval sea fishing may have been driven by the demand of urban populations and elite central places. Conversely, the situation in Ireland and Scotland during the ‘long eighth century’ may show more continuity than change. Neither region had adopted urbanism, coinage or other aspects of incipient commercialisation at this date. In Ireland, the main focus of economic intensification in the ‘long eighth century’ may have been innovations in arable agriculture – as evidenced by the distribution of radiocarbon and dendrochronological dates on water mills, for example (Kerr et al. 2009; McCormick 2014). Nevertheless, substantial coastal fish traps continued to be built, as at Chapel Island in Strangford Lough (Chapter 9). No fish bone assemblages are dated exclusively to the 700s, but eighth- to ninth-century material from the monastery of Illaunloughan, on an island off the southwest coast, included a diverse range of 18 taxa. The most abundant were sea bream (Sparidae), wrasse (Labriderae) and hake (Merluccius merluccius), with lesser numbers of gadids, such as pollack (Pollachius pollachius) and cod. All parts of the skeleton were represented. This fishery was not specialised and probably entailed local activity.

In Scotland, where preservation conditions have seldom favoured tree-ring dating, it is difficult to differentiate between developments of the eighth and ninth centuries using archaeological methods. Nevertheless, by the mid-AD 800s there was clearly Scandinavian influence in northern and western Scotland, not least on diet and subsistence practices, including a marked increase in the importance of sea fishing (see below). There remains a transitional archaeological period, however, for which we cannot yet be certain whether this Scandinavian influence was preceded by a small-scale increase in indigenous
The eastern Baltic region has resonances with contemporary circumstances in Ireland and Scotland. Coastal Estonians continued to eschew towns and marine fish at this date (cf. Chapter 11; Mägi 2015). In contrast, areas such as the Polish and German Baltic coasts participated in both the emerging urbanism of the ‘long eighth century’ and the first beginnings of medieval sea fishing. The earliest herring bones from medieval Poland, dating to the first half of the eighth century, are from the near-coastal trading site at Truso, part of the network to which the North Sea wics also belonged (Makowiecki 2012; Chapter 12). Cod bones, conversely, are not known from Poland until later (see below). Near the western limits of Baltic Slavonic settlement, at the eighth- to early ninth-century trading site of Groß Strömkendorf on the Wismar Bight in Germany, herring is the most common fish taxon, and both cod and whiting are also well represented (Schnöckel 2004, 30; see Müller-Wille and Tummuscheit [2004, 37] regarding the chronology of the site). The abundance of cod is atypical for a Slavonic settlement of this date, raising the possibility of Scandinavian influence in addition to the emergence of urban demand (Müller-Wille and Tummuscheit 2004, 36–7; Schnöckel 2004, 119).

In Scandinavia, conversely, the ‘long eighth century’ was characterised by a continuity of fishing patterns established by the Migration Period. Nevertheless, there may also have been some intensification of activity associated with elite and proto-urban demand. Continuity of herring fishing in the Baltic region can be assumed based, for example, on the eighth–ninth-century phase of Selso Vestby on Zealand and perhaps also on the fifth–eighth-century phase of Eketorp on Oland (Enghoff 1999, 57; Chapter 13). Two ling (Molva molva) bones from the early phase of Eketorp (geographically beyond the typical range of this species) – and the presence of a few large cod vertebrae without associated cranial bones – may imply some trade of preserved gadids at a very early date (Enghoff 1999, 56–8, 63–4). Alternatively, these specimens could be intrusive from the overlying eleventh- to fourteenth-century phase, from which almost 60,000 fish bones were recovered. Regardless, we know gadid fishing was practiced during the ‘long eighth century’ in southern Scandinavia, with (albeit imprecisely dated) cod of a range of sizes being represented in finds from central places, such as Tissø and Gammel Lejre (Chapter 13). There were also cod and haddock remains in the eighth-century phase of the trading settlement of Ribe on the North Sea coast of Jutland. They were of small individuals – 35–65 cm total length (TL) in the case of cod – and included all parts of the skeleton, implying local fishing. Unlike the occupants from many other early wic sites – from Truso in the east to Hamwic (Southampton) in the west – those of Ribe seem not to have consumed herring. Instead, the gadids were found together with larger numbers of flatfish bones.

Norwegian fishing – mostly for cod and related species – showed some evidence of intensification within an overall pattern of continuity. In Hordaland there was greater use of fishing stations from the later part of the Merovingian Period (AD 570–800) onwards (Johannessen 1998, 44). In Lofoten, seasonal fishing continued and may have expanded. It is evidenced by excavations at Flakstad and Borgvær (Wickler and Narmo 2014). It is unlikely to be a coincidence that both Lofoten sites were within the political sphere of the Migration Period to Viking Age central place at Borg in Lofoten (Wickler and Narmo 2014), where the largest longhouse known in Scandinavia (c. 83 m) was built around the seventh century AD (Näsman and Roesdahl 2003). Thus it has been argued that the early (pre-commercial) expansion of Norwegian fishing was driven by the demands of chiefly patrons (Chapters 4–6).

AD 850 to 1050: the ‘fish event horizon’

In the years around the turn of the first and second millennia AD there was an increase in the importance of sea-fish across most of the geography of present interest. The initially tongue-in-cheek label the ‘fish event horizon’ (Barrett et al. 2004a) has acquired some currency as a convenient shorthand for this complex phenomenon (e.g. Frantzen 2014, 233; Perdikaris and McGovern 2008, 203). The character, scale and precise chronology of change varied with location. Nevertheless, there were clear inter-regional resonances. More bones of marine fish (in both absolute numbers and in relative terms vis-à-vis freshwater and migratory taxa) are found at more sites and/or at greater distances from the sea.

The English evidence derives from a diversity of sites (e.g. Barrett et al. 2004a and references therein), but the time-series from York is one of the most informative. It is large, well dated, well preserved, well recovered and (with minor exceptions) identified using comparable laboratory methods (Chapter 15). Here we see a major increase in the abundance of herring during the middle of the tenth century, when it replaced eel as the most frequent taxon by number of identified specimens (NISP). At the same time, gadid fish (in this case mainly cod itself) first began to appear in more than trace numbers. Gadids became frequent by the middle of the eleventh century, outnumbering freshwater and migratory species other than eels by NISP. The story from London is similar. Far more herring remains are known from around the turn of the millennium than in previous centuries. Gadids such as cod and whiting appear in meaningful numbers for the first time and flatfish also occur in large numbers (Locker 1997; Orton et al. 2014; Chapter 16). In the south of England, marine fish (mostly herring) replaced freshwater and migratory species (mostly eel) as the most abundant fish in Hamwic/Southampton by AD 1030 (cf. Colley 1984; Coy 1977; Hamilton-Dyer 1997). These examples are sufficient to illustrate a general trend.
It is also relevant that the marine fish represented in zooarchaeological assemblages from earlier English sites, particularly southern English sites, such as Sandton, Bishopstone and Lyminge, rarely translate into evidence for the consumption of measurable amounts of marine protein based on stable isotope analysis of human bones (Chapter 20). With the exception of probable Scandinavian migrants (e.g. Pollard et al. 2012), only burials from Caister-on-Sea and Burgh Castle near the Norfolk coast show even limited evidence of a marine diet before the eleventh century (Hull and O’Connell 2011). At York, the first probable locals from medieval England to have clearly adopted a marine diet were a minority of young men who died in the mid–late eleventh or early twelfth centuries and were buried in the parish cemetery of St Andrew, Fishergate. It seems reasonable to infer, as Müldner (2009; Chapter 20) has, that these men had been directly involved in the growing sea fishery.

The organisation of the growing English fisheries of c. AD 950–1050 can be inferred by back-projecting from Domesday Book of AD 1086 and later sources. In Domesday we observe the role of herring as renders from both rural estates and coastal ports (Chapter 3), such as Dunwich, an important Suffolk town that now lies under the North Sea (Sear et al. 2011). Campbell (2002) has estimated that the Domesday renders alone may imply an annual catch of at least 3,298,000 herring. During the centuries under consideration, these fish were probably salted and dried or salted and smoked, rather than barrelled in brine (Chapter 1; Chapter 3). Coastal, river and inland trade must have brought the fish to centres such as York and London, where their bones have been excavated.

It remains an open question to what degree English herring were serving distant markets during the ‘fish event horizon’. Given the centrality of English herring exports to the later (thirteenth–fourteenth centuries) wine trade with Gascony (Littler 1970, 203, 224–5; see below), it may be reasonable to speculate that many preserved English catches were sent up the Rhine and the Seine, which were the earlier conduits of continental wine to England (see Rose 2011, 17, 61). If we accept the possibility of some continuity into later centuries, it is also relevant that fish were the first item in Henry of Huntingdon’s list of English exports to Germany c. 1130 (Oksanen 2013, 179). One might speculate that in the tenth and eleventh centuries, England’s abundant herring were traded for both Rhenish wine and the influx of German silver thought to have influenced the coinage of late Anglo-Saxon England (cf. Sawyer 2013, 28, 98).

Unlike herring, gadid fish are invisible in Domesday and other historical sources of a similarly early date (Chapter 3). Yet bones of cod do occur in tenth- and eleventh-century assemblages from England (e.g. Barrett et al. 2004a; Chapters 15–16). At present, stable isotope analysis of fish bones suggests that very few dried cod from the Scandinavian North Atlantic region reached England in the ninth–eleventh centuries. Instead there was an increase in local cod fishing, probably driven by the demand of expanding urban populations (Barrett et al. 2011).

The apparent discrepancy between historical and archaeological evidence regarding cod fishing around AD 1000 can probably be understood in light of the much later accounts of the Dunwich fishery preserved in the Bailiffs’ Minute Book of 1404–30 (Bailey 1992). Here we see that the main seasonal fishery was for herring and the related sprat (Sprattus sprattus), but that this focus was supplemented by opportunistic fishing for cod (and other taxa) (Bailey 1992, 16). For many English fishermen – of the tenth–eleventh centuries and later in the Middle Ages – gadid fish and other marine taxa probably represented important secondary catches in a calendar (and taxation system) focused mainly on herring.

From the perspective of environmental history, a final key aspect of the English ‘fish event horizon’ is whether a decline in freshwater resources was one cause of the move to the sea (Barrett et al. 2004b; Hoffmann 1996; 2002). Opinion is divided (cf. Chapter 3; Chapter 15). It is clear that freshwater and migratory fish did continue to be consumed in England after AD 1000. Nevertheless, the large and well-recovered zooarchaeological dataset from York allows us to observe important trends that may be obscured elsewhere (Chapter 15). The absolute abundance of freshwater fish remains declined through time, and the average TL of one of the most abundant obligate freshwater species, pike (Esox lucius), also decreased. Large individuals (50–80 cm TL) were well represented until the middle of the eleventh century but almost absent after that. These patterns suggest the possibility of overfishing. In addition, it has been suggested that the disappearance of graying (Thymallus thymallus) and burbot (Lota lota) from the York fauna was due to increasing water pollution (O’Connor 1989, 198). What is not yet known is the degree to which we can generalise from the picture of a single town.

Crossing the English Channel, we see that the chronology of increased sea-fish consumption is similar in Belgium (Chapter 14). At present, the key assemblage is from the trading centre, or portus, of Gent (Ghent), where sea-fish appear in layers of mid-tenth-century date. The most abundant marine taxa are herring and flatfish. Some of the latter may represent flounder caught in freshwater, but placie (which does not migrate upriver) were identified among the remains of this group despite the difficulty of attributing flatfish bones to species (Wouters et al. 2007; Chapter 14). Gadids are not represented among these earliest sea-fish remains from Ghent, only appearing (and then in very small numbers) in the eleventh–twelfth centuries. In this instance, the relevant species was haddock. Another important assemblage comes from a short-lived settlement at Ename, dating to the late tenth and eleventh centuries. It is a small
and unrepresentative collection, having been recovered by hand rather than sieving with mesh, but it did include herring, plaice and a single cod bone. The settlement, which developed near a fortification, is thought to have had trade functions, reinforcing the link between early sea fishing and emergent urbanisation. Van Neer and Eryvynck (Chapter 14) rightly caution that earlier evidence of marine fishing may yet be found in Belgium, pointing out the occasional eighth-century continental finds mentioned above. Yet on the present evidence the assemblage from Ghent provides a synchronous parallel for those from English towns such as York or, more appropriately (given the relative abundance of flatfish bones), London.

Synthesis of the medieval fish bone record from the Netherlands is still in progress (Ine van der Jagt pers. comm.). Based on existing evidence, it appears there was some limited use of sea-fish, including gadids and flatfish, at terp sites (raised settlements) of the Wadden Sea (Wadden Sea) area throughout the first millennium AD (Prummel and Heinrich 2005). There were also small numbers of herring, flatfish and gadid bones inland, at Dorestad and near Utrecht in the ‘long eighth century’ (Beerenhout 2009; Prummel 1983, 94, 108; see above). Nevertheless, marine fish are rare finds in the Netherlands prior to the turn of the tenth and eleventh centuries AD, based on the records of the on-line Dutch zooarchaeological database (BoneInfo nd; Lauwerier and de Vries 2004). The regular appearance of species such as cod in the faunal record begins with examples from such settlements as Vlaardingen c. AD 1000–1050 (Buitenhuis et al. 2006, 67) and Deventer between the ninth and twelfth centuries (IJzereef and Laarman 1986, 453). If sea fishing had been important in earlier centuries, one would expect to see the evidence at a site like Domburg, a coastal stronghold and market centre with a peak in activity during the ninth and tenth centuries. Yet this settlement has produced very few fish bones despite excellent preservation conditions; there were seven from the most recent excavation, of which only one (a cod) was unambiguously marine. There were no herring bones in either the hand collected material or the environmental samples (Buitenhuis 2011).

In parts of Scotland, there is unambiguous evidence for a major increase in the importance of sea fishing during the ninth and tenth centuries. Areas of the country influenced by the Scandinavian diaspora of the Viking Age saw holistic changes in material culture and subsistence at this time (Barrett 2003). Among the new cultural practices were catching and consuming more and larger cod family fish, particularly cod, saithe (Pollachius virens) and ling (Barrett et al. 2001). This new development is most evident in the Northern and Western Isles, at sites such as Old Scatness (Nicholson 2010), Pool (Nicholson 2007), Quoygrew (Harland and Barrett 2012), Bornish (Sharles et al. 2015) and Bostadh (Cerón-Carrasco 2011). By the eleventh–twelfth centuries, there was yet further intensification of marine fishing – evident from zooarchaeology (Barrett 1997; 2012; Barrett et al. 2004a) and the assessment of human diet using stable isotope analysis (Barrett and Richards 2004; Chapter 20). By this time it is likely that unsalted dried gadids (stockfish) were being produced for the payment of local renders and possibly also for export trade (Barrett 1997; 2012; Harland 2007). The emergence of large-scale sea-fish consumption in the extensive areas of Scotland without overt Scandinavian influence is discussed below in the context of developments in the High Middle Ages.

Within the Scandinavian-influenced zone of northern and western Scotland, there is a contrast between the north, where fishing for cod family species was the main focus, and the west, where herring were of greater importance (cf. Barrett et al. 1999; Cerón-Carrasco 2011; Serjeantson 2013; Sharples et al. 2015). This difference cannot be explained based on the distribution of the relevant species. It may instead relate to differing communities of practice in the Northern and Western Isles. There has been some discussion regarding whether western herring fishing developed in part for trade – to the Hiberno-Scandinavian town of Dublin, for example. Although not inconceivable, it remains to be established where, at this date, Hebridean islanders could have procured the large supplies of salt usually necessary to preserve this species for long-range trade (Sharles et al. 2015, 253).

There is not yet abundant fish bone evidence for Ireland from the ninth to eleventh centuries. Like their antecedents (see above), coastal settlements of the west continued to use a diverse range of marine species – perhaps indicating expedient rather than specialised fishing. Moreover, taxa such as wrasse suggest a focus on inshore activity at settlements like Doonloughan (Chapter 19). However, large gadids may have been favoured in newly established Hiberno-Scandinavian towns, such as Dublin and Wexford (McCarthy 1998, 61; Chapter 9; Chapter 19). Herring may also have been important in these urban settlements, based on finds noted in botanical samples of tenth–early eleventh-century date from Fishamble Street in Dublin (Geraghty 1996, 55). Much research regarding fish bone from Ireland’s Hiberno-Scandinavian towns remains for the future.

Turning to the eastern Baltic region, we see that in Poland the late ninth to eleventh centuries witnessed the growth of sea fishing for herring and the first evidence for inland trade of this fish (Chapter 12). Herring bones became abundant in coastal sites during the tenth century, at the trading site of Wolin and the strongholds of Kołobrzeg-Budzistowo and Sopot. In the tenth–eleventh centuries, they appeared far inland for the first time, at Grzybowo, a stronghold of the Piast dynasty, 250 km from the coast. By the eleventh century, they occurred at a number of inland sites – Wroclaw, Poznań, Kruszwica and Kaledus 2 – all of which served as elite strongholds at this date.
It is clear from this inland transport alone that the early catches of herring from the Baltic waters of Poland were being cured. The method may be indicated by the eighth-century deposit of herring bones from the trading site of Truso (introduced above) and an assemblage from Kolobrzeg-Budzistowo dating to between the ninth and thirteenth centuries. In both cases, the cleithra are missing (Chapter 12). This is one of the characteristics of the gutted and pickled cure made famous by later Scanian and Dutch fisheries (cf. Chapter 2; Chapter 13; Chapter 15).

In Chapter 12 it is argued that this growth of herring fishing and trade was probably related to Polish state formation under the Piast dynasty in the tenth century, combined with the concurrent adoption of Christianity (with its fasting practices that encouraged fish consumption). It is also likely to be relevant that the Piasts conquered both the trading settlement of Wolin (with its herring fishery) and the stronghold of Kolobrzeg (with its salt springs). A new socio-economic network combined with increased elite demand and a new Christian ideology to create conditions favourable for an increase in sea fishing around the turn of the first and second millennia AD.

The chronology of growing herring fishing and trade seen in Poland has also been observed in the previously Slavonic areas of the Baltic coast of Germany – at ninth–tenth-century Mønklønn, for example – and perhaps also on the island of Rügen, which appeared in the textual record as a major centre of herring fishing and trade by the twelfth century (Benecke 1982, 286; 1987; Enghoff 1999; Chapter 2). Conversely, at the eastern limits of the Baltic region, marine fish do not seem to have had either a social or an economic role until later in the Middle Ages. Unlike Poland and Germany, Estonia is distinctive in that even at the Viking Age harbour site of Tornimäe, on Saaremaa Island, there is no evidence of sea fishing among the many bones of a well-preserved and sieved assemblage (Chapter 11).

Unlike most areas discussed, Scandinavia showed much continuity in sea fishing during the Viking Age. Nevertheless, there are some hints of increases in the intensity of fishing and the distances over which fish were transported. Some herring were transported to relatively local inland centres, such as the town of Viborg Søndersø in Jutland (Chapter 13). Herring were particularly abundant at Haithabu (in modern Germany, but part of the kingdom of Denmark when occupied in the Viking Age), where they could have been easily trapped in the adjacent Schlei fjord (Lepiksaar and Heinrich 1977, 36; Radtke 1977). This site is also notable for having yielded bones from saithe, ling and halibut (Hippoglossus hippoglossus), all species more likely to have been caught in the Skagerrak, North Sea or North Atlantic than in the Kattegat or Baltic Sea (Heinrich 2006, 186–9; Lepiksaar and Heinrich 1977, 90–4, 106–7; Schmölecke and Heinrich 2006, 220–9). These finds co-occur with small numbers of cod bones that may also be non-local catches based on carbon and nitrogen isotope analysis (Barrett et al. 2008; cf. Becker and Grupe 2012). It is tentatively proposed that the cod arrived as stockfish imported from Norway, an explanation that could equally apply to the saithe and the ling. Moreover, cured halibut is known to have been another (albeit rarer) Norwegian export in later centuries (Nedkvitne 2014, 364). The remains of these four species have been interpreted as provisions of mariners trading more precious cargoes (Heinrich 2006, 188–9; Lepiksaar and Heinrich 1977, 118). Nevertheless, it is possible that they provide the earliest evidence for a pattern of transport that was later commercialised.

Very small numbers of herring and cod bones at the trading town of Birka in Sweden, where remains of freshwater fish dominated the assemblage, could conceivably also represent trade goods (Chapter 11). Elsewhere in Sweden, Viking Age fishing is evidenced at a variety of coastal sites, with herring, gadids (especially cod) and flatfish all well represented. These remains are consistent with local catches (Enghoff 1999), although ongoing stable isotope studies may ultimately revise this interpretation (Sabine Sten pers. comm.).

Few Viking Age fish bone assemblages are known from the Skagerrak. A small collection (mainly from waterlogged pits) of ninth–tenth-century date from the trading site of Kaupang confirms the widespread role of herring, while also including smaller numbers of gadids, such as cod. As at Birka, we do not know whether these remains indicate local fishing or exchange (Barrett et al. 2007). Fish bones from Oslogate 4, dating to the early (eleventh-century) years of Oslo’s existence as a town, represent whole cod and thus probably local fishing rather than trade (Chapter 18). Moving to the North Sea coast, the trading site of Ribe has not yet produced an analysed fish bone assemblage dating between AD 850 and 1050. Its early ninth-century phase yielded no herring, and at this date the settlement instead relied mainly on small haddock and cod, probably caught locally.

Viking Age fishing in western and northern Norway showed much continuity from the previous Merovingian Period. Ephemeral, probably seasonal, fishing structures remained the norm in the Lofoten islands (at Borgvær, for example), where the harvest of the sea must have continued to be a contributor to the wealth of chieftains at such centres as Borg. The main target species was cod, with small numbers of saithe and other taxa also being caught (Wickler and Narmo 2014, 81). Fishing booths like those in Lofoten also continued to see use in Hordaland, in western Norway (Johannessen 1998, 44). Nevertheless, there is evidence for an increase in fish consumption, at least in northern Norway, from the Merovingian Period to the Viking Age, based on stable isotope analysis of human skeletal remains (Naumann et al. 2014).

The consumption of cod and other marine taxa reached deep into Norway’s inner fjords and perhaps even its mountainous interior. At eighth–tenth-century Bjørkum, c. 12 km from the innermost reach of the Sognfjord system,
small numbers of herring, cod, saithe, pollack, and tusk (*Brosme brosme*) (be they from the nearby fjord or the distant open sea) were found together with more numerous salmonid bones representing catches available from the immediately adjacent Lærdal river (Barrett *et al.* 2015). Much farther inland, a few bones of herring, cod, saithe, haddock and other sea-fish were also recovered from Vesle Hjerkinn, a royal farm and mountain lodge for travellers over the Dovre mountains in central Norway (Lie and Fredriksen 2007, 164). The Vesle Hjerkinn chronology is ambiguous because there is no differentiation between Viking Age and later (eleventh–fourteenth-century) bones from the site. It is an important example, however, because both cranial and postcranial cod bones were recovered at a location to which only preserved sea-fish could realistically have been transported. Thus some Norwegian stockfish were made without decapitating the fish first – or some fish heads were also dried for long-range transport. The existence of occasional travelling fish heads obviously limits the resolution of the main methods used to recognise traded gadids – anatomical patterning and stable isotope analysis (Chapter 1). Some imports may thus go unnoticed based on archaeological evidence. However, it is relevant to note that this observation does not undermine cases in which processed and/or isotopically non-local fish are recognised.

As is noted above, the Scandinavian practice of harvesting cod and other sea-fish spread to west-Norse settlements in Scotland and Ireland during the Viking Age. It was also an important component of the socio-economic package transported to Iceland during its permanent settlement in the late ninth and tenth centuries. Here, as in Norway, cod and other gadid fish were air dried without salt for later consumption. Some were transported to interior sites, such as Sveigakot in Mývatn, as part of a complex Viking Age provisioning network that long preceded Iceland’s entry into the international stockfish trade in the thirteenth century (Perdikaris and McGovern 2009; Chapter 7). In this instance, zooarchaeological evidence shows that these transported preserved fish were invariably decapitated (Perdikaris and McGovern 2009, 85).

**The High Middle Ages: AD 1050 to 1350**

The centuries between AD 1050 and 1350 were characterised by the increasing importance of sea fishing in areas where it was already practiced, the spread of this activity to those places in the north of Europe where it had not previously been adopted, and the emergence of a pan-European fish-trade network. These changes entailed both incremental and punctuated developments. They also involved both shifting foci of production and consumption and shifting networks of exchange. The end of the period was characterised by the well-documented and widespread trade of salted herring from the western Baltic and dried stockfish from Norway, largely monopolised by member towns of the German Hansa under the leadership of Lübeck. However, this apogee of the medieval fish trade emerged from diverse origins, some driven by rural suppliers as much as by urban merchants and consumers.

Beginning in England, we know from written sources that the herring fishery of the east and south coasts was increasing in scale during the eleventh century (Chapter 3). In addition to the seasonally abundant shoals of fish, it was the surprisingly large-scale salt production (based on boiling sea water), especially in East Anglia, that made this possible (Campbell 2002). The catch was cured by various combinations of salting, drying and smoking, not yet involving barrels (Chapter 1; Chapter 3).

This herring fishery continued to be conducted from both rural estates and ports. The latter shifted in relative importance through time. Most famously, the central role of Dunwich was overtaken by the comparatively recent settlement of Great Yarmouth in the course of the twelfth and thirteenth centuries. The Yarmouth fair was seasonally attended by many continental fishermen who landed their fish for curing. Forty German vessels are mentioned in a twelfth-century hagiography (Campbell 2002, 6; Chapter 3), and sources from the early fourteenth century refer to between c. 500 and c.1000 fishing boats (Saull 1982, 78). In 1295, Edward I issued an order protecting fishermen from Holland, Zeeland and Friesland at Yarmouth (Unger 1978, 341). King’s Lynn and Boston, important new coastal centres of the late eleventh to early twelfth centuries, were more ports than fishing harbours, albeit very significant importers of Scandinavian stockfish (Carus-Wilson 1962–3; Nedkvitne 2014, 31, 55; Chapter 5). To the north, Grimsby developed as a centre of herring and cod fishing and fish trade in the twelfth and thirteenth centuries, only to be challenged by the growth of Hull during the early thirteenth century and the short-lived efflorescence of Ravenserodd (situated only a few kilometres away, across the Humber estuary, near what is now Spurn Head) between the 1230s and the mid-fourteenth century (Beresford 1988, 513–14; Rigby 1993, 7–12, 31–3). Yet farther north, fishing was conducted from (for example) Bridlington, Whitby and Scarborough (Chapter 3). To the south, there were large-scale herring fisheries in Kent and Sussex (Tsurushima 2006; Chapter 3).

In all instances there was a hierarchy of major and minor fishing centres jostling for relative advantage. Thus, for example, Dunwich contended with local rivals Blythburgh and Walberswick (Bailey 1992, 11–12) in addition to Great Yarmouth. Most of the fishermen themselves probably resided in rural estates, putting to sea as a seasonal activity, but (smuggling aside) fish were often landed in ports. It can be assumed that this was partly to facilitate salting, and partly related to tithe and market regulations. Contemporary sources record how renders, such as tithe,
should be paid and which market regulations (intended to prevent practices such as forestalling) must be adhered to (Rigby 1993, 11; Chapter 3)

Both zooarchaeological and textual evidence informs us that the harvests of these fisheries were consumed across England, in towns, monasteries and rural settlements (e.g. Barrett et al. 2004a; Colson 2014; Serjeantson and Woolgar 2006). As is argued above, herring may also have been exchanged for continental wine in the eleventh and twelfth centuries. This was certainly the case by the time England’s wine trade shifted from Rouen and La Rochelle to Gascony, early in the thirteenth century (Littler 1970, 203, 224–5; Rose 2011, 63).

The English herring fisheries of the High Middle Ages were associated with important secondary fisheries for cod and related species. Some of these fish may have reached market while still fresh or lightly salted, but many must have been preserved for longer storage. Cod bones from late twelfth–mid-fourteenth-century Cartegate in Grimsby provide evidence for local manufacture of a råskjær-like product (with head and anterior vertebrae removed on-site) (Russ 2011; cf. Chapter 1; Chapter 18). Given the southerly latitude of Grimsby, it is likely that these fish were both dried and salted, creating a cure like those better documented from the activities of later medieval and post-medieval fishermen of the English West Country (cf. Kowaleski 2000, 439). It is unlikely to be a coincidence that the consumption of both whole and pre-processed (decapitated) cod can be observed in the thirteenth-century fish bone record from York, a journey upriver from Grimsby (Chapter 15).

Some specialised fishing ports (such as Grimsby and Ravenserodd) also became key centres for the import of North Atlantic stockfish. In other instances, such as King’s Lynn and Boston, ports arose that focused on the transhipment of diverse English and imported goods, including preserved fish. Yet other centres, such as London and Bristol, were foci of urban population that imported large quantities of fish for local consumption (Colson 2014; Kowaleski 2003, 217). These examples represent a continuum from major metropolis (London) to short-lived fishing port (Ravenserodd), along which other settlements are harder to categorise. For example, the Cinque Ports of southern England held major rights in the East Anglian herring fishery – by charter from the thirteenth century and in practice already from the twelfth or even the eleventh century (Chapter 3).

Turning to fish imports, can we tell when, and to what degree, imported preserved fish (especially salted herring and dried gadids) from distant waters entered the medieval English market? Related to this, can we tell when English fishermen first sought out distant fisheries? The growth of English long-distance fisheries for cod and related species was predominantly a development of the late 1300s and subsequent centuries (discussed below). Similarly, although English imports of barrellled herring from the Baltic Scanian fishery are first documented in 1308, large-scale import of this iconic product only became common later, in the second half of the fourteenth century (Nedkvitne 2014, 517–18). English fishermen also made efforts to engage directly in the Scanian fishery, although their success was ultimately limited by the protectionist policies of the Hansa (Jahne 2009, 177). The absence of fish bone evidence for the distinctive Scanian cure (in which specific parts of the skeleton are removed during processing) from consumer settlements such as York is consistent with these observations based on the written record (e.g. Chapter 15).

In contrast, there is plentiful evidence for the import of stockfish to England from Norway and perhaps elsewhere in the North Atlantic region before AD 1350. The first anecdotal historical references are from the late eleventh and early twelfth centuries (Chapters 4–5). However, zooarchaeological evidence from London suggests that the major shift from consumption of locally caught (whole) to traded (decapitated) cod may not have occurred until the early thirteenth century (Orton et al. 2014; Chapter 16). Moreover, stable isotope analysis of a sample of English cod bones shows that most specimens predating the thirteenth century have δ13C and δ15N values consistent with relatively local catches, in either the southern North Sea/English Channel or the Irish Sea (Barrett et al. 2011; see Hutchinson et al. 2015 for comparative data regarding the isotope values to be expected in the Irish Sea). It is not until the thirteenth to fourteenth centuries that specimens from London better match North Atlantic or Arctic Norwegian sources. A few thirteenth- to fourteenth-century cod bones from York also have stable isotope signatures characteristic of stockfish-producing regions, but this town seems to have continued to rely on relatively local fish products to a greater degree than London (Barrett et al. 2011; Chapter 15).

It is difficult to pinpoint the precise source of the earliest stockfish imported to England. By AD 1294, before systematic English custom records began, the Norwegian crown had successfully implemented Bergen as a staple transhipment port through which all northern exports should flow (DN vol. 5, 23). Based on more detailed fourteenth-century sources, it is clear that the town’s economic monopoly was intended to include both northern Norway and the Norwegian ‘taxlands’ of the North Atlantic (e.g. Iceland and the Northern Isles of Scotland) (Keyser and Munch 1849, 181–2). Thus the origin of stockfish can seldom be traced farther than its transhipment in Bergen using historical sources. Moreover, the precision of stable isotope evidence is not sufficient to separate Iceland, northern Scotland and northern Norway with confidence (Barrett et al. 2011; Hutchinson et al. 2015).

What we do know is that Arctic Norway was a major producer of stockfish from at least the turn of the eleventh and twelfth centuries (Chapters 4–5), that the medieval town of Borgund in Sunnmøre’s stockfish-producing area was thriving


by the twelfth century (Chapter 6), and that Iceland first began to export stockfish at some point in the thirteenth century (Edvardsson 2010; Thór 2009, 329; Chapter 7). In addition, it is likely that the Scandinavianised region of northern Scotland, ruled by the earls of Orkney, was producing stockfish for trade by the eleventh–twelfth centuries (Barrett 1997; 2012; Barrett et al. 1999; Harland 2007; Harland and Barrett 2012). In this last context, it may be relevant that Orcadians are noted as visiting Grimsby in the early twelfth century (Gudmundsdóttir 1965, 130) and that one of the parishes dominated by London’s medieval stockfishmongers was dedicated to Magnus the Martyr, patron saint of Orkney (Colson 2014). As the stockfish trade became increasingly commercialised in the thirteenth and fourteenth centuries, it is likely that some small-scale producers – including those in Orkney – were marginalised vis-à-vis Arctic Norway (Barrett 2012). A similar process of ‘globalisation’, entailing increased regional specialisation of labour, may also explain the decline between AD 1100 and 1200 of the cod fishery in Hordaland, western Norway (Johannessen 1998, 43; Wickler and Narmo 2014, 85; see above).

Shifting focus to the Low Countries, we see that the years from AD 1050–1350 were characterised by growth in the importance of sea fishing and sea-fish trade. Based on the zooarchaeological evidence from urban sites in Belgium, the relative importance of marine species vis-à-vis freshwater fish steadily increased between the eleventh and fourteenth centuries; bones of the former switched from being a small minority to the majority of identified fish remains (Chapter 14). It is argued that this evidence probably implies a reduction in the availability of inland fish stocks due to human impacts, such as habitat changes and overfishing, perhaps combined with limited urban access to increasingly controlled freshwater fisheries (Ervynck and Van Neer 1998; Chapter 14; cf. Hoffmann 1996).

The pre-existing emphasis on herring and flatfish in Belgian sites (see above) continued in the eleventh–fourteenth centuries. Gadid fish slowly increased in relative importance, reaching over 40% of the identified fish bones in late thirteenth–early fourteenth-century Mechelen. In the eleventh to twelfth centuries, gadid fish from Flemish sites were mostly whiting and haddock. Cod first became common (although not dominant) in the thirteenth and fourteenth centuries (Chapter 14). The earliest stable isotope evidence for possible imports of preserved cod from beyond the North Sea in Belgium is from thirteenth–fourteenth-century Mechelen, but at this date only one of five studied specimens yielded a potentially non-local signature (Barrett et al. 2011).

The expansion of the local Flemish fishery in the twelfth and thirteenth centuries is also well documented in historical sources, having emerged out of earlier initiatives by the counts of Flanders to extract marketable goods from their holdings within newly embanked coastal landscapes (Tys 2015; see also Ervynck et al. 2004). Estates paid renders in herring, the coastal plain became heavily populated, and by the middle of the twelfth century, fish markets were established in coastal comital towns such as Nieuwpoort and Grevelingen. These ports served as continental parallels to Dunwich and Great Yarmouth in the sense that they, too, were intermediaries between fishermen from dispersed rural estates and inland centres of population and consumption (Tys 2015).

That these fisheries entailed shore-based processing of local catches is evidenced by the linkage of herring and salt production (by burning peat) in historical sources (Tys 2015). Similar fisheries along the coast of the Netherlands are also known from twelfth-century sources (Unger 1978, 340). The barrelling of salted herring at sea was a subsequent development, of the late fourteenth and fifteenth centuries (see below). Nevertheless, fishermen from the Low Countries were also active in the East Anglian and Scanian herring fisheries (Campbell 2002, 6). As is discussed above, catches off the English coast were landed and cured near the fishing grounds before transhipment to both local and distant markets. Regarding Scania, Unger (1978, 339) suggests that fishermen from Kampen and Harderwijk (in what is now the Netherlands) were already participating by the end of the twelfth century. Merchants from around the North Sea were certainly active at the Scanian fairs in the thirteenth century (Jahnke 2009, 172–3). As a result, some Øresund herring were shipped west. One might speculate whether twelfth- and thirteenth-century herring bones from Bremen, for example, derived from this source (Küchelmann 2015, 268).

The importance of sea fishing and fish trade also increased in Scotland during the High Middle Ages. The intensification of fishing for cod and related species in the Scandinavianised highland and island regions of northern Scotland in the eleventh–twelfth centuries has been introduced above. At fishing settlements such as Quoygrew in Orkney much of the archaeo-geological sediment is made up of gadid bones and marine molluscs, the latter probably having served as bait for the fishery (Barrett 2012). There is reasonable circumstantial evidence that stockfish was being produced (probably without salt) at sites like Quoygrew and Robert’s Haven, for export to destinations farther south, both directly and via Bergen in Norway, by the twelfth century at the latest (Barrett 1997; 2012). This initially booming fishery may have been in decline by the 1200s, although it revived episodically in later centuries beyond the chronological range of this chapter.

Fish bone evidence suggests that a cured gadid product also began to be manufactured in coastal settlements of lowland Scotland in the course of the High Middle Ages. A thirteenth-century assemblage of cranial bones and abdominal vertebrae from large cod and ling recovered at Leith suggests that a råskjær-like product was manufactured on-site, be it for consumption in nearby Edinburgh or export (Stronach 2002; cf. discussion of Cartergate, Grimsby, above). Similar anatomical patterning is evident in a cod and ling assemblage of thirteenth–fourteenth-century date from
the burgh of Eyemouth (Dixon 1986, 83). Large cod and ling are also well represented in thirteenth–fourteenth-century deposits in Aberdeen (Harland 2010). Here, however, the relatively even representation of different skeletal elements is consistent with local consumption. A few groups of bones from specific archaeological contexts may represent the remains of preserved cod that had been decapitated elsewhere. Otherwise bones from all parts of the skeleton show that whole fish were brought to the town (Harland 2010, 32) – a pattern similarly noted in twelfth–fourteenth-century deposits from Perth (Hodgson et al. 2011, 53–7).

Zooarchaeology also demonstrates that herring were an important catch in some areas of Scotland in the High Middle Ages. They continued to play a major role in the Western Isles, as in previous centuries (e.g. Ingrem 2005, 192–3), but were also caught in the Firth of Forth (Chapter 3) and consumed in the newly established burghs of the east (e.g. Hodgson et al. 2011; Stronach 2002). Salmon (Salmo salar), another of Scotland’s major traditional resources (albeit a migratory rather than truly marine species), is surprisingly poorly represented in the zooarchaeological record. Scottish customs were first applied to fish exports in the late fourteenth and fifteenth centuries (see below), making inferences regarding the scale of earlier trade impossible. Nevertheless, external sources record cargoes destined for both England and the continent in the thirteenth century (e.g. Littler 1970, 202; Rorke 2001, 183).

Our understanding of the chronology of the expanding sea fisheries in Ireland is limited by the present paucity of published fish bone evidence from its Hiberno-Scandinavian towns and the late medieval date of the first customs accounts to record Irish fish exports (Chapter 9; Chapter 19). Nevertheless, Trim castle reveals a thirteenth–fourteenth-century fishery for cod, and to a lesser degree other marine species, that were transported inland. The anatomical evidence suggests that these fish were whole, and thus perhaps fresh or only lightly cured (Chapter 19). A few cod and haddock bones were also traded inland as early as the tenth–twelfth centuries, with bones having been recovered from deposits of this date at Knowth (Chapter 19). In the south, as at eleventh–twelfth-century Cork, hake was the most frequent species, followed by cod and ling. This pattern prefigures an export fishery for these taxa known from late and post-medieval sources. The relevance of herring fishing is particularly hard to gauge, due to recovery bias, but one can perhaps interpolate its importance based on the earlier (tenth–early eleventh-century) consumption waste from Fishamble Street in Dublin discussed above and from later medieval archaeological and historical evidence for its export from Ireland (see below). Target species such as hake, ling and large cod imply open-water fishing, but coastal fish traps also continued to be built – with eleventh–thirteenth/fourteenth-century examples known from both the west (County Clare) and east (Strangford Lough) (Chapter 9).

In Scandinavia, as was already implied by the discussion above of inter-regional trade, the years between AD 1050 and 1350 witnessed the large-scale expansion of commercial fisheries, particularly those for cod (dried as stockfish) in the north and for herring (pickled in brine) in the western Baltic Sea. There is less evidence for changes in local consumption of fish, although the relative importance of different taxa did shift in specific contexts.

The date of the emergence of the stockfish trade from Arctic and western Norway has occasionally been a matter of debate. As is discussed above, some stockfish may have been exchanged within Scandinavia (or at least used as travellers provisions) during the Viking Age – as implied by finds from Haithabu (in modern-day Germany), for example. On the present evidence, however, initial expansion of the trade to include English and continental markets can best be attributed to the decades around AD 1100 (Chapters 4–5; Chapter 18). The Lofoten Islands proved to be the most consistently important centre, but production also occurred elsewhere: farther north in northern Troms and Finnmark (Chapter 4), around Borgund in western Norway (Chapter 6) and, as already discussed, probably also in the Scandinavian earldom of Orkney (which controlled Shetland and the northern mainland of Scotland in addition to Orkney itself). At some point in the thirteenth century, Icelandic stockfish were drawn into the trade as well (Chapter 7).

One consequence of the stockfish trade was the growth of Bergen as a major urban centre in the late eleventh and (particularly) twelfth centuries (Hansen 2005; 2015). Another was the development of permanent fishing villages along the coast of Arctic Norway (beyond the limits of cereal cultivation) by the mid-thirteenth century (Chapter 4). Yet another was the growth of trading ports in eastern England – such as King’s Lynn, Boston, Grimsby and Ravenserod – that relied in part on the exchange of English cloth and grain for Norwegian stockfish (Carus-Wilson 1962–3; Nedkvitne 2014; Rigby 1993). Many of these fish were sent on to urban consumers in centres of population such as London (Colson 2014; Orton et al. 2014; Chapter 16).

What began as a modest trade, of importance to northern producers but perhaps less so to southern consumers (Barrett 2012, 276–82), rapidly expanded in the middle decades of the thirteenth century. The evidence derives from diverse sources. In England, the earliest recorded formal trade agreement with Norway dates to AD 1223 (Helle 1968). In the fish bone record, London shows a rapid shift from consumption of whole cod to decapitated cod at much the same time (Chapter 16). Stable isotope analysis also suggests that imported cod first became common in England – particularly in London, but to a lesser degree also in other centres – in the thirteenth–fourteenth centuries (Barrett et al. 2011; Chapters 15–16). Historical sources indicate that direct Anglo–Norwegian trade was initially frequent, gradually being superseded by middlemen of the
German Hansa during the first half of the fourteenth century (Nedkvitne 2014).

Another consequence of the stockfish trade (and of the herring trade to be considered below) was the growth of the German Hansa itself. As in England, this development emerged from pre-existing trade. Towns of the lower Rhine region may have been one important early market. We know, for example, that Norwegians were trading at Utrecht by 1122 (Nedkvitne 2014, 33). Another locus of initial consumption was probably the western Baltic. Finds of decapitated large cod from late eleventh–twelfth-century Schleswig (Lübeck’s economic predecessor) may derive from imported stockfish, continuing a trend first proposed vis-à-vis neighbouring Haithabu (Heinrich 1987). This evidence has been central to the inference that emerging urbanism (rather than Christian fasting practices, for example) played a major role in the growth of fish trade and fish consumption in medieval Germany (Lampen 2000, 210–11). Following these possible antecedents, it was in AD 1278 that German merchants, led by Lübeck, first secured distinctive trading privileges in Norway (Nedkvitne 2014, 51). The influence of Lübeck and other Wendish towns increased thereafter, with occasional setbacks, and culminated in the establishment of a powerful Hanseatic Kontor at Bergen in the 1360s. Hanseatic ships carried some stockfish into the Baltic, but many were transported to England as part of a triangle trade that saw Baltic rye and German beer taken to Norway and English cloth transported to the east (Nedkvitne 2014; Unger 2002).

In southern Scandinavia and neighbouring areas of northern Germany, herring fishing grew into an export industry of major international importance in the years between AD 1050 and 1350. The most well-known fishery, in the Øresund, and adjacent western-Baltic waters around Scania, came to dominate the European herring trade by the late thirteenth century and continued to do so until the sixteenth century (Chapter 2). Its focus was the paired settlements of Skanör and Falsterbo. These were both fishing settlements and international markets, under the protection of the Danish kings and (from the thirteenth century) with officially recognised communities of German and Dutch merchants.

Before the dominance of Scania there was already a commercial herring fishery in the Western Baltic Sea. It was conducted from Rügen in Germany during the twelfth century (Jahnke 2009, 168–70). The first of a series of episodically-productive herring fisheries from the Norwegian (now Swedish) coast of Bohuslen, (Bohuslän) at the eastern limit of the Skagerrak, was also recorded in the 1100s (Alheit and Hagen 1997; Chapter 2). Moreover, herring may have been cured in Poland and northeastern Germany for small-scale inland trade already in the tenth and eleventh centuries, and this species comprised a high proportion of the fish bone recorded from the Viking-Age trading sites of Haithabu (see above), Wolin and Truso (Chapter 12). Thus the large-scale Baltic herring industries of the High Middle Ages emerged from pre-existing practices.

Although also rooted in earlier traditions, the Scanian herring fishery was of unprecedented scale and significance. Its branded, high-quality, barrels served Baltic and North Sea consumers and also reached distant markets of the continental interior. Holm (Chapter 2) estimates that, at c. 35,000 tonnes, the Scanian herring trade exceeded the volume of the important wine trade between Bordeaux and England by the early fifteenth century. Like that of North Atlantic stockfish, the trade of this commodity came increasingly under the control of the German Hansa. Lübeck was particularly influential, being well placed to control access to abundant supplies of salt mined at nearby Lüneburg and to widely distribute the finished product (Chapter 2).

Moving to the eastern Baltic, as already noted, we can see that herring had begun to be cured and traded in Poland by the tenth–eleventh centuries at the latest. The number of sieved medieval fish bone assemblages is not sufficient to observe how the importance of this species may have ebbed or flowed over the following 300 years. The changing use of cod can be observed, however, as this species grows larger and thus has bones that are more easily recovered by hand collecting. With very minor exceptions (one bone from Sopot and three from Kołobrzeg–Budzistowo), remains of cod only begin to occur in Poland (and then in small numbers) in assemblages of the thirteenth–fourteenth centuries. The find contexts are the towns of Gdaňsk, Kołobrzeg and Elbląg and the monastery of Stargard Szczeciński. The earliest chronology of these finds may be the second half of the thirteenth century, based on the most closely dated specimens (Chapter 12). The majority have stable isotope values inconsistent with an origin in the eastern Baltic Sea region. They are instead likely to represent preserved imports – stockfish or analogous products – from beyond the Kattegat (Orton et al. 2011; see also Orton et al. forthcoming). It is also striking that some of these bones are from individuals of greater than 100 cm estimated TL, larger than is typical for fish taken from the Baltic cod population (Chapter 12). Interestingly, their overall length distribution is bimodal, with peaks around 50–60 cm and 70–100 cm, perhaps implying stockfish were categorised by size, as is known from historical sources (e.g. Wubs-Mrozewicz 2009, 191).

The chronology of medieval cod finds in Estonia supports the Polish evidence (Chapter 11). In Tallinn, the best-dated examples occurred in contexts of the thirteenth and/or early fourteenth centuries. These finds were from excavations at 4 Rahukohtu Street (which revealed a residence of Danish conquerors within Toompea Castle) and at 10 Viru Street and 10 Sauna Street (which both represent more typical occupation in the lower town). The above-mentioned finds were all of vertebrae and cleithra, bones typically left in
preserved cod, such as stockfish. The same applies to cod found during excavations of broadly dated (thirteenth–sixteenth-century) material at Vanemuise Street in the inland town of Tartu. In both Tallinn and Tartu, some of the bones were from fish of between 95 cm and 125 cm estimated TL, larger than is typical for Baltic cod. Moreover, like the early cod from medieval Poland, stable isotope analysis of a sample of these finds shows that they are unlikely to have been caught in eastern Baltic waters. Sources in Arctic Norway, elsewhere in the North Atlantic and/or in the North Sea are more likely (Orton et al. 2011; forthcoming).

Two sites of thirteenth-and/or fourteenth-century date, namely, 1 Vabaduse Square in Tallinn and Karksi castle in southern Estonia, include trace numbers of cranial bones (no more than two per site) in assemblages that are otherwise also of postcranial specimens (Rannamäe and Lõugas forthcoming; Lembi Lõugas pers. comm.). These may be the first Estonian indications of medieval cod fishing in the eastern Baltic. The emergence of a local fishery for this species is clearly evidenced by later (fourteenth–sixteenth-century) finds of small cod, including cranial bones, from the coastal Estonian town of Pärnu (Chapter 11) and from Tartu Street in Tallinn (Russow et al. 2013; Lembi Lõugas pers. comm.). Cod from the inland town of Valmiera, upriver from the Gulf of Riga in Latvia, probably belong to this later development. They are broadly dated to the Middle Ages (Chapter 11).

Unlike in Poland, the earliest finds of herring in Estonia are contemporary with, not earlier than, the thirteenth–early fourteenth-century introduction of cod. Herring bones are represented in several assemblages from Tallinn, although they were not found in the Vanemuise Street excavations at Tartu (Chapter 11). The number of recovered specimens from medieval Estonian sites is still small, but because many of the relevant collections were hand collected, the importance of this species is probably underestimated on present evidence.

Although many of the earliest medieval finds of cod in the eastern Baltic region may be imports, a local fishery for this species did develop in the course of the fourteenth century, with its own distinctive traditions of butchery and curing (Chapter 12). One term, strekfuscz, was probably applied to both dried pike and dried cod. Its first mention, in 1328, relates to a purchase by the Teutonic Knights at Goldingen near Elblag (Hoffmann 2009, 119). However, most evidence for cod fishing and processing in the eastern Baltic post-dates AD 1350. One catalyst may have been the preceding trade of imported stockfish, which developed concurrent with Scandinavian and German colonization (Chapters 11–12).

The late Middle Ages: AD 1350 to c. 1550

Although their volume is difficult to quantify, Europe’s established sea fisheries reached a peak in the decades around AD 1300. Thus they tracked the apogee of High medieval demographic and economic expansion, prior to the economic, climatic and epidemiological challenges of the mid-fourteenth century (e.g. Campbell 2010). Some fisheries declined, temporarily or permanently, after the mid-1300s. Others prospered in a new period of expansion that culminated in the major (Dutch) North Sea herring and (Iberian, French and English) cod fisheries off Newfoundland of the sixteenth and seventeenth centuries.

The English ‘particular’ customs accounts provide unique, semi-quantifiable glimpses of the Norwegian stockfish trade during the changes of the 1300s. Imports may have reached 2000 metric tonnes per annum in the early fourteenth century, but probably fell to less than half of this after the famine of 1315–22 and the plague of 1346–53 significantly reduced Europe’s population (Chapter 5). Nevertheless, prices rose. Problems of supply presumably exceeded the reduction in demand, particularly in a post-plague world where the surviving consumers had more disposable income. Fishermen became comparatively wealthy, and migrants of diverse origin flocked to new fishing villages along Norway’s Arctic coast (Chapter 4). Direct imports of stockfish from Bergen to England (albeit mostly via Hanseatic ships by the mid-fourteenth century) continued until the late fifteenth century (Nedkvitne 2014, 161), by which time English fishermen were fully established in Icelandic waters (Chapters 7–8). Subsequently the main market for Norwegian cod was the continent. Germany continued to be a destination for stockfish from Bergen until c. 1700, albeit supplemented with fish from direct Hanseatic trade to Iceland, the Faroe Islands and Shetland, which first began in the fifteenth century (Friedland 1973; Mehler and Gardiner 2013; Nedkvitne 2014; Chapters 7–8). Holland also emerged as a significant market for Bergen stockfish from the fifteenth century (Wubs-Mrozewicz 2009, 195). Continued international demand meant that Arctic Norway had an economic ‘parachute’ in the wake of the crises of the fourteenth century. In the hundred years following the Black Death, fishermen received three times as much grain for their stockfish (Chapter 5). Settlement archaeology suggests that long-established fishing settlements, such as Borgvær in Lofoten, survived post-plague depopulation of the wider region (Wickler and Narmo 2014). The new, specialised fishing villages of Arctic Norway also prospered, and continued to do so beyond the end of the Middle Ages. They were abandoned in the seventeenth century, in favour of more diversified farming and fishing settlements, after a fall in stockfish prices that began around AD 1500 (Chapters 4–5).

The Scanian herring fishery also continued to prosper in the late Middle Ages. Systematic customs accounts regarding Baltic fisheries first become available in the late fourteenth century. As we have seen above, however, whatever the deleterious impact of late medieval depression, the sale of
barrelled Scanian herring was booming in the early decades of the fifteenth century. Annual exports were in the tens of thousands of tonnes, and c. 17,000 men participated directly in the fishery (Chapter 2). The value of barrelled herring vis-à-vis stockfish was also rising in the years between 1259 and 1550, presumably due to increasingly rigorous quality controls regarding the production of the former (Chapter 5). As a product, it reached as far inland as Switzerland (Jahnke 2009, 180). Barrelled herring of lower value were also made on the Baltic island of Bornholm, and from the fifteenth century, a commercial fishery serving local markets developed in the Limfjord of northern Jutland (Chapter 2).

The dominance of Scanian herring in international trade was ultimately superseded by Dutch catches from the North Sea, as far afield as the Northern Isles of Scotland, which were cured on-board ship. This practice seems to have begun in the late fourteenth or early fifteenth centuries (Unger 1978). It expanded in the sixteenth century (Bennema and Rijnsdorp 2015), with a shift from Scanian to Dutch barrelled herring in European shipping being evident by the time of the earliest Øresund toll registers of the 1560s (Chapter 2). The fish-bone evidence from late medieval Denmark is not abundant, but a decline in herring fishing may be evident in the zooarchaeological record from sites such as Tårnby, on the Øresund (Chapter 13). Here herring bones dropped to only 33% of the assemblage (by NISP) in the sixteenth century, from a high of 77% in the late tenth–thirteenth centuries.

In England, different sea fisheries expanded and contracted in the late Middle Ages. In the course of the late fourteenth and fifteenth centuries, West Country fishermen (especially from Devon and Cornwall) developed large-scale local and long-distance fisheries for such species as cod, hake and ling (Kowaleski 2000; 2003). The coast of Ireland was a major destination, but Iceland was also visited (see further below). On one occasion in 1438, fishermen of Saltash (in Cornwall) were fined for going to Finnmark (Arctic Norway) without licence (Childs 1997, 285). Temporary fishing stations (some operated by Gascon merchants) were established already in the early thirteenth century, but permanent fishing villages developed in the late Middle Ages, during the late fourteenth and early sixteenth centuries (Fox 2001; Kowaleski 2014, 47; Littler 1970, 203). Although the Black Death of the mid-fourteenth century reduced the number of fishermen and boats in some communities, the long-term trend was towards expansion in both the quantity of trade and the distances travelled (Kowaleski 2014). After John Cabot sailed from Bristol and ‘discovered’ Newfoundland in 1497, West Country fishermen played a major role in England’s migratory cod fishery in North America, plying waters that were initially most frequented by ships from France, Portugal and Spain (Candow 2009b; Kowaleski 2003; Pope 2004).

In contrast, the English east coast herring fishery experienced a serious and long-lasting decline from the second half of the fourteenth century (Kowaleski 2003, 191–8). Saul’s (1982; 1983) study of the fate of Great Yarmouth assembles diverse and persuasive evidence. To provide one striking example, in 1334 it was the fourth-highest taxed of England’s provincial towns (after Bristol, York and Newcastle), whereas by 1377 it was eighteenth (Saul 1982, 76). Crucially, its trade of preserved herring for Gascon wine (which had engaged 65 ships from Yarmouth in 1303–11) was in decline by the 1360s at the latest.

Great Yarmouth’s fate was not unique; the decline affected all of eastern England. The causes are open to debate given that the pan-European market for preserved herring remained strong. A variety of environmental and socio-economic challenges probably converged (Kowaleski 2003, 193–8). The harbours of many ports experienced siltation and/or destruction by storm surges in the fourteenth century. Another key variable was the decline in continental boats landing fish in England, in the face of political and military instability. Increasingly, fishermen from the Low Countries salted their catch on board and finished curing it in home ports – a trend that culminated in the practice of barrelling herring at sea which underpinned the post-medieval Dutch fishery mentioned above. Other factors influencing the decline of the English herring trade include major military requisitions of the fishing fleet and the superior quality of competing products. As noted above, imported barrelled herring, initially from the Baltic, began to find a market in England during the fourteenth century (Nedkvitne 2014, 517–18).

Another variable is the fact that emerging late medieval fisheries of the English West Country were better placed for the French wine trade, in which Yarmouth had played a leading role during the thirteenth and early fourteenth centuries. Most important of all, however, may have been the rising cost of labour after the Black Death, a critical variable in the decline of formerly large-scale salt production (by boiling sea water) in eastern England (Bridbury 1955, 26). The competitive advantage of the eastern English herring fishery must itself have evaporated in the absence of a cheap local preservative. Imported solar salt from Atlantic Europe was available to all from the late fourteenth century, but it was most accessible to the emerging fisheries of the southwest (Kowaleski 2003, 226).

As England’s fishery for North Sea herring ceased to be profitable, a reduced number of fishermen from diverse locations along the east coast shifted their emphasis to other species, especially cod caught in increasingly distant waters – in the North Sea (e.g. the Dogger Bank), off the coasts of Denmark and Norway and around Iceland (Childs and Kowaleski 2000). Direct English involvement in Iceland began in the first two decades of the fifteenth century (Childs 1995, 12). It entailed both trade for stockfish (preserved without salt by local fishermen) and fishing by
English vessels to make a product that was salted and dried (Chapter 8). These activities were not without controversy and political intervention, given that Hanseatic and royal Danish interests were best served if Icelandic exports were funnelled through Bergen. Yet the 1400s, nevertheless, became known as Iceland’s ‘English century’ (Chapters 7–8). Many settlements of varying scales participated, but the merchants of Hull (and of Bristol, in the southwest) were particularly involved (Childs 1995). Iceland remained an important source of dried cod for the English market into the seventeenth century (Jones 2000). Based on stable isotope and ancient DNA evidence, it is thought to have probably provided some of the provisions on the Tudor warship Mary Rose, which sank in 1545 (Hutchinson et al. 2015).

The decline of England’s east coast herring fishery saw the emergence of multiple competitors, only some of which have been considered thus far. Wales, a nation that has not yet figured in this chapter, has important evidence of early fish traps – in estuarine settings and on the western seaboard (e.g. Godbold and Turner 1994; James and James 2003; Turner 2002) – but not yet an abundant zooarchaeological record of medieval fish bone finds. Nevertheless, textual evidence reveals the existence of a coastal herring fishery before the thirteenth-century English conquest of Gwynedd (Chapter 3). It developed into a major commercial enterprise attracting migrant labour in the late fifteenth and sixteenth centuries (Kowaleski 2003, 219–20).

Scotland’s sea fisheries also prospered in the fifteenth and sixteenth centuries. Royal customs on herring were introduced in 1424 (Rorke 2001, 197), and the volume of exports rose dramatically in the sixteenth century (Rorke 2005, 153). Salmon were the target of initial customs charges in 1398 and of systematic taxation from 1425 (Rorke 2001, 182–3). Exports of cod were explicitly added to the Scottish customs system in the 1460s, having previously been evident from anecdotal sources (Rorke 2001, 197; see also above). The availability of solar salt from western France, which increased from the 1360s (Bridbury 1955, 67), must have partly fuelled this increase in trade, particularly of barreled herring and barreled salmon. The Scottish picture was not, however, a uniform one. As noted above, local dried cod production declined in late medieval Orkney (governed as a Scandinavian earldom until 1468) in the wake of political interventions by the expanding kingdoms of Scotland and Norway that temporarily weakened the archipelago’s international connections (Barrett 2012).

As in so many of the regions discussed, Ireland’s marine fisheries boomed in the late Middle Ages, before a decline in the seventeenth century following the suppression of independent Gaelic lordships. By the fifteenth century, fish were one of the island’s main exports, and Irish waters also attracted fishermen from distant shores (Chapter 9). Trips from England’s West Country have been mentioned above, but in the late fifteenth and sixteenth centuries, Breton and Spanish vessels were also very active along the Atlantic coasts of Ireland, trading with Gaelic lordships and reaching agreements that allowed them to make their own catches. Cod, ling and hake were the main targets of these migrant fisheries. Cod and ling were also caught in the Irish Sea; some were processed for later consumption at Arran Quay in Dublin in the fifteenth–early sixteenth centuries. But herring constituted the major catch along Ireland’s eastern and southern coasts (Chapter 9; Chapter 19). Many of these herring were cured for export. The evidence is mainly historical, probably due to limited use of sieving during the recovery of archaeological fish bone assemblages, but a consignment of barreled herring from the wreck of the sixteenth-century Drogheda boat provides a clear example of Ireland’s trade in this commodity (Harland 2009).

Fishing and fish trade also increased in the eastern Baltic Sea (east of Bornholm) in the late Middle Ages. Stable isotope evidence suggests a shift in the origin of cod bones found in towns such as Gdańsk and Uppsala. Many thirteenth–fourteenth-century specimens may represent imports from beyond the Baltic Sea (e.g. Norwegian stockfish), whereas most fifteenth–sixteenth-century finds have comparatively local isotopic signatures (Orton et al. 2011). This trend is supported by zooarchaeological evidence regarding butchery patterns, with later medieval assemblages being more likely to include skull bones and cod of small estimated TL (Jonsson 1986; Chapters 11–12). Of note is a distinctive method of preparing fish for drying that was applied to both cod and pike in the eastern Baltic Sea region: anterior vertebrae were removed, but cranial bones and caudal vertebrae were both left in the finished product. This pattern was first recognised in fifteenth–sixteenth-century Uppsala (Jonsson 1986), but it has also been identified tentatively in a fifteenth-century assemblage from Mala Nieszawka, a castle of the Teutonic Knights near Toruń. It can be equated speculatively with the Baltic dried fish product known as strekfuš, which seems to have been variously manufactured from pike and cod, and which begins to appear in historical sources during the fourteenth century (Hoffmann 2009; Chapter 12; see above). Baltic stockfish were also manufactured in the late Middle Ages, with Hel (near Gdańsk) and Curonia being two known centres of production (Nedkvitne 2014, 130). The late medieval growth of fishing and fish trade in the eastern Baltic occurred against a backdrop of major urban expansion and cultural influences from Scandinavia, the Teutonic Order and the German Hansa (Hoffmann 2009; Orton et al. 2011; forthcoming; Chapters 11–12).

**Conclusions**

What then are the answers to the eight questions posed at the outset of this book (Chapter 1)? First, was the growth of early medieval sea fishing a correlate of state formation
and urbanisation? Urbanism was a key variable in many contexts, ranging from the Baltic and North Sea wîces of the ‘long eighth century’, to the urban boom associated with the turn of the first and second millennia AD, to the growth of medieval towns in the Baltic region between the twelfth and fourteenth centuries. Sometimes urbanisation, state formation and fish trade went hand in hand, as in the conquest of Polish coastal towns by the Piast dynasty in the tenth century or the royal Norwegian investment in both the Lofoten fisheries and in Bergen in the years around AD 1100. In other cases (such as Truso in Poland) incipient urbanisation and its appetite for sea-fish could precede state formation, and of course urban growth continued long after the initiation of political centralization in all regions of northern Europe.

Secondly, were sea fisheries developed in response to social drivers, such as Christian fasting practices, elite demand and/or the cultural foodways of migrant communities? The role of elite demand (and investment) was probably critical in stimulating many of northern Europe’s sea fisheries, from the provisioning of estate centres in Anglo-Saxon England to Hanseatic and royal Danish involvement in the Øresund herring fishery. Elite demand was direct, through the requirements of supplying households, and indirect, through the need for wealth from taxation and other renders. Medieval migrants also played a role in spreading traditions of sea fishing and/or sea-fish consumption. Examples range from Viking Age Scandinavian settlement in parts of Scotland to western influence in the eastern Baltic region during the thirteenth and fourteenth centuries. The role of Christian fasting has been more controversial. During the High and late Middle Ages it clearly helped foster a market for stored fish products suitable for consumption at times such as Lent. In earlier centuries, however, the evidence has proven ambiguous (cf. Barrett et al. 2004, 629–30; 2011, 1523; Frantzen 2014, 232–45; Lampen 2000, 210–11). Moreover, demand for sea-fish existed even among non-Christian communities (e.g. Viking Age Scandinavians). Nevertheless, in some contexts Christianisation converged with state formation as a probable catalyst for growing fish trade, as in tenth-century Poland.

Thirdly, was there an unprecedented sea-fishing revolution at the turn of the first–second millennia AD? There are exceptions to the hypothesised rapid ‘fish event horizon’ in England and elsewhere around the North and Baltic seas c. AD 1000. Earlier examples of sea-fish consumption exist, even in England, and the chronology of expanding fishing activity can be tracked over centuries rather than decades in contexts such as Flanders. Nevertheless, sea fishing did increase in importance across most of the geography covered by this book in the years between AD 850 and 1050. More sea-fish bones are found at more sites and/or farther from the coast. Even in cases where earlier finds of marine fish bones have been made (at Bishopstone in southern England, for example), stable isotope analysis of human bones suggests that marine protein was not yet a major contributor to diet. With specific exceptions (e.g. from Scandinavia and the coast of eastern England), isotopic evidence for substantial consumption of the sea’s harvests dates to the Viking Age and later.

Fourthly, did sea fishing expand as a result of human impacts on freshwater ecosystems? The authors of the chapters in this book are divided on the issue. What is clear is that the consumption of freshwater fish declined in quantitative importance through time, both in absolute numbers and in relative terms vis-à-vis marine fish. Where the evidence is available, as at York, it is suggested that this decline may have been associated with a decrease in fish size. However, it is difficult to know how representative this case is of wider patterns. In Belgium, for example, there are differences in the representation of freshwater fish between urban and rural assemblages, suggesting variable access and/or differing degrees of human impact on aquatic ecosystems. This issue clearly merits more research. Nevertheless, the fact that freshwater fish were increasingly monopolised by the elite (often via aquaculture using fish ponds) – and protected by legislation – in the High Middle Ages (Dyer 1988; Hoffmann 2014, 272; Serjeantson and Woolgar 2006) may imply that they had become rare in the wild.

Fifthly, could marine fisheries of the High Middle Ages have overfished formerly superabundant species, such as cod and herring? Human impacts on premodern marine ecosystems have been demonstrated in other contexts (Rick and Erlandson 2008; Roberts 2007). Moreover, catches to fuel the major trades of stockfish and barrelled herring were large in scale and of great economic importance. Nevertheless, based on the present evidence and on comparison with twentieth- and twenty-first-century data, it seems that fishing pressure on the Norwegian (northeastern Arctic) cod used for stockfish production was probably sustainable (Chapter 5). Moreover, although herring catches in the late medieval Øresund fishery did exceed those of around AD 1900, the fishery continued to be successful into the sixteenth century, and its demise is best explained in terms of political change (Chapter 2). We cannot yet quantify the scale or impact of fishing pressure in the North Sea during the critical years of expansion around AD 1000, and medieval Irish Sea catches are also unmeasured. Despite promising efforts, it is also not yet possible to disentangle the impacts of human predation and natural processes (such as climate change) on the growth, chemistry and genetics of marine species as inferred from scientific analyses of skeletal remains (e.g. Bailey et al. 2008; Bolle et al. 2004; Ólafsdóttir et al. 2014). In cases where there were clear reductions in sea fishing and/or the size of marine fish caught during the late Middle Ages – such as cod fishing in Orkney and Hordaland, or herring fishing in East Anglia – socio-economic changes are the most likely explanation. Overall, it is too soon to make generalisations regarding the possible impact of medieval sea fishing on cod and herring. As with human impacts on freshwater fish, much important work remains for the future.
Turning to the sixth and seventh questions, when did the long-range trade of high-bulk and low-value staples, such as salted herring and dried cod, really begin? When did such trade expand to a pan-European scale? The answers are closely tied to trends in the emergence and growth of urbanism and elite demand noted above. Around both the Baltic and North seas, herring were an important staple in the wics of the ‘long eighth century’. Many must have been cured for transport, because herring spoil quickly and some of the sites, such as Dorestad and York, are inland river ports. The butchery evidence from Truso in Poland may even suggest early experimentation with the gutted cure later made famous by the Scanian and Dutch fisheries. By the eleventh century, the large-scale herring fisheries of eastern and southern England may already have been exchanging salted and smoked fish for continental wine, a pattern better evidenced from the twelfth century and, particularly, the thirteenth century. Gascony (and briefly La Rochelle) were the focus of this trade by the time that historical records became abundant, but earlier sources of wine, along the Seine and the Rhine, may have been the first destinations of English herring exports. In the eastern Baltic, herring were being transported to inland strongholds of the Piast dynasty by the tenth–eleventh centuries. In the western Baltic, an export fishery of barrelled herring developed in Rügen during the twelfth century, partly under the influence of the growing town of Lübeck. In the thirteenth century, the focus of production shifted to Scania, culminating in the largest known medieval fishery.

The cod trade has a different chronology and geography. In Norway, there was a lengthy tradition (that stretches into prehistory) of producing stockfish. On present evidence, we can suggest that its transport to Scandinavian towns as part of a commercial trade is likely to have begun by the eleventh century at the latest. Export of stockfish beyond Scandinavia, in exchange for cloth, grain and wine (beer was imported only after 1200), probably also began on a small scale in the eleventh to twelfth centuries. However, it is in the thirteenth–fourteenth centuries that this product becomes most visible in the fish bone record of consumer settlements around the North and Baltic seas. By this date some small-scale producers (in Orkney, for example) were being excluded from the market, whereas others, such as Icelanders, were incorporated into the international stockfish trade. Elsewhere, cured (probably dried and salted) gadid products were being manufactured in settlements of the Scottish, Irish and English coasts by the thirteenth–fourteenth centuries at the latest. These became major articles of trade in the course of the fourteenth and fifteenth centuries.

Lastly, to what degree did demand for sea-fish influence the increasingly ‘global’ destinations of late medieval mariners? The answer to this question has occupied a central place in the popular perception of fisheries history (e.g. Kurlansky 1997; Fagan 2006). Many goods were widely exchanged in medieval Europe, including the cloth, grain, wine and beer for which cod and herring were sometimes traded (Berggren et al. 2002). Moreover, the transport of luxuries such as pepper entailed pan-Eurasian networks throughout the chronology of present concern (e.g. Loveluck 2013, 123, 315). Nevertheless, the combination of high-bulk cargoes, long-distance transport and seafaring competence involved in fishing and fish trade means that these activities made a particularly significant contribution to emerging globalisation at the transition from the Middle Ages to the Renaissance. Long-range interconnections and geographically differentiated specialisations of labour connected every axis of the compass rose. Stockfish from Arctic Norway found their way to Tallinn and Tartu. Herring from the North Sea were enjoyed in Bordeaux. Herring from the Baltic Sea were consumed as far inland as Switzerland. Spanish, French and English fishermen caught Irish hake. Icelandic cod, probably transported by English fishermen, provisioned the crew of the Mary Rose. Thus the migratory Newfoundland fishery that began in the sixteenth century – which exceeded the North American fur trade in economic importance (Candow 2009a, 411) – was only an incremental step from late medieval distant-water activities. Yet the complex consequences of this step, and all that preceded it, were not trivial. Medieval fish trade entailed a self-perpetuating drive for more fish from more distant waters. It created opportunities for wealth creation on an unprecedented scale. It contributed to extensive long-range trade networks. It made regional economies susceptible to contingent access to products and markets. It made even ‘remote’ communities prosperous, but also exposed them to conquest, economic domination and/or disease. Lastly, it created the preconditions for long-term impacts on marine ecosystems that continue to unfold.

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