THE CATCH CORRIGENDA

p.90 pp. ***_*** should read pp.165–167.

p.375 pp. ***_*** should read pp.268–269.

p.421 Klosterliteralien Tegernsee (KLTeg) and the five items under that heading should appear as a subentry under Munich, Bayerische Hauptstaatsarchiv (BHSA).

INTRODUCTION CONSIDERING FISHERIES

0.1.2 From Fish to Commodity

A possibly tendentious overview of the twentieth-century cod collapse: For two human generations from the 1950s international 'cod wars' flared around the North Atlantic, pitting Iceland against Britain, Norwegians against Russians in the arctic, New Englanders against Maritimers, Canada against Spain on the offshore banks.[1] While in the name of economic efficiency central governments favoured heavily capitalized offshore trawlers, provincial interests sought to protect livelihoods and communities of traditional inshore fishers.[2] Meanwhile critical regional cod populations were failing.

Suddenly in the 1990s the evidence could no longer be denied. The Arcto-Norwegian stock, which had yielded a peak catch of 1.3 million tonnes in 1956, fell by 85 percent to 212,000 tonnes in 1990 and fisheries managers predicted complete collapse. From Georges Bank every year in the early 1990s fishers removed about 60 percent of the resident cod, haddock, and yellowtail flounder, a rate of depletion which drove the spawning population to one-tenth its historic size. Contemporary estimates put the Newfoundland cod stock at but 1 percent of its original size (however determined).[3] As compiled by FAO, long-term global catches of cod peaked just over three million tonnes in 1962, then fell below half that figure in 1990 and below one million after 2000. By the end of the twentieth century the International Union for Conservation of Nature (IUCN) had placed several historically major populations of *Gadus morhua* on both sides of the Atlantic on its Red List of Threatened Species, where they remain.

In response European states grudgingly emulated Icelanders to set tight quotas on captures in their waters, and federal authorities in the United States and Canada imposed moratoria and strict limits on the cod (and other) fisheries in their exclusive economic zones of the

[1] Hart, *Anglo-Icelandic Cod War*; Jónsson, *Friends in Conflict*; Pontecorvo, ed., *Fisheries Conflicts*; VanderZwaag, *The Fish Feud*; Dewar, *Industry in Trouble*.

[2] Pross and McCorquodale, *Economic Resurgence*; Matthews, *Controlling Common Property*; Rogers, *Oceans Are Emptying*.

[3] Barinaga, "New study," 1043; Myers et al., "Population dynamics of exploited fish stocks," 1106–1108; Cramer, "Troubled waters," 22–26. Retrospective analysis by Frank et al., "Trophic cascades," concluded the nadir was at less than 5% of maximum historic biomass.

northwestern Atlantic. Although some governments backed up restrictions with elaborate, if inadequate financial aid to thousands of suddenly unemployed fishery workers, a five-century-old human way of life along the Atlantic coast was destroyed. Life in aquatic communities was transformed, too. By a process called trophic cascade, reduction of cod to local relict populations freed the next level of predators to retain more of the ecosystem's energy; lobster, squid, shrimp, crab, and smaller piscivorous fishes grew in number … and in time came to support a smaller, more precarious, population of human fishers as well. Young cod, however, exposed to many more of their own predators, have in a quarter-century failed to reestablish that species' former dominance.[4] Ecologists refer to a 'regime change'.

0.1.4 Telling Tales in Time and Space

While I am well aware that invertebrates play key roles in aquatic systems and occasionally in human diets, this book necessarily focuses on fish. Animals placed by traditional Linnaean taxonomy in class *Pisces* are in recent phylogenetic classification seen as that part of Phylum *Chordata* Subphylum *Vertebrata* not included among the four-limbed *Tetrapoda.* This includes three extant classes: *Cyclostomata* (lampreys and hagfishes), *Elasmobranchii* (sharks and rays), and *Osteichthyes* (bony fishes). Other organisms enter this study only when plainly relevant to the fishes pursued, consumed, and discussed by medieval humans.

This historian and publication lack capacity to integrate all aspects of ecosystems. Zooarchaeological communities dedicated to fish remains coincide little with those who study molluscs or arthropods, and soft-bodied organisms rarely leave remains of any kind. Medieval sources mentioning the acquisition or consumption of invertebrates are vastly more rare even than those on fishes. Likewise, medieval hunting and consumption of marine mammals (seals, whales) is another specialized historical pursuit and story of the past.

0.2.2 Interrogating What Remains

Price references, once critically framed, can illuminate where fish fit into budgets of households rich and poor and hence into dietary choices. They indicate something of a fishmonger's or fisher's prospects for financial returns. Relative prices may reveal regional tastes and, perhaps,

[4] Fisheries Resource Monitoring System, http://firms.fao.org/firms/en (consulted 1 June 2018).

changes in supply at both short and longer terms. How do we know about medieval fish prices? At least three genres of sources each need a different approach.

General narrative descriptions: individual or collective assertions that at some time or place fish in general or a named variety were thought cheap or expensive, whether generically (as by Abelard in the mid-twelfth century) or for some special reason (as associated variously with availability to elites or the poor). Assuming the text is authentic, it remains anecdotal and commonly qualitative, recording the perception of a medieval person in certain circumstances, but needing placement in some broader preferably comparative, context.

Individual local statements of price, whether as observed or as set in normative regulations. These differ from the previous class by being quantitative in nature, identifying the fish variety, the unit of measure (a given number, weight, volume, etc), and the currency. Reference may be to general market conditions (as present in some merchants' manuals) or to specific transactions. Regulated prices, common in several medieval settings, may be thought possibly wishful on the part of authorities but unlikely to have deviated wildly from the actual situation. Reference to multiple taxa in the same legislation allows for comparison, as does reference to other foodstuffs or wages. Still even the latter data point can provide only momentary local glimpses, although successive enactments by the same agent ought to suggest changes or stability over time. A caveat: two such references separated by even a few years do not themselves identify a trend nor sustain inference of a straight line development between the two dates. Wherever annual or even seasonal series are available large short-term fluctuations are the norm. Lines on charts in *The Catch* connect only consecutive data entries, others are shown only as points.

Price series are chronological listings of price for a specific commodity in a certain place/region as occurring over time. Such data sets, for all their being essential to discuss temporal variations, present great problems in studying medieval fisheries. Historian Claude Hocquet asserted in 1987 "Il est prématuré et imprudent de prétendre tracer dès maintenant une histoire des prix et leur évolution."[5] He then went on to attempt a bit of just that, as have others. But while Robinson and Starkey, "Sea Fisheries, 1376–1976," 139, explicitly urged basic research on fish prices in medieval England, ironically one of the better-served regions, a generation after their writing little has changed.

[5] "Pêcheries médiévales," 53.

Almost none of the extant series are themselves original records, but rather laboriously compiled by recent historians from individual entries in a consistent run of sources, whether a temporal sequence of regulations or, preferably, from actual accounts of transactions. The best of the latter are extracted from records of long-running institutions (hospitals, municipal or other governmental/seigneurial agencies, etc.) or notarial compilations of sale contracts. Medieval sociocultural practices of literacy and numeracy and the historical equivalent of taphonomic destruction together made such records few and the task of extracting price references tedious. Institutional purchases in some settings appear to have been consistently at lower price than true retail.[6] Consistency in the product, locality, measurement units, and currencies (or at least the ability to convert to standard units) is essential. Published series indiscriminately mixing transactions in dried and fresh cod, brined and smoked herring, or tench and trout are worthless.[7] For reasons probably relating to the sociology of historical research in the nineteenth and twentieth centuries, most published or otherwise accessible series of medieval prices in general and fish in particular were undertaken well before about 1950 and completed by the 1970s. The Allen –Unger Global Commodity Prices Database (www.gcpdb.info) compiled by Robert C. Allen and Richard W. Unger brings together in digital form materials from books otherwise difficult to consult, so it is a vital source for any research on medieval prices, fish included. Still, no critically worthwhile series for fish begins before 1200, only a handful start before the mid-fourteenth century, and only a few dozen provide useful (multi-decade) runs predating 1530. No series known to me refer to varieties taken in fresh water or on markets of France or Italy. It is almost an indictment of generations of economic historians to admit that only Earl Hamilton in the 1930s attempted to construct from anywhere in Mediterranean Europe (Iberia, southern France, Italy) price series for such standard commodities as sardines, hake, or *tonnina*.

The diverse preparations and points of origin for most varieties plus paucity of critical local price series and their generally tardy inception (fifteenth century or later) together still constrain analysis. Even for

[6] Grafe, *Distant Tyranny*, 51.

[7] Thorold Rogers *History of Agriculture and Prices*, vol. 1, pp. 635–641; vol. 2, 552–557; vol. 3, 310–344; and vol. 4, 526–545, so blends various herring products as to be almost useless; and D'Avenel, *Histoire économique*, vol. 3, pp. 271–278, though nominally French, simply copies English herring prices from Rogers, *History*, and then in vol. 4, pp. 340–344, bundles together individual purchases of diverse types, quantities, and packages of herrings at different locations in France and elsewhere, which can have no interpretive meaning.

northwestern Europe no scholar has hitherto (publicly) tried to synthesize what serial data exists into a wider view where local perturbations may be identified and filtered out. Extant data sets must be selected with caution to explore very specific issues and not 'price history' in general. Nevertheless, concerted research efforts to assemble and make publicly available fish price series from medieval Paris, Lyon, Milan, and especially the rich archives of Florence and Venice deserve high priority.

CHAPTER 2 PROTEIN, PENANCE, AND PRESTIGE

2.1.1 Fish on Medieval Menus

a. Among other later medieval locations with rich evidence of fish consumption can be mentioned the seven farms, now mounds, of Helgy parish, Norway, where 70 percent of recovered bones came from fish, and nine-tenths of those were cod.[1] At the same time (*c.* 1400), the family living in a fine town house in Tarquinia, coastal central Italy, ate what the analyst called "a great diversity of excellent food species," including common eel, cyprinids, and pike from local inland waters, and a dozen marine taxa, most commonly sea breams, mullets, and marine eels.[2] Meanwhile along the Austrian Danube and its alpine tributaries such well-sieved late medieval sites as latrines in Vienna's Stallburg and the abbey of St. Pölten provide thousands of fish bones from as many as thirty-four species, but from the sea only herring, a few cod, and a handful of flatfishes.[3]
b. Further financial records of elite household fish consumption

Budget planners for English king Edward IV in the 1470s projected fish as a tenth of the annual maintenance costs for knights of the household, while the actual expenditure accounts from Westminster abbey during the 1490s–1530s record annual purchases of fish totaling five tonnes dressed weight, twice that recorded for animal meat, and providing 12 percent of the calories consumed by the monks and their attendants.[4] Employing another methodology, historian Philip Slavin used kitchen accounts kept by well-documented English religious houses in the generation before the Black Death (i.e. early fourteenth century) to extrapolate an average daily per capita caloric intake in the range of 2,000 kcal, of which about 8 percent (165 kcal) came from fish; high-status households consumed more, low less. After the Black Death, at least some of the well-recorded increase in meat and dairy consumption came at the expense of fish.[5]

[1] Holm-Olsen, "Economy and settlement pattern."
[2] Clark et al. "Food refuse," 241–242. Some fish vertebrae here had passed through human digestive systems.
[3] Galik et al., "Fish remains as a source," fig. 2 and table 1.
[4] Myers, ed., *Household of Edward IV*, 108–110; Harvey, *Living and Dying*, 46–51. Early sixteenth-century household accounts from the counts-palatine of the Rhine and from their longtime rivals, counts of Leiningen, both put fish at about 11% of expenditures for foods other than cereals (Fouquet, "'Wie die kuchenspise sin solle'," 20; Bull, "Wirtschaftliche Verflechtung der Pfalz," 88).
[5] Broadberry et al., *British Economic Growth*, 288–289, recalculating data from Philip Salvin as there cited.

2.3.2 Scales of Value

In the early 1300s *ad valorem* customs dues paid for fish on entry into Paris came to only 4 denier on a load of salt or pickled herring and 16 denier on fresh herring or salt cod, but 4 sou 6d (54d) on rays, 8 sou (96d) on ordinary fresh fish, and 9 sou (108d) on whiting. Market ordinances from towns along the Catalan and Valencian coast then rated sturgeon the most costly fish at 8 *dinar* per pound, lamprey and shad almost as high, and a diversity of marine species down to less than a single *dinar* for anchovy and certain sea breams. At contemporary Bologna a pound of sturgeon was priced sixteen times one of crayfish.[6] The Innsbruck town council in 1470 established 8 kreuzer for a two-pound pike and 5kr for a carp of the same size, while an equal quantity of smaller fishes went for 3kr.[7]

2.4.1 Costly Food at Any Level

At Palermo, seaside principal residence of the Aragonese kings of Sicily in the years around 1400, fresh sardines and other common local fishes at 28d per pound outstripped the best lamb at 22d. On fish days there and at Catania favoured tuna, eel, and seasonally available tench and shad reportedly went for two and three times what meats cost on flesh days. Fish at double the price of meat was also then the norm in Florence.[8] In 1430 the town council at Amberg in the Upper Palatinate set the price for carp at half that for pike but six times that for pork and nine for mutton. Price series from Augsburg covering the last third of the 1400s indicate a kilogram of herring steadily about the same price as 2.6 kg of beef, but,

[6] Hocquet, "Pêcheries médiévales," 154–155; Mutgé i Vives, *La ciudad de Barcelona*, 19–20, and "L'abastament de peix i carn," 109–136; Ayza Roca, "La pesca en la València," 169–180; Curto Homedes, "El consum de peix," 152–158; Lleonart et al., "Marine species and their selling prices in the Crown of Aragon"; Pini, "Pesce, pescivendoli e mercanti," 335; Pucci Donati, "Il mercato del pesce." Agents for Pope Benedict XII (1335–1342) paid as much for a single local Garonne salmon in Toulouse as they did for a thousand salt herring (Weiss, *Versorgung des päpstlichen Hofes*, 392–394).

[7] Stolz, *Geschichte der Gewässer*, 377

[8] Bresc, "La pêche et les madragues," 167–169. A pound of the cheapest Florentine fish, *lasche* at 1 soldo 10 denari, came to 15% of a labourer's daily wage (Pinto, *Toscana medievale.*, 95, 101–102 and 141–144). By mid-century at Siena a kilogram of fresh sea fish at 5–6 soldi was twice the price of a chicken at 2–3s, but less than 'a big chicken' at 7s (Balestracci, *Renaissance in the Fields*, xxii).

when grain prices began to rise, that herring's equivalent in wheat went from 11.5 kg in the 1460s to 7.5 kg in the 1490s.[9]

2.4.2 Fishing for Subsistence, Sale, or Play?

Of course the analytically necessary contrast between subsistence and artisanal commercial fishing should not be overdrawn. Certain thirteenth-century Breton coastal fishers were obliged to fish conger throughout the summer and provide the catch to their seigneur, who gave them a fixed sum for each fish. Competition by selling the catch elsewhere allowed the lord to expel the miscreant from his tenure.[10]

[9] Cnopf, *Entwicklung der Teichwirtschaft*, 20–23; Hitzbleck, *Bedeutung des Fisches*, 105–108, concurs.
[10] Darsel, "Conditions du métier," 478.

CHAPTER 3 TAKE AND EAT

3.1 Local Supply

Some Additional Archaeological Sites with Predominantly Local Fish Consumption Dated before 1100 (by Region in Roughly Chronological Order)

At a sixth/seventh- century chieftain's household on Bornholm, 95.6 percent of fish remains were herring.[1]

Four of five excavated villages (primarily seventh/eighth-century) along the Bavarian Danube contained bones of food fish, specifically carp and barbel native to those waters. No marine organisms occur.[2]

From what excavators described as "a very rich pit of elite garbage" dated to the late seventh or early eighth century (so contemporaneous with Trier's St. Irminen convent) at a Merovingian hunting lodge on the eastern slope of the Vosges came 197 fish bones and 62 scales, the largest share being cyprinids native to the upper Rhine basin.[3]

In a carefully excavated late sixth-century Lombard fort at Monte Barro near the outlet of Lake Como, two-thirds of the numerous identifiable fish bones were from cyprinids, notably rudd and tench, and another 20 percent from pike. With the traces of eel and trout, all five species there recovered remain resident in Lake Como and nearby waters today.[4]

At Brescia, located a long day's walk equidistant to two large subalpine lakes, both early Lombard settlers and eighth–eleventh-century monks ate fish from the neighbourhood. Pike bones dominate the sieved samples from the monastery of St. Giulia, with cyprinids (tench and chub) also strongly represented and fewer trout, eel, and sturgeon. Those monks ate no detectable marine organisms.[5]

The pattern of remains seen at San Vincenzo (see text) was typical of multiple early (and even high) medieval sites in Rome, Lazio, and regions further down the peninsula, with big native freshwater varieties, notably

[1] Enghoff , "Fishing in the Baltic" and sources there provided.
[2] Schäffer and von den Driesch, "Tierknochenfunde," 25–26.
[3] Putelat and Logel, "Une chasse aristocratique," 261–263.
[4] Baker, "Fauna," and Baker, "Subsistence," given context in Baker, "Rôle de la chasse," and Baker and Clark, "Archaeozoological evidence." Gabriel, "Fish assemblages," found only freshwater pike and cyprinids at Padua's sixth–seventh century baptistry and Ward-Perkins, "Informazioni," just chub, pike, and tench at tenth-century Pavia.
[5] Baker, "Vertebrate remains."

tench and pike, accompanied by local estuarine species. The latter emerge as the leading food fish only from Naples south, where freshwater habitats were few.[6]

From the monastery established on a headland called Hartlepool in northeastern England about 640 and abandoned before 800, remains of eighteen taxa were recovered. Bones of eel, flatfishes, small gadids, small salmonids, and herring predominated in that order. As the analyst put it, "the fish eaten were dominated by species from freshwater, estuarine and shallow waters off the shoreline, and reflect a completely different pattern of fishing from that evidenced in the [later] medieval period."[7]

The handful of fish bones dating to the seventh–ninth centuries from a religious site at the mouth of the Firth of Forth all belong to the marine and migratory varieties to be expected at its inshore location.[8]

Analogous to Haithabu but further east in the Baltic at Truso, a Viking trading post beside a Prussian estuary, half the 4,729 sieved and identified fish bones of late eighth–early tenth-century date came from local cyprinids, most commonly bream, and a quarter from sturgeon, with further appreciable representation of perch, pike, and pike-perch. The condition and context of the herring remains (13 percent but nearly all from one ninth-century feature) cause the analyst to judge them as trade goods, not a local product[9]

Likewise, up to the 1200s people at Gdańsk, farther east than the herring schools, ate few of those fish and mostly the same species as at Truso. In both cases the large size of sturgeon may have provided the bulk of fish food.[10]

At Hitzacker on the lower Elbe, kitchen waste from the eighth–eleventh-century residence of a Slavic prince yielded 260 identified fish bones (and later periods still more): 132 came from pike, 86 from ten species of cyprinids (with 1 carp) and 36 from sturgeon, all of them resident in the Elbe. Local transition to German culture and settlement over the twelfth–thirteenth centuries left those ratios unchanged and

[6] De Grossi Mazzorin, "I resti archeozoologici," 53–59 and 79–80. Battafarano and De Grossi Mazzorin, "Analisi dei resti ittici," found three Byzantine sites in Apulia full of grouper, mullet, and sea bass. Ditchfield, *Culture matérielle*, 331–334, further documents the importance of coastal and lagoon fisheries in southern Italy during Byzantine and Norman times.

[7] Locker, "Fish bones … Hartlepool" (1988), 201, and Locker, "Fish bones … Hartlepool" (1990).

[8] Cerón-Carrasco, "Fish and marine-shell remains."

[9] Makowiecki,, "Janow Pomorski."

[10] The 'preliminary' study of Susłowska and Urbanowicz ,"Szczątki kostne ryb," was further summarized and interpreted by Zbierski, "Ichthyological studies on fishing"; Kubasiewicz, *Badania Archeozoologiczne*, 243; and Rulewicz, *Rybołówstwo Gdańska*, 61.

added only a half-dozen remains of fish from the sea. But this site was not sieved.

Consumption trends at mid- to late Anglo-Saxon/Viking York, type site for the "Fish Event Horizon," roughly parallel those in London (see O'Connor, "What shall we have for dinner?"; Harland et al., "A case study"; Harland et al., "Fishing and fish trade").

Tenth–eleventh-century contexts at Norwich yielded up to 90 percent herring and eel with only a few other estuarine fishes.[11]

From late tenth-century contexts at Eynsham monastery in inland Oxfordshire have come only small bone assemblages dominated by eel and pike, but more numerous finds from the last Anglo-Saxon generation (mid-eleventh century) yield 60 percent herring bones, followed by the eel and pike.[12]

Waste discarded from the tenth –twelfth-century kitchen at the castle of the counts of Sulzbach in northern Bavaria (Upper Palatinate) contained bones of pike, carp, and several smaller cyprinids, all native to still waters of the upper Danube basin.[13]

The pattern seen at Sulzbach also held in table scraps from an eleventh–twelfth-century collegiate church on a tributary of the Moselle in Saarbrücken: 474 fish remains held no marine species and 67 percent cyprinids.[14]

A few days' travel up the Somme estuary, so as near the sea as Ghent, a tenth–twelfth-century deposit beside Amiens cathedral yielded 60 percent bones of eel, 20 percent herring, and 12 percent cyprinids, while a further walk inland at Boves castle twelfth-century levels contained 26 percent each of herring and eel plus about half that share each of whiting, flatfishes, and cyprinids.[15] All these varieties were native or regular visitors to the watershed.

The eleventh–twelfth-century monks' kitchen at La Charité-sur-Loire provides a French counterpart to Polish or Austrian riverine sites, featuring many small cyprinids, chiefly bream, and fewer bones from eel, pike, trout, and burbot. All fish found at medieval La Charité were native to the Loire.[16]

[11] Locker, "Fish bones" … *Norwich*, 42–44.
[12] Hardy et al., *Aelfric's Abbey*, 356–357 and 379–380. Serjeantson and Crabtree, "How pious? How wealthy?," observe that inland sites like Eynsham thus lagged in the eleventh-century English shift toward fish from the sea.
[13] Pasda, "Tierhaltung Sulzbach," 254, notes carp as a sign of the count's high social rank.
[14] Deschler-Erb et al., "Tierknochen aus St. Arnaul." [15] Clavel, *L'animal*, 12 and 46.
[16] Audoin-Rouzeau, *Ossements animaux*, 146–147, and additional particulars from the preliminary essay, Audoin,"Ossements animaux," 215–217.

On the Meuse, a twelfth-century cesspit in the poorer part of Namur received many bones from eel and small stream fishes (minnow, stickleback, stone loach), fewer from river cyprinids, perch, and pike, and only the rarest herring bone.[17]

Benedictines of St. Philibert at Tournus on the Saône consumed large numbers of local pike, perch, tench, dace, and eel from the 1100s through the 1500s, but left no trace of any sea foods.[18]

Written sources from before the mid-twelfth century which name fish to eat refer to familiar local aquatic ecosystems and not elsewhere.

Fishes apt to appear on a Frankish king's table were assessed by the Byzantine doctor, Anthimus, active in the region between Seine and Rhine shortly after 511. He named eleven taxa, four from fresh water (trout, perch, pike, and gudgeon), five diadromous (salmon adult and parr, eel, lamprey, and sturgeon), and but two (plaice and sole, which he thought the same organism) from marine habitats.[19] All these creatures were native to the cold, lotic or inshore ecosystems of the northwest continent; salmon and perhaps pike were not part of the doctor's earlier Mediterranean experience.

Cassiodorus, Roman administrator for Gothic kings during the 520s–530s, described fishers taking necessary food in rivers from Tiber to Mincio and along shores of Istria and the emerging Venetian lagoon.[20]

Writing a generation or so after the event, monastic historian Bede reported Bishop Wilfrid in the 670s teaching the pagans of Sussex to fish (for herring?) in the sea, for they had earlier caught only eel in rivers.[21]

About 1000, the Wessex schoolmaster Aelfric of Eynsham composed short "realistic" dialogues to encourage his pupils with their Latin and someone helped more by providing an Anglo-Saxon translation. Aelfric's fictive fisher took pike, minnow, trout, and burbot from fresh water and there, too, the migratory eel, lamprey, salmon, and sturgeon. To sea, however, he went reluctantly and of true marine fishes could name only herring, plaice, and sole (all to be taken close to shore).[22]

[17] Lentacker et al., "Historical and archaeozoological data," table 1.
[18] Sternberg, "Une spécificité de la cuisine monastique," 88–92.
[19] Anthimus, *De observatione ciborum*, items 39–47 (Liechtenhan ed. 1963, 18–20 and 41–42; Grant, ed. and tr., 1997, 64–69 and 100–105, though neither editor seems well acquainted with the names of European fishes). Two characteristically inshore molluscs, oysters and scallops, also receive notice.
[20] Cassiodorus, *Variae*, 5:16–17, 5:20, 121:22, and 12:24 (Fridh, ed., pp. 195–196 and 48–491; only the latter are tr. Barnish, pp. 175–179).
[21] Bede, *Historia*, 4:13 (Colgrave and Mynors, ed. and tr., pp. 374–375).
[22] Aelfric, *Colloquy*, ll. 85–121 (Garmonsway, ed., 1978, 26–30), understood as advised in Howe, "Historicist approaches," 90–93, and by Gneuss, *Aelfric*. Aelfric probably wrote the Colloquy before arriving at Eynsham.

When Parisian scholar Alan of Lille wanted about 1160 to verbalize the diverse variety of Nature's fishes, he could name but a dozen: sturgeon, herring, plaice, mullet, and salmon or sea trout he associated with the ocean; pike, barbel, shad, lamprey, eel, perch, and chub came from fresh water.[23] All those species could then be found in the lower Seine basin and along nearby shorelines; the greater number migrated between those habitats.

One of the twelfth century's most acute thinkers, Hildegard of Bingen, understood fish wholly from her deeply familiar waters of the middle Rhine. When she listed thirty-seven "fishes" members of her community might conceivably eat (allowing for two duplicates and subtracting two marine mammals), thirty-two of the thirty-three organisms lived in the Rhine and its tributaries. Herring (which Hildegard likely knew only as salt fish) and flounder unlikely swam as far upriver as her convent, but seven species migrated right by it and twenty-two lived entirely in fresh water.[24]

In contrast to Italy and northern lands very few fish remains have been recovered from medieval Iberia. Contexts from Madrid's Plaza Orientale dated to the tenth through thirteenth centuries contain barbel but also hake, conger, and some small sharks. When sieved, domestic refuse from twelfth – thirteenth-century Moorish Saltés on the Gulf of Cadiz was dominated by local inshore species, although some sardine, tuna, and mackerel were present (Lentacker, "Preliminary analysis"). This appears typical of sites from al-Andalus. But taking into account the local ecosystems, differences between Muslim and Christian uses of local fish were subtle at most (Morales Muñiz et al., "Pesquerías medievales hispanias," 149–155 and table 1). Even as late as 1550–1551, celebratory meals at Lisbon's Tomar convent involved only locally available fishes (Alves Dias, "Un Banquet royal").

3.2 Direct Subsistence Fishing

3.2.1 Fishing "for Their Own Table"

Dwellings of Slavs living in sixth–seventh-century Borchelt in Brandenburg with no sign of a resident lord or specialist artisans had widely distributed

[23] Alanus, "De planctu naturae," ed. Häring, pp. 817–818; tr. Sheridan, 94–98. But is Latin *capito* with a tiny body and large head (Häring ll. 227–228) to be understood as chub or as sculpin (miller's thumb)? Alanus also knew whales, seals, and sirenians lived in the sea.

[24] Hildegard, *Physica*, lib. 5, cap. 2–36 (Hildebrandt and Gloning, eds., vol. 1, pp. 259–285; Throop, tr., 160–176).
Compare Moulinier, "L'abbesse et les poissons," 465–468.

fish remains (Müller, "Tierknochenmaterial," 272–273), while farmsteads on peat lands first drained and cultivated in eleventh-century Holland contained fishing equipment (Edelman, "Oude ontginningen"; Kok, *Wonen op het veen*, 83–86).

Tenants at Fontaine, where the Launette joins the Nonette to the north of Paris, were assured in 1270 of their right to fish with basket traps and by hand (Blary, *Domaine de Châalis*, 98–99).

3.2.2 Mutual Regulation and Local Ecological Knowledge

Free local subsistence fishing can further be seen in many communes of Hainault (Verriest, ed., *Corpus des records de coutumes*, 11, 46, 56, 176–177, 261 *et passim*, and a regional overview in Verriest, *Régime seigneurial*, 320–323); waters controlled by the city of Ghent (Nicholas, *Metamorphosis*, 260–261); Lorraine (Cabourdin, *Terre et hommes*, 676–677); the Zürichsee (Amacher, *Zürcher Fischerei*, 131); and Tirol (Stolz, *Geschichtskunde der Gewässer*, 353–357).

3.2.3 Defending Fisheries Commons

Popular Resistance Montanari, *L'alimentazione contadina*, 282–283, reports the case in 858 of unnamed "ill-wishers" who tore down a fisheries installation owned by the church of Como.

In 1525 Duke William of Bavaria reportedly considered proclaiming free fishing for all as a means to forestall an imminent invasion of rebellious peasants or revolt of his own (Riepertinger, "Typologie der Unruhen," 334). Tirolian peasants assembled at Merano did gain common use of all natural waters in 1525 and it was set into new provincial statutes in 1532, but after 1536 ducal ordinances again carved it away (Stolz, *Geschichtskunde der Gewässer*, 360–363).

Violent collective action by burgesses of Stirling, Scotland, over collective access to salmon in the river Forth flared up repeatedly from the mid-1300s (Hoffmann and Ross, "This belongs to us!").

Provençal villagers near Romans in 1447 appealed straight to the king to reverse his local officer's ban on free fishing (Sclafert, *Le Haut-Dauphiné*, 146–147).

Dyer, "Consumption," 35, cites court proceedings wherein a gang sixty strong in 1376 attacked the park of Evesham abbey at Ombersley in Worcestershire, taking thirty deer and fish worth a hundred shillings.

Poaching Further examples of peasants poaching fish from privatized waters are widespread. Four men of Alverthorpe near Leeds

stood accused in 1314 of taking pike from private waters at night while John Thurston and John Newman of Upwood, Huntingdonshire, got caught setting illegal basket traps in 1411.[25]

Clandestine spearing of salmon continually bothered owners of fishing rights on, for instance, the upper Loire and Dordogne.[26]

In 1526 the judge for Tegernsee abbey fined villagers from Lenggries who had sneaked over the ridge separating their valley from the upper Weissach where big lake trout from Tegernsee were spawning.[27] Similar activity vexed lords of trout streams along the hilly border between Moravia and Silesia.[28] Monks of the Grand Chartreuse blamed neighbours' poaching for the fifteenth-century collapse of their fishery in a now dry lake near Villette, Haut-Dauphiné.[29]

3.3 Indirect Subsistence Fisheries

3.3.1 Obligated Peasant Workers

The late tenth-century Anglo-Saxon text called *Gerefa*, a literary description of the reeve's duties, had peasants "make fish weirs" (*faldian fiscwer*) during May, June, and July (*Gerefa*, Gobbit, ed., clause 24).

During the eleventh –twelfth century both Reichenau abbey and the bishop of Constance required tenants along the lake shore to turn out on demand to fish for whitefish and then be fed at the lords' kitchen (Bossart and Flück, "… *dass auch die fisch feüchter und kalter natur sind,*" 137).

Foreign merchants familiar with fifteenth- and sixteenth-century Hungary describe peasants constructing elaborate palisades and fences to capture beluga sturgeon for the royal household (Zlatykó, "Aspects of fishing," 401–403).

3.3.2 The Lord's Expert Servants

– *of Religious Institutions* St. Ambrose at Milan received a quarterly mixture of fish from a property on Lake Como (Montanari, *L'alimentazione contadina*, 293).

[25] Wakefield Manor *Court Rolls*, series 1, vol. 3, p. 36; Olson, *A Chronicle*, 20 and 182–183. Other poachers at Romsey in 1435 set night lines and pots in the Test (Coldicott, *Hampshire Nunneries*, 78).

[26] Fournial, *Les villes et l'économie*, 195; Bidon and Bossard-Beck, "La préparation des repas," 1984, 70; Cocula-Vaillieres, *Un fleuve et des hommes.* 133–134.

[27] BHSA KL Teg 185 1/3, fols. 155r–160r.

[28] Jeřábek, "K studiu rybářství".

[29] Sclafert, *Le Haut-Dauphiné*, 214–215.

Since well before the eleventh century the Roman monastery of SS Andreas and Gregory was employing its own fishers in salt ponds of the Tiber estuary (Vendittelli, "Diritti ed impianti," 409–422).

Fishing on a reach of the Río Arlanzón below Burgos brought servants of two local monastic houses to such violent confrontations in 1478 that Queen Isabella herself had to impose a settlement (Bonachía Hernando et al., "Monasterios y pesca fluvial," 23–25). On Danish Zealand in that same decade five of thirteen farms in a river-mouth village owed the local Benedictines rents in fish, fishing work, or fishing gear (Hybel and Poulsen, *Danish Resources*, 215).

– of Secular Lords, Small and Large Monks and their saints wrote and kept the written record, but a fisher on a well-defined reach of the Cher had long served a lay seigneur, Euverard of Vatan, until given with his fishery to Vierzon abbey (Devailly, ed., *Cartulaire de Vierzon*, nos. 30–31, pp. 142–149).

Small-scale fishing servants in a lesser secular lordship were to be found far up the Saône in Franche-Comté, where two fishers, Deodorat and Pierre, with their families worked on their designated fishery for the local seigneur, Humbert de Jussey, until 1148, when Humbert gave people and resource to the Cistercians recently established at Cherlieu. Another fishing family at Jussey, Hugh and his two sons, came under the abbey's lordship only in 1211.[30]

Czech *piscatores* in the eleventh–twelfth-century written record were princely dependants, mostly linked to named fisheries near important royal sites. Only about one in five also had land to farm. (Sasse, *Socialstruktur Böhmens*, 242, 253–254, and 259; Graus, *Dajiny venkovského lidu*, 1:298–309.)

The late fourteenth-century household of dukes of Burgundy got most of its fish directly from artificial ponds on ducal estates. But when the family traveled to Paris, servants provided fresh fish from their river fisheries en route: in July 1376 they had pike, carp, tench, trout, salmon, lamprey, and eel twice from the Ource and once from the Seine at Aisey (Beck, "Pêche et étangs ducaux"; Beck, *Eaux en Bourgogne* , 233–234).

Master fishers from the later thirteenth century also included Nicholas *piscator* working for the bishop of Winchester and William *piscator regis* for Henry III.[31] In 1270 the count of Savoy's "piscatores comitales" went out daily.[32]

[30] Kempf, "L'économie et la société," 98, 102, and 104.
[31] Roberts, "Bishop of Winchester's fishponds," 130–135; McDonnell, *Inland Fisheries*, 19–20; Steane, "Royal fishponds," 46.
[32] Nada Patrone, *Il cibo*, 317–318.

3.4 Compatible Technologies

3.4.1 Small Gears for Household Use

Spear fishing is clearly illustrated in a twelfth-century gospel from Zweifalten (Sauerlander, "Architecture," 704), as in contemporary sculptures above the portal of the cathedral at Oloron Sainte-Marie on the north flank of the Pyrenees (Bartal, "Le programme iconographique," 106–110). The latter fisher took an unmistakable salmon.

The mid -thirteenth-century pseudo-Ovidian Latin poem *De vetula*, perhaps composed by French scholar and cleric Richard de Fournival (1201–before 1260), sets out in lib. 1, cap. 20 (ll. 361–380) equipment suitable for small-scale fishing to support a household. The author begins with the same three devices as Sigebert, then elaborates:

> Now also it was my custom to catch sea fishes, these with traps, those with hooks and some with a seine, others with winged mesh extended in a pyramidal cone; still now to the river [fishes] I turn myself, having made with twigs for certain kinds a deceiving basket, where a flexible stick allows the fish entry and escape its prepared bitingly sharpened point prevents.
>
> Fooling at times with gripping hooks those sorts enticed by worms, other kinds through line threads fastened together by means of knots, known to envelope, while the wood floats above, and the lead seeks the bottom, – and not either [when] it, leaping, approaches the airy region – or, diving, it wanders into the depths of the mud sporting with us from foreign elements:
>
> And now eels, by the threatening of terrifying thunder stunned, and by the water, itself rushing down into a box dividing its course[?], to retain for capturing by hand; And now to transfix with the tined spear, [when] seen with a lighted torch at night beneath the gleaming waves.[33]

Besides the remains of a wicker trap from fifteenth-century Ename abbey in Flanders (Fig. 3.4), such medieval devices have been recovered from, for example, eleventh-century Gdańsk (Rulewicz, *Rybołówstwo Gdańska*, fig. 65), eighth–tenth-century Bohemia (Andreska, "Archeologické nálezy rybá□ského"), Holland (Brinkhuizen, "Some notes on fishing gear," 38–48), and Ireland (O'Sullivan, *Foragers, Farmers and Fishers*).

Castilian fishers making their own nets are reported in Abad Garcia and Peribáñez (Otero, "Pesca fluvial," 158–160), and the same was demanded of those who fished salmon for the Scottish Cistercians at Coupar Angus (Rogers, ed., *Rental Book*, entries #20 and 548).

[33] Latin text ed. Robathan, *Pseudo-Ovidian De Vetula,* 62; R. Hoffmann translation.

3.4.2 Crew-Served Equipment and Installations

Cooper and Ripper, "Fishing and Managing," report successive weirs on another site in the Trent dating from the seventh through twelfth century, first using oak piles and later stone-filled cribs, the former arranged to take downstream migrant adult eel and the latter possibly targeting upstream migrant salmon.

In 1395 the weir on the Saône at Verdun, then owned equally by the duke of Burgundy and a local seigneur but with timber remains now dated to the eleventh–thirteenth centuries configured like those at Colwick, provided the duke's household alone more than 1,200 eel in a few late-summer and autumn weeks' operation.[34] Not far from the Saône radiocarbon and dendrochronology have dated comparable structures of posts found in the Cher from Gallo-Roman times through the tenth century and others in the Thiele near Neuchatel to the mid-tenth to twelfth century. Though in entirely different river basins both of these, too, were oriented to take eel.[35]

Another purpose-built labyrinth operated on the salt pond of Marignane near Marseille before 1025.[36] Elsewhere in Europe nineteenth-century ethnographers found peasant fishers setting fences of wooden laths, willow branches, reeds, or nets on poles to divert fish movement into rounded chambers at each end (Brinkhuizen, "Some notes on fishing gear," 17–19; Höfling, *Chiemsee-Fischerei*, 67–73).

Remarkably similar to the wetland pond network at Glastonbury are the conjoined canals, *piscinae*, *stagna*, *lacus*, and *vivaria* described in early thirteenth-century perambulation charters and found in archaeological field work near Tóköz in the northern Hungarian plain.[37]

3.4.3 Saving the Catch for Future Use

Shallow coastal tanks for keeping captured marine and euryhaline fishes were the predominant Roman and Byzantine form of 'fishpond' (*vivarium*) (Higginbotham, *Piscinae*; *Geoponika*, lib. 20, c.1 and c.20 [Beckh, ed., 511–529; Dalby, tr., 339 and 343]; Dagron, "Poissons, pêcheurs et poissoniers," 59–60; Marzano, *Harvesting the Sea*, 199–233).

[34] Beck, *Eaux et forêts*, 245–246.
[35] Troubat, "Pêcheries fixes," 119–130, and Plumettaz, "Un pêcherie." Weirs now detectable only as post holes or piles of stones are undatable.
[36] Amargier. "Notes sur l'ichthyophagie," 313–315.
[37] Takács, "Medieval hydraulic systems in Hungary," 290–299.

CHAPTER 4 ARTISANS AND MARKETS

4.1 Artisan Fisheries and Their Formation

4.1.1 "To Make Their Living by Fishing"

As far back as the 1030s commercial fishing was well-enough evolved in some parts of rural Italy that a reforming prior at Castel Sant'Elia, some fifty-five kilometers north of Rome, could "buy fish from nearby areas" to wean reluctant monks from meat.[1]

In Mediterranean estuarine environments comparable to those of Languedoc, one 'Clavellus piscator' and his fellows paid dues around 1154–1155 to live and fish in the Pisan wetlands at the mouths of the Arno and Sercio,[2] while within a generation after Christians captured Tortosa in 1149, thirty-seven named fishers were paying dues to fish the Ebro delta and freely sell their catch in town.[3] Eleventh- and twelfth-century marine fisheries in southern Italy have been described without the institutional detail needed to distinguish between subsistence and commercial orientations.[4]

Despite the legendary precedent of Grim, Domesday Book's tabulation of herring renders from east coast ports, and remains of diverse freshwater and inshore fishes at sites from East Anglia to Scarborough, documentation of actual fishing activity along the English North Sea before the thirteenth century is lamentably sparse. Organization of production in Anglo-Saxon and Norman times remains essentially unknown.[5]

Early fourteenth-century manorial court records for Lakenheath, a fen-edge village in Suffolk, reveal several peasant families who obtained their principal income from fishing, perhaps mostly for eel. They held leases on fishing rights at specific sites; owned weirs, bow nets, and multiple boats; and sold their catches locally and in such nearby towns as Ely and Bury St. Edmunds.[6] Archaeological excavation of waterfront

[1] John of Salerno, *Vita Odonis* 3:7 (MPL 133, cols. 79–80).
[2] Garzella, "*In silva Tumuli* e *in Stagno*," 145–147 and 155–156.
[3] Curto Homedes, "El consum de peixa," 150.
[4] Martin and Noyé, "Façades maritimes," 471–473.
[5] Saul, "Herring industry"; Rippon, *Transformation of Coastal Wetlands*, 220–224. Campbell, "Domesday herrings"; Bailey, "Historical ecology," 230–232; and Kowaleski, "Early documentary evidence," 23–29, concur.
[6] Kilby, *Peasant Perspectives*, 157–162.

neighbourhoods in Gdańsk and other Pomeranian ports found lake, estuary, and bay fisheries developing from individual small netting gear in the ninth–eleventh century to the crew-served *niewód* seine during the twelfth and thirteenth. Ship companies put ownership marks on this big equipment and used it to take marketable surpluses of herrings. The evidence of early conditions and development is entirely material. Clear verbal records appear only centuries later.[7]

4.1.2 Transitions

Late fourteenth- and early fifteenth-century financial accounts of the Polish royal household, whether in Kraków or sojourning elsewhere, record purchases of fresh fish from named local fishermen. For instance, "Stanisław the fisherman [was] paid on 9 November 1393 for fish for the king's kitchen … 3 marks and for transporting them to Nepolomice, ten scot."[8]

In contrast, however, to the regional cases discussed in this section, full-time artisan fishers remained few in medieval Scandinavia. The great fisheries there, subsistence and large-scale export alike, offered only seasonally limited work for underemployed peasants, and few towns provided continual market demand for a fresh product.[9] Some specialized variants are explored in Chapter 8.

4.2. Household Enterprises in Local Communities

4.2.1 Social Positions

Fishers' houses were a feature of coastal villages in Cumbria already by around 1200, while the eponymous residential area at deeply inland Oxford has a long history.[10] When Kraków gained municipal status in 1257 it absorbed *Ribitwy*, 'Fisherville' beside the Vistula, but the neighbourhood remained full of fishing families. At La Ciotat on the coast of Provence during the 1460s–80s fishing occupied a solid majority of the

[7] Rulewicz, *Rybołówstwo Gdańska*, 270–276 and 324–336.
[8] Piekosiński, ed., *Rachunki dworu*, 229 – and further examples on 65, 101, 164, 373, 374, 376, and 385.
[9] Nedkvitne, "Fishing, whaling, and seal hunting"; Christensen and Nielssen, "Norwegian fisheries," 147–150; Holm, "Catches and manpower," 177–184; Kristiansen, "Fish for peasants and kings," 213–218; Hybel and Poulsen, *Danish Resources*, 1312, 161, and 222.
[10] Winchester, *Landscape and Society*, 110–111; Prior, *Fisher Row*, is an extended example.

half-hundred local households, and by then parts of coastal Brittany had known like proportions for a century.[11]

4.2.2 Small-Scale Technologies

Amacher provides a model syncretic description of traditional, mainly artisanal, techniques and vessels in the urban lake fishery of the Zürichsee, while Höfling traces what are closely analogous methods from the fifteenth–early twentieth-century Chiemsee.[12]

Equipment used in a Mediterranean estuarine and inshore setting by fishers of Valencia is cataloged in their late medieval guild ordinances.[13]

4.2.3 Gender Division of Labour

Late medieval English towns, inland Shrewsbury and those of more coastal East Anglia, Sussex, and the southwest, saw wives of fishers often dominating petty retail of fish.[14] In Lisbon women peddled the ubiquitous local sardines in all their forms, fresh, dried, salted, smoked. At Porto *pescadeiras* ('fishwives') from producing households in nearby villages went each morning to designated sites to sell their own products. Not until after *terce* (roughly 0900hrs) could they sell to *regrateiras* (petty hucksters or regrators).[15]

4.2.4 Collective Organization

The fishers' corporation at Valencia originated with the Christian conquest of 1238 and received royal privileges in 1250.[16] "Old practice" (*altergewonheit*) was the stated basis for the first statutes proclaimed by the fishers' guild of Frankfurt am Main in 1355. That corporate body had achieved legal autonomy back around 1300, following supervision by the city council since 1219 and earlier collective subordination to royal officers.[17]

[11] Stouff, *Ravitaillement*, 201; Touchard, *Commerce maritime breton*, 58–59.
[12] Amacher, *Zürcher Fischerei*, 21–77; Höfling, *Chiemsee-Fischerei*, 27–112.
[13] Ayza Roca, "La pesca en la València," 167–169.
[14] Hutton, "Women in … Shrewsbury" 1985, 94–95; Mate, *Daughters, Wives and Widows*, 44–45; Goldberg, *Women, Work, and Life Cycle*, 107–108; Fox, *Fishing Village*, 113, 123, 128, and 148.
[15] Catarina, "Abastecimento," 23–27; Melo, "Women and work," 256 and 261–262.
[16] Ayza Roca, "La pesca en la València," 160–162.
[17] Cahn, *Recht der Binnenfischerei*, 93–95 and 109–116. By 1500 more than thirteen places along the Rhine in the Palatinate, mostly mere villages, had fishers' guilds (Mone, "Ueber die Flussfischerei," 73).

Details of gear regulation by fishers' guilds can also be seen at Valencia, Zaragoza, and London.[18] Perhaps the wish to avoid conflicts over the needs of different capture techniques lay behind the 1469 requirement at Tulln on the Danube that each fisher choose annually whether he would fish with traps, the seine, or hook and line.[19]

4.3 Urban Fish Markets[20]

4.3.1 Freshly Caught from Nearby Waters

Despite cultural, institutional, and ecological differences the fish market at Constantinople shared a distinctly regional quality,[21] as did those of inland towns in Piedmonte and communities along the Gulf of Lions.[22] Elsewhere this common feature meant when the fifteenth-century Burgundian ducal court sojourned in Bruges its kitchen staff obtained exclusively fishes from the nearby North Sea but just a short move inland meant they bought only freshwater fishes.[23]

While signs of artisanal fishing appear early on the Catalan coast, records of specific urban fish markets seem curiously late. That at Lleida is hinted in a text of 1206 but mostly known only after 1300. The first fish market in Barcelona was created by a private investor in 1210 and remained in private hands until 1335, when the municipality took it over to break a monopoly.[24]

Clear designation and legal enforcement of specific sites to sell fish are widely documented. During 1384–1388 the town of Tortosa rebuilt its special public fish market or 'peixateria', while rules at fifteenth-century Madrid were also explicit.[25] Like Rome Venice had a principal

[18] *Ibid*.; Rodrigo Estevan, "Fresco,frescal, salado, seco, remojado," 554; and Riley ed., *Liber Albus*, 331–334.
[19] Petrin, "Archiv," 32.
[20] Most all of the market features identified in Section 4.3 can also be seen at small scale and with the typical local idiosyncrasies in studies of lesser centres in the Crown of Aragon: Roca Cabau, "Provision and consumption in … Lleida," 281–301; and Barceló Crespí and Mas Forners, "Fishing in Majorca, 1230–1521," 126–129.
[21] Dagron, "Poissons, pêcheurs et poissoniers," 57–59 and 67; Maniatis, "Organizational setup and functioning," takes a view more purely from institutional economics.
[22] Nada Patrone, *Il cibo*, 319–320 and 326–330; Larguier, "Des lagunes à la mer," 19–198.
[23] Sommé, "L'Alimentation quotidienne," 109–110.
[24] Riera Melis, "Pesca en el Mediterránea Noroccidental," 35–36; Roca Cabau, "Provision and consumption," 297.
[25] Curto Homedes, "Consum de peix," 158–159; Puñal-Fernandez, *Mercado en Madrid*, 180–216.

market at the Rialto bridge and lesser sites elsewhere; other Italian communes did likewise.[26]

Comprehensive municipal fish market regulations were issued, for example, at Grasse in 1263, 1335, 1463, and 1493, Merano in 1317, Tortosa in 1342, Zürich in 1359 and 1389, and Kraków in 1408.[27]

4.3.2 Fishmongers

London's fishmongers formed one of the largest city guilds and famously rivaled the butchers for choice spots on the marketplace and on the Common Council.[28]

Contracts between fishmongers and fishers also survive from Barcelona[29]

In Provence, where no primate city consolidated regional trade, a polynodal web linked urban consumers to coastal fishers: fishmongers from Avignon, Tarascon, Beaucaire, and Arles dealt with fishers from Arles; men from Grasse contracted with people in Cannes, Antibes, La Napoule; and so on. During Lent, 1426, merchants from Romans, more than sixty kilometres inland, bought fish in Marseille.[30]

4.3.3 For the Sake of Safe Abundance

City statutes at Rome kept both the wholesale and the retail trade open to all comers. Towns in Holland guaranteed free trade on their fish markets as

[26] Faugeron, *Nourrir la ville*, 523–524, and in other Italian communes see Mira, *pesca nel medioevo*, 73–76.

[27] Stouff, Ravitaillement, 424–427 (with general discussion of Provençal market ordinances, 203–205); Stolz, *Geschichtskunde*, 375–376; Curto-Homedes, "El consum de peix"; Amacher, *Zürcher Fischerei*, 167–169, 189–190, and 387–390; Cahn, *Recht der Binnenfischerei*, 127–130; Piekosiński, ed., *Kodeks dyplomatyczne*, #262 and #336.

[28] Billington, "Butchers and fishmongers"; Unwin, *Gilds and Companies*, 37–42 and 75–81; Cutting, *Fish Saving*, 40–41; Epstein, *Wage Labor*, 199–202. Butchers and fishmongers engaged in running conflicts on the marketplace of Buda (Szende, "Stadt und Naturlandschaft," 395, and "Sopron fish market," 161), but in late medieval Bruges the two crafts allied in struggles over urban governance (Brown and Dumolyn, *Medieval Bruges*, 283–289).

[29] Mutgé i Vives, "L'abastament de peix," 109–116, is to be read in context of Mutgé i Vives, *La ciudad de Barcelona*, 15–20.

[30] Stouff , *Ravitaillement*, 204–208. Fishers and fishmongers were not necessarily happy associates: historian Daniel Smail reports a running fight along the Marseilles quay in January 1342 between Julian Marquet, an immigrant Catalan fishmonger, and Jacme Guilhem, a fisher (Smail, "Common violence," 55–56).

did the royal privileges of Kraków and Valencia.[31] Siena developed special facilities and regulations for its necessarily large imports from Perugia.[32]

Measures to encourage direct contact between fish sellers and retail customers: Even at twelfth-century Worms the privileged fishers were forbidden to go out of the city to buy fish for resale, and some four centuries later and thirty-five kilometers away the count palatine's ordinance likewise forbade fishmongers of Heidelberg from buying for resale within a 'mile' of town.[33] The York ordinances of 1301 ordered illegal forestallers to be pilloried, dragged on a hurdle through town, and then banished.[34] Kraków, again like London and Worms in records some centuries older, also forbade or tightly constrained trading among non-residents.[35] Late thirteenth-century Perugia demanded a special licence to resell fish.[36]

Measures to ensure freshness: Kraków's 1408 market statute placed the municipal seal on fish brought for sale. A fish unsold after the first day had half the seal removed and a second day's failure cost the remainder of the seal. Lübeck's 1399 guild ordinance forbade fresh fish not sold on the day they arrived from being brought back to the market.[37] Similar regulations were in force on both maritime sides of the Iberian Peninsula, Barcelona and the Basque country. The episcopal privilege received by Tortosa in 1181 and updated in municipal ordinances of 1342 simply assigned knowledgeable inspectors to view the fish by light of day to be sure they met local standards.[38]

Barcelona set out procedures for handling spoilt fish. Like Zürich, Lübeck and other north German towns obliged fish sellers to report any attempt to sell spoilt or undersized fish.[39]

[31] Lanconelli, "Gli *Statuta pescivendulorum urbis*," 90–94; Boer. "'Roerend van der visscheryen'," 120–123; Piekosiński ed., *Kodeks dyplomatyczne*, #262 and #299; Ayza Roca, "La pesca," 164–165.

[32] Catoni, "Super facto pisciu," 299–302.

[33] The ordinance of the Rhine Palatinate, 1502 (Mone, "Ueber die Flussfischerei," 91) is paralleled from the Baltic to Geneva and Lower Austria in Cahn, *Recht der Binnenfischerei*, 129–130. For similar provisions in London ordinances see Riley, ed., *Liber albus*, 323–328.

[34] Prestwich, ed., *York Civic Ordinances*, 13–14.

[35] Piekosiński, ed., *Kodeks dyplomatyczne*, #299 and 336; Riley, ed., *Liber albus*, 325 and 329.

[36] Scialoja, "Statuta," 832

[37] Piekosiński, ed., *Kodeks dyplomatyczne*, #299; Lampen, *Fischerei und Fischhandel*, 201–202 and n. 1096

[38] Curto-Homedes, "El consum de peix,"166; Mutgé i Vives, "L'abastament de peix," 17; and Arizaga Bolumburu, "La alimentacion," 203–204.

[39] Mutgé i Vives, "L'abastament de peix," 17. Lampen, *Fischerei und Fischhandel*, 201.

Municipal attention to honest measures and correct identification of the fish offered for sale can also be traced at London, Rome, and Perugia.[40] An advance sale contract made at Arles in 1433 gave close attention to the size and acceptable content of the fish basket.[41]

4.4 Market Price

4.4.1 Price Formation

Hoping to mitigate Lenten price increases, some weeks in advance of that season municipal authorities at Marseilles and at Arles appointed certain local merchants to organize large and secure supplies of fresh fish, an arrangement not unlike Spanish *obligado* contracts. Nonetheless in fifteenth century Marseilles Lenten shoppers paid half again the normal rate for bogue and 40 percent more for tuna.[42]

Not all even voluminous records provide the detail needed to assess varietal values. The fourteenth-century papal curia itself commonly bought fish in bulk at the point of production, not Avignon's own market, and accounted by number or volume, not weight, so its records provide no useful quantitative comparison[43]

Richental's report from the unusual circumstances at early fifteenth-century Constance put salted beluga sturgeon at the top, 60 percent higher than fresh local whitefish. Pike, bream, tench, and carp came in just under the sturgeon.[44]

Fifteenth-century consumers at another inland centre, Madrid, were prepared to pay for conger three times what they did for sardines.[45] Across the Tyrrhenian Sea from Catalonia and Provence, records at Palermo and Catania dated1380–1415 likewise show tuna and the local delicacy of tuna roe leading the price list with the now familiar red mullet, sea bass, gilthead, and white sea bream just below, and bogue, sardine, anchovy, conger, and cuttlefish going for the least money.[46]

[40] Riley, ed., *Liber albus*, 326–327 and 330; Lanconelli, "Gli *Statuta pescivendulorum urbis*," 111–112; and Scialoja, "Statuta," 838.
[41] Stouff, *Ravitaillement*, 423–424.
[42] Hocquet , "Pêcheries medievales," 56; Stouff, *Ravitaillement*, 204.
[43] Weiss, *Versorgung des päpstlichen Hofes*, 531–539, for the pontificate of John XXII.
[44] Ulrich, *Konzilschronik* , Feger ed. facsimile, fol. 25b. Small fishes sold by volume (*maß*) including gudgeon, sculpin, and dace were in the same range as the most expensive sold by weight, perhaps because a full *maß* outweighed a *pfund*. Fish names in Loomis, tr., p. 101, are unreliable.
[45] Puñal Fernández, *El Mercado*, 200–203. See also Sánchez Quiñones, "Los Precios de Pescado," 184–186.
[46] Bresc, "Pêche et coraillage," 108–109.

Set prices in Ivrea distinguished between lake fish and those from the Doria and other rivers, while Vercelli legislated different levels for Lent and for other seasons. Bologna set prices for pike, tench, and eel 12 to 20 percent higher during September through April (winter months but including Advent and Lent) than in May to August, while further distinguishing those for eel by size and water of origin.[47] Provençal towns, Grasse, Arles, and others, were regulating fish prices by ordinance probably from the thirteenth century.[48] Lucerne established such laws in the first decade of the fourteenth century and communities around the Lake of Geneva did so a generation later.[49]

[47] Nada Patrone, *Il cibo*, 330; Pucci-Donati, "Mercato del pesce," tables 3 and 4).
[48] Stouff, *Ravitaillement*, 203–204 and 426–427.
[49] Cahn, *Recht der Binnenfischerei*, 131–132.

CHAPTER 5 SYSTEMS UNDER STRESS

5.1 Environmental Consequences of Demographic and Economic Growth

5.1.1 Habitat Destruction

Case studies of regional clearances might include Maas, *Moines-défricheurs*, 22–23; Jenn, "Défrichments cisterciens," 42–48; Bertrand, "Pour une histoire écologique"; Durand, *Paysages médiévaux*, 177–245; Rösener, *Bauern im Mittelalter*, 40–54 and 118–133; Hoffmann, *Land, Liberties, and Lordship*, 34–92; Rackham, *Trees and Woodland*, 39–90; and Williamson, *Shaping Medieval Landscapes*.

In the lower Harz, soil profiles from the bottom of slopes on abandoned medieval fields display a pattern like that described along the Leine, but it is more specifically first attributed to the bare winter fallow of a three-course rotation. A subsequent phase of wet-season floods and dry season dewatering of streams and springs followed cutting of forests to fuel a mining and ironworking industry which grew from the late 1200s to 1400s. In Bavaria sixth– eleventh-century changes in river morphologies have also been traced to anthropogenic landscape modifications.[1] Siltation in backwaters along the Lys and Scarpe rivers in Artois and Hainault, a region which had since 900 lost two-thirds of its woodlands, is mentioned by the late 1200s.[2] At the Lac d'Annecy in Savoy, higher up and a century later than Lac Paladru, the same pattern of siltation followed monastic establishment of cereal-producing granges (Oldfield and Clark, "Environmental history," 152–155, with works there cited, and Crook et al., "Human impact," 255–257).

Scholars working at a longer temporal scale point out the recurrence of erosion and deposition episodes in Mediterranean history, with micro-regions and microclimates responding differently to human and natural climatic changes.[3]

[1] Linke, "Medieval deserted fields," 296 and 301; Werther, "Histoire(s) des vallées"
[2] Derville, "Rivières et canaux," 11, 15, and 19.
[3] See Horden and Purcell, *Corrupting Sea*, 312–338, and Grove and Rackham, *Nature of Mediterranean Europe*, 167–190 and 288–311, although neither team of authors much attends to medieval developments as such.

Mill dams and fish weirs constructed in the Havel system between 1180 and 1250 raised water levels by 1.5 m and created a 150 km lake system that reshaped the landscape and settlement structure of Brandenburg.[4] Barrier and diversion effect of the mills which proliferated during the tenth through twelfth centuries on river systems between Béziers and Nimes are also well documented.[5]

Salmon fishing at mills in Denmark occurs in McGuire, *Cistercians in Denmark*, 140, and that in lower Normandy is treated in Halard, "La pêche du saumon," 175 and 177. Watermills as fishing sites are further discussed in Bauchet, "Droits et structures de pêche" for the Marne; Defosse, "Pêche et pêcheries" for the upper Allier; and Malavolti, "I proventi dell'incolto," 260–264, for the waters of Fucecchio in Tuscany. In Europe's Atlantic, North Sea, and western Baltic drainages this barrier effect may have lent more value to mill-based fishing rights than did the mill ponds on which Lampen, *Fischerei und Fischhandel*, 85–87, focuses. From that perspective also relevant are Alfonso Anton, *Colonización cisterciense*, 176–177; Brien, "Développement de l'ordre cistercien," 43–44 and appendix IV; Lohrmann, "Zwei Mühlenweistümer," 223; Tock, ed., *Chartes des évêques d'Arras*, nos. 90 and 214; and the discussion of mills, eel, and salmon in Darby, *Domesday England*, 279–285.

Mill dams and other barriers damaging runs of fish are reasonably well documented. About 1470 a Rhineland abbot was complaining that since construction of a new dam three years earlier on the Dhünn (a Rhine tributary) "neither salmon nor [other] fish can go up …"[6]

Anadromous populations not only need access to suitable spawning habitat, they also characteristically adapt to specific flow regimes in both the main river and the spawning tributary, and form discrete and separate spawning stocks, even within individual river systems. When environments are changed – as by deforestation or barriers – survival of the stock will depend on natural variation in the gene pool providing some individuals more suited to the new regime. Their spawning success will, over time, modify the genetic composition and the behaviour pattern of the whole surviving population (Thorpe and Stradmeyer, "Management

[4] Kaiser et al., "A large-scale medieval dam-lake cascade."
[5] Durand, *Paysages médiévaux*, 258–259.
[6] "dar enkan noch laeis noch vijsch up gegayn" (Mosler, ed., *Urkundenbuch der Abtei Altenberg*. vol. 2: *1400–1893*, no. 206). On the other hand, as in the early modern Elbe, flood events could break downstream barriers and allow the return of salmon to upriver fisheries where they had long been rare or absent (Wolter, "Historic catches"). Impassable dams break the ecological continuity of rivers and so fragment even populations of resident fishes (see discussion in Jungwirth et al., "Re-establishing and assessing ecological integrity").

examples," 83–85 and 94). To the extent that medieval dams and weirs (always low by modern hydroelectric or flood-control standards) failed fully to block especially the larger streams and tributaries, salmon in particular would shift their spawning downstream in the watershed. A later observer (e.g. Lelek , "Rhine River," 480–482; Jäger, *Einführung*, 200–204) might miss the empty highest tributaries, see some still-extensive early modern runs (compare Martens, *Zalmvissers van de Biesbosch*, or Nauwerck, "Lachsfang in der Kinzig"), remain unaware of a half-millennium of adaptation to preindustrial levels of human development, and think the situation still "natural." (See discussion of 'shifting baselines' in Chapter 2.) However, in a situation where the main river was too warm for salmon, dams on upper tributaries alone sufficed to extirpate salmon from the Duero before 1900 (Lobon-Cervia et al., "Historical changes "). Perhaps the Irish tradition of horizontal mills (see Rynne, "Waterpower in medieval Ireland") helps explain survival of salmon in so many of that island's streams.

Medieval water supply and waste disposal have become widely studied topics. Long rows of latrines over channels running back into the local stream were, since at latest the eleventh century, the norm among all monastic orders and, where location permitted, secular palaces. In one famous incident in 1184, the hall floor in the palace of the archbishop of Mainz at Erfurt collapsed and pitched members of the imperial court into underlying cesspits (*cloaca*) through which the river Gera flowed.[7] Efforts to manage sewage and waste disposal in London and other English towns are covered by Keene, "Issues of water"; Magnusson, "Water and wastes"; and Jørgensen, "Cooperative sanitation." Later legislation for Paris is more concerned with industrial effluents (Mieck, "Anfänge der Umweltschutzgesetzgebung," 335–336; Rouillard, "La législation royale").

5.1.2 Overfishing and Depletion

Although fishing pressure and 'depletion' are debated as technical terms in present-day fisheries science, their generic use cannot be avoided to describe intensified use of known or new capture techniques on the one hand and declining yields of fish from local or regional fisheries on the other. Depletion in particular should be understood relative to specific

[7] Grewe, "Wasserversorgung,," 74–75. The same collection has more information in contributions by Kosch, "Wasserbaueinrichtungen in hochmittelalterlichen Konventenanlagen," notably pp. 96, 110–112, and 134–135, and by Benoît and Wabont, "Wasserversorgung in Frankreich," especially pp. 195, 204, and 207–216, which include orders besides the Cistercians. See also Benoît and Rouillard, "Medieval hydraulics in France," 180–187.

technologies and the fish populations susceptible to them. Destruction by human agents of a salmon run in one specific river does not necessarily imply large contraction in the total population of the species. Certainly medieval Europeans knew these concepts, whether or not they applied them in ways approved by present-day scientists.

By later medieval centuries association of declining fisheries with overfishing had become commonplace among communities and officials alike. Motifs of shortage and overfishing came out in local administrative decisions, as when, for instance, the royal governor of Languedoc in the 1370s decided new fishing methods introduced by citizens of Lagrasse were to blame for decline of fish stocks in the river Orbieu.[8] The Castilian *Cortes* complained in 1435 that trout rivers had been 'depopulated' (*despoblar*) by overfishing, and similar perceptions were being voiced in enactments by communal governments at Florence and Strasbourg. Fifteenth century Venetian debates over the state of the lagoon included whether intensive fishing was damaging the city's supply of local fish.[9] Soon thereafter territorial princes in Bavaria and Austria justified fisheries regulations to prevent damage of fisheries by too-intensive use.[10]

More archaeological indications of species loss and likely depletion: A compilation of fishes identified at fourteen Dutch sites found sturgeon, shad, and/or salmon at six of eight dated before 1000 AD and at none of the six thereafter. At some time between the twelfth and the fifteenth century European catfish were also extirpated from the Scheldt watershed.[11]

5.2 Beneficiaries?

5.2.1 Eel

John of Garland reported street sales of eel in Paris by 1220; earlier sites with fish remains are lacking. Many subsequent finds then document steady consumption of eel there.[12] Along the western coast of the Gulf of Lions eel ranked among the best-documented taxa throughout the high

[8] Mahul, ed., *Cartulaire et Archives … de Carcassonne*, vol. 2, pp. 507–515.

[9] Izquierdo Benito, *Precios y salarios en Toledo*, p.124 n. 289; Trexler, "Measures against water pollution," 463–467; Mone,"Ueber die Flussfischerei," 82–84; Stromeyer, *Geschichte der Badischen Fischerzünfte*, 2; Faugeron, *Nourrir la ville*, 183–184.

[10] Hoffmann and Sonnlechner, "Vom Archivobjekt zum Umweltschutz," 81, 116–120, and 131.

[11] Clason, Prummel, and Brinkhuizen, "Vogelen en vissen," 16–20; van Neer et al., "Freshwater fisheries."

[12] Hunt, ed., *Teaching and Learning*, 202; Desse and Desse-Berset, "Pêches locales, côtières ou lointaines"; Sternberg , "L'approvisionnement de Paris"; and Clavel, *L'animal*, 50–53.

and later Middle Ages, being taken locally and sharing popularity with sea breams, sardines, and red mullet.[13]

5.2.2 Herring Fisheries on the Rise

Herring, no Mediterranean fish, received the Middle Latin name [*h*]*allec*, from a Roman word for fermented fish sauce and ultimately from the Indo-European root for 'salt' (*hal*). Medieval authors consistently associated herring with salt: William of Hirsau's sign language (*c.* 1079–1082) did herring as 'fish' + 'salt'; writing about 1157 Hildegard of Bingen found it the only fish – she considered thirty-five varieties – healthier to eat salted than fresh.[14] For modern food science and archaeological perspectives see Locker, *Role of Stored Fish*, 43–45 and 53–67 with works there cited, and Clavel, *L'Animal*, 154–160.

Many local studies treat medieval herring fishing, but no scholar has examined its whole interdisciplinary and multinational history, although Mollat du Jourdin, *Europe and the Sea*, 145–146, suggested some general working hypotheses. Cutting, *Fish Saving*, 53–73, and Hodgson, *The Herring*, offer anecdotal overviews from a British standpoint, sometimes with what have become obsolete references; Jahnke, *Silber des Meeres*, and Lampen, *Fischerei und Fischhandel*, 149–187, focus on the western Baltic. Several contributors to Barrett and Orton, eds., *Cod and Herring*, make up-to-date archaeological and historical contributions, though still conceived as a set of regional studies confined to parts of the North Sea and Baltic. Trade is better documented and hence more fully studied than production or especially consumption, although the latter can be assessed archaeologically.

Credible evidence of the absence of herring-eating inland before the eleventh century includes Locker, "Two Middle Saxon occupation sites"; Locker, "Peabody Site, Chandos Place, and the National Gallery"; Locker, *Fishergate, Norwich*, 42–44; and Locker, *Role of Stored Fish*, 170–191 and 277, the latter using a sample of another twenty well-sieved English sites; and also Hardy et al., *Ælfric's Abbey*, 356–357; Barrett et al., "Archaeo-ichthyological evidence," 365–366; Orton et al., "Fish for the city," 517; Harland et al., "Medieval York," 175–193. From the continent compare Benecke's, "Zur frühmittelalterlichen Heringsfischerei," an overview of fifty-eight sites, with his later reports in his "Lieps und Tollensesee" and "Mecklenburg," as well as Enghoff, " Baltic region" and Enghoff, "Southern North Sea".

[13] Puig, "Ressources de l'étang et de la mer," 108–114.
[14] Jarecki, *Signa loquendi*, 165–168; Hildegard, *Physica* 5:22 (Hildebrandt and Gloning, eds., vol. 1, pp. 278–279; tr. Throop, p. 171).

The small, soft bones of herring pose special zooarchaeological difficulties, and little should be made of their apparent absence from unsieved sites (compare Benecke, "Bergungsmethode," and Ervynck and Van Neer, "Preliminary survey," 304–305). In remains recovered from the harbour at Haithabu the herring absent from hand-picked finds comprised almost half of those in sieved samples (Heinrich, "Fischresten aus dem Hafen," 157–193, and Schmölcke and Heinrich, "Tierknochen … Schlämmfunde," 220–233).

5.2.3 Exotic Carp Invade the West

Jennifer Harland has usefully sketched the two independent and distinctive domestications of *Cyprinus carpio*, one associated with paddy rice cultivation in Neolithic China and another with artificial ponds in medieval Europe.[15]

Interestingly, neither Cassiodorus nor any other Roman writer equates *carpa* with Greek *Cyprinus* (κυπρινος). While Aristotle describes what is probably carp (or another member of the *Cyprinidiae*) in its lower Balkan and Asia Minor setting, the Roman Pliny alludes to *cyprinus* only as a marine organism (*Nat. Hist.*, IX: xvi and xxv). The root *k r p*⋆ is therefore likely of Germanic or earlier Celtic origin.[16] No medieval author equates *carpa* with *cyprinus*; the first to do so may well be the Moravian humanist, cleric, and writer on fish culture Jan Dubravius in his *De Piscinis*, written in the 1530s and first printed in 1547 (discussed in Chapter 7 below).

Outer limits to carp's range before the twelfth century are well established. Under whatever name, the species is absent from Ausonius' fourth-century description of eleven fish taxa in the Moselle (Ausonius, *Mosella*, ll. 85–149); from extensive eleventh-century treatments of fish at Cluny (Ulrich, *Constitutiones*) and at St. Gallen (Ekkehard IV, *Benedictiones*, in Duft, *Bodensee*, 20–232 and 90–91); from the large catalog of fish remains from ninth–eleventh-century Haithabu (Lepiksaar and Heinrich, *Untersuchungen … aus … Haithabu*; Heinrich, "Temporal changes," and compare Heinrich "Untersuchungen … aus Schleswig," 186–187); and from the extensive fish remains recovered from numerous sites in Flanders (Van Neer and Ervynck, *Archeologie en Vis*, 24–29; Van Neer and Ervynck, "New data on fish remains") and northwestern France (Clavel, *L'Animal*, 132–133). No remains or verbal

[15] Harland, "Origins of aquaculture".
[16] Thompson, *Glossary of Greek Fishes*, 135–136; Tischler, "Fische: Sprachliches," 121–122.

mentions from before 1200 suggest carp culture or artificial fishponds. These are wild fish.

Absence of carp from England in the thirteenth and most of the fourteenth century likely confirms that it became well-known in northern France only after Philip II drove John of England from Normandy and Anjou in 1205, inhibiting easy exchanges among the two landed elites. Carp do not tolerate salt water, so needed purposeful human assistance to get to Britain. See Chapter 7.

5.4 Natural Dynamics

5.4.1 Climatic and Hydrographic Variabilities

Major thirteenth- to fifteenth-century marine incursions along continental shores of the North Sea included the Jadebusen, a gulf beside the Weser estuary, which formed following storm floods in the thirteenth century (today again much reclaimed). The Dollart or Dollard on the Dutch–German border was created when storms in and after 1413 overwhelmed poorly maintained dikes (detailed discussion in Knottnerus, "Reclamations and submerged lands," 255–261; Curtis, "Danger and displacement," 113–116, narrates the complexities from a terrestrial perspective). In the Rhine/Scheldt delta the St. Elizabeth flood of 19 November 1421 overwhelmed farms and villages of the Biesbosch between the mouths of the Waal and Maas, turning for ensuing centuries a onetime agricultural landscape into a lucrative estuarine fishery for salmon, shad, sturgeon, and flatfishes (Martens, *De zalmvissers van de Biesbosch*, 25–31 and 41–54, with the larger context of environmental change provided in Soens, "Origins of the western Scheldt").

CHAPTER 6 CULTURAL RESPONSES

6.1 Allocating Fish and Fisheries Resources

6.1.2 Privatization of Fishing Rights

In much of Italy private acquisition of public rights culminated during the eleventh century when, for instance, fishing rights in wetlands and estuaries of the Pisan coast passed from the counts of Tuscany to regionally important church corporations.[1] In the south of the peninsula, public coastal fisheries in Lombard principalities were then also being ceded to private landowners, but it was Norman conquerors who there and in Sicily, too, simultaneously established royal authority over fisheries and granted or acknowledged ownership by local lords.[2]

Disputes arising from separate riparian lordship and ownership of fishing rights include a long-lasting and violent conflict over fisheries access between Jean de Joinville, seneschal of Champagne and later biographer of Louis IX, and the monks of Saint-Urbain at Troyes.[3] Men even died in violent mid-fifteenth-century clashes over fishing in the river Cher.[4]

Further instances of citizen fishing in municipal waters: From the thirteenth century the city of Bruges owned fishing rights on major waterways for common citizen use, but later farmed out to rich burgers designated sites in moats and ditches.[5] Municipal statutes at Rome from 1580, which permitted all "*civi et habitatori Urbis*" to fish the Tiber everywhere other than in privately owned fisheries, paraphrased older laws going back to 1365 (Rome, *Statuta* 1580, 177–178 [a reference for which I thank my colleague Tom Cohen]). The same principle of regulated citizen fishing in Spanish municipal waters goes back at latest to ideas found in the twelfth-century royal charter for Cuenca.[6]

Additional examples of diverse arrangements by rights holders to convey use of the waters to actual artisan fishers: Salem abbey in

[1] Garzella, *"In silva Tumuli* e *in Stagno,"* 145–147.
[2] Martin, "Cittá e campagna," 333–34; Bresc, "La pêche dans l'espace économique," 275–280.
[3] Cheyette and Chickering, "Love, anger, and peace," 94–96 and sources there cited.
[4] Querrien, "Pêche et consummation" (2003), 433.
[5] Brown and Dumolyn, *Medieval Bruges*, 68–69; Murray, *Bruges*, 59.
[6] Ladero Quesada, "La caza en las ordenanzas," 239, and Puñal Fernández , *Mercado en Madrid*, 175–180, describe a situation anticipated in the Cuenca *fuero*, article 1 (Ureña y Smenjaud, ed., *Fuero*, 224–225; Powers, tr., *Code of Cuenca*, 29–30).

1260 let out to four brothers a one-quarter share in its beach seine site called "*diu tiufe trahte*' ('the deep haul') on Lake Constance, taking in return a payment of 2,000 dried whitefish each Martinmas.[7] Several individuals and families at the Ely manor of Lakenheath took various individual demesne fisheries on lease for different terms of cash and other obligations.[8] Into the 1300s the dozens of waters owned by the dukes of Burgundy served mainly to supply the ducal household, but thereafter were progressively leased out for competitive bids by fishers and fishmongers; in Franche-Comté this happened even earlier to most domanial and communal fisheries.[9] Coastal lagoons of Mallorca were fished on short-term leases from the crown or other proprietors. At Madrid in the 1480s one Benito Romano obtained six years' exclusive use of a reach of municipally owned river for a large annual sum in cash, then hired workmen to build a weir to take fish.[10]

6.2 Public Regulation of Fisheries

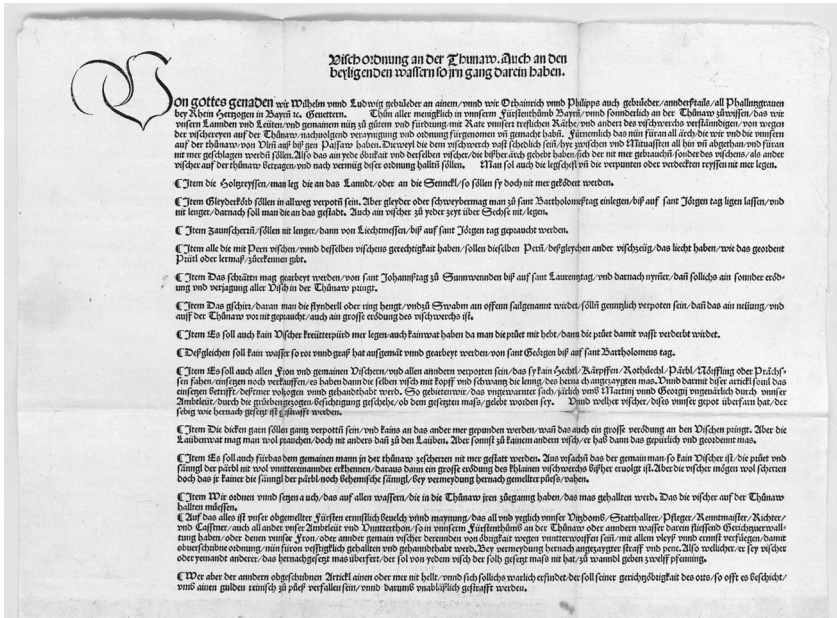
6.2.1 Authority

Exemplary or survey treatments of medieval regional fisheries legislation are to be found in Noël de la Morinière, *Histoire général des pêches*, 369–373; Mone, "Ueber die Flussfischerei," 67–97; Stolz, *Geschichtskunde der Gewässer*, 381–383; Mira, *pesca nel medioevo*, 44–55; Thomazi, *Histoire de la pêche*, 278–280; Grand and Delatouche, *L'Agriculture*, 544–546; Sicard, *Moulins*, 125–128; Cahn, *Recht der Binnenfischerei*, 57–60 and 132–138; Kisch, *Fischereirecht im Deutschordensgebiete*, 173–183 and 188–192; Willam, "Fischerei," 99–137 and 145–146; Trexler, "Measures against water pollution," 460–467; Moorhouse, "Medieval fishponds," 479 (identifies several thirteenth- and fourteenth-century English royal statutes regulating river fisheries); Materné, "Beroeps- en vrijetijdsvisserij," 142–143; and Materné, "Exploitatiemetoden," 219–222.

6.2.2 Measures

Full-size images of the Bavarian ordinance printed in 1528 follow

[7] Mone, "Ueber die Flussfischerei," p. 72 n. 4 [8] Kilby, *Peasant Perspectives*, 157–162.
[9] Beck, *Eaux et forêts*, 235–248, and Gresser, *Pêche et pisciculture*, 80–114.
[10] Barceló Crespí and Mas Forners, "Fishing in Majorca, 1230–1521," 141–143; Puñal Fernández, *Mercado en Madrid*, 177. For commercial leases of fisheries in Piedmonte see Nada Patrone, *Il cibo*, 320–324. Several contributions in Alfani and Rao, eds., *Gestione delle risorse collettive*, 164–170, 175–177, and 200–201, make passing reference to late medieval leases of older municipal fishing rights in the Po.



Visch ordnung an der Thunaw. Auch an den beyligenden wassern so im gang darein haben.

Von gottes genaden wir Wilhelm vnnd Ludwig gebrüder an einem/vnnd wir Otthainrich vnnd Philipps auch gebrüder/ainnderseits/all Phallnngrauen bey Rhein Herzogen in Bayrn ꝛc. Genettern. Thün aller menigklich in vnnserm Fürstenthümb Bayrn/vnnd sonnderlich an der Thünaw gesessen/das wir vnnsern Lannden vnd Leiten/vnd gemainem nutz zů gůtem vnd fürdrung mit Rate vnnserr trefflichen Rathe/vnd andern des vschwerens verstäntdigen/von wegen der vischereyen auf der Thünaw nachvolgend verayrnigung vnd ordnung fürgenomen vñ gemachet habē. Fürnemlich das nun fürran all zirch die wir vnd die vnnsern auf der thünaw/von Vlm auf biß gen Paſaw haben. Dieweyl die dem vischwerch vaſt schedlich sein/dye zwyschen vnd Mitnaassen all bin vñ abgetban/vnd fürran mit mer geschlagen werdn sollen. Alſo das ain yede dörfftt vnd derselben vischer/die bißher zirch gehebt haben/sich der nit mer gebrauchē/sonder des vischens/als ander vischer auf der thünaw Vertagen/vnd nach vermug disee ordnung halttn sollen. Man sol auch die legtschetl vñ die verpunten oder verdeckten reyssen nit mer legen.

Item die Holzreyssen/man leg die an das Lambt/oder an die Semeckt/so sollen sy doch nit mer gekbent werden.

Item Gleydeckseh sollen in all weg verpotn sein. Aber gleyder oder schweybermag man zů sant Bartholomeytag einlegen/biß auf sant Jörgen tag ligen lassen/vnd nit lenger/darnach soll man die an das gestade. Auch ain vischer zů yeder zeyt über Sechs nit/legen.

Item Zaunscherrn/sollen nit lenger/dann von Liechtmessen/biß auf sant Jörgen tag gepauncht werden.

Item alle die mit Pern vischen/vnnd desselben vischens gerechtigkait haben/sollen dieselben Pern/desgleychen ander vischzeüg/das kleht haben/wie das geordent Pünt oder lermaß zůerkennen gibt.

Item Das schnätrn mag gearbeyt werden/von sant Johannstag zů Sannwenden biß auf sant Laurentztag/vnd darnach nymer/dann sollichs ain sonnder erdnung vnd verjagung aller Visch in der Thünaw pringt.

Item Das gschirr/daran man die Hyndterl oder ring hengt/vndzů Swabm ain offenn sailgemannt wirdet/sollt gemnglich verpoten sein/dann das ain neüung/vnd auff der Thünaw von nit gepraucht/auch ain grosse erdnung des vischwerchs ist.

Item Es sol auch kain Vischer kreütterpünd mer legen/auch kainwat haben da man die pünt mit hebt/dann die pünt damit vasst verderbt wirdet.

Desgleichen sol kain wasser so rot vnnd graſ hat aufgemāt vnnd gearbeyt werden/von sant Georgen biß auf sant Bartholomeus tag.

Item Es sol auch allen Fron vnd gemainen Vischern/vnd allen ainnderm verpoten sein/das sy kain Hechtl/Karpffen/Rotthechtl/Pärbl/Nöfling oder Prächsen faben/einsetzen noch verkauffen/es haben dann die selben visch mit kopff vnd schwanz die leng/des hernach angezaygten mas. Vnnd darmit disee artickl sonl das einsetzen betrifft/desrmer vorgetan vnnd gehandlebabt werd. So gebietenwir/das vngewarnter sach/zirch vnnd Martiny vnnd Georgi nngenärlich durch vnnser Ambtleüt/durch die gebengezogen/besichtigung geschehe/ob dem gesetzten maſs/gelebt worden sey. Vnnd welher vischer/dises vnnser gepot überfarn hat/der sebtg wie hernach gesetzt ist gestraſft werden.

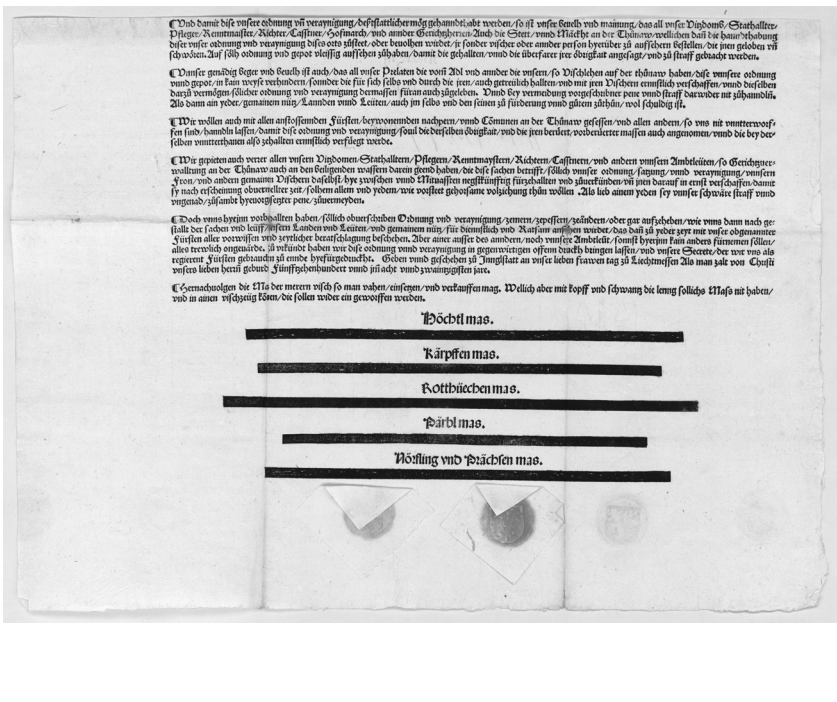
Item Die dicken garn sollen gantz verpotn sein/vnd kains an das ander mer gepunden werden/wan das auch ein grosse verdbung an den Vischen pringt. Aber die Laubenwat mag man wol praūchen/doch nit andere dann zů den Lauben. Aber sonnſt sů kainem andern visch/er hab dann das gepürlich vnd geordente mas.

Item Es sol auch fürbas dem gemainen mann zů der thünaw zůschernen nit mer gestatt werden. Aus vrsachē das der gemain man so kain Vischer ist/die pünt vnd sänngl der pärbl nit wol vnnttereinander erkbennen/daraus dann ein grosse erdnung des khlainen vischwerchs bißher erwolgt ist. Aber die vischer mögen wol schernen doch das je kainer die sänngl der pärbl noch behemische sänngl/bey vermeydung hernach gemelter püss/haben.

Item Wir ordnen vnnd setzen a uch/das auf allen wassern/die in die Thünaw jren zůgang haben/das mas gehalten werd. Das die vischer auf der Thünaw halten müessen.

Auf das alles ist vnser obgemelter Fürsten ernstlich beuelch vnnd maynung/das all vnd yeglich vnnser Vndomb/Statthaltter/Pfleger/Rentmaister/Richter/vnd Castner/auch all ander vnser Ambtleüt vnd Vnnterthon/so in vnnserm Fürstenthümb an der Thünaw oder ainnbem wasser darein fliessend Gerichtgerwaltung haben/oder denen vnnser Fron/oder ainnder gemain vischer berennden von dingkait wegen vnnterwasser sein/mit allem vleyss vnnd ernst verfügen/damit obuerschnidne ordnung/nun fürron vestigklich gehalten vnd gehanndtbabt werd. Bey vermeydung hernach angezaygter straff vnd pene. Alſo wellicher/er sey vischer oder yemandt anderer/das hernachgesetzt mas vberfare/der sol von yedem vischt der solh gesetzt mas ist hat/zů wannbl geben zwelff pfenning.

Wer aber der ainnbern obgeschribnen Artickl ainen oder mer nit helte/vnnd sich sollichs warlich erfinndet/der soll seiner gerichtsbörigkait des orts/so offt es beschicht/vmb ainen gulden rainsch zů pöen verfallen sein/vnnd darumb vnablässlich gestrafft werden.



Vnd damit diss vnsere ordnung vñ verayrnigung/desstattlicher mög gehanndtlabt werden/so ist vnser Ernstl vnd maynung/das all vnser Vndomb/Statthaltter/Pfleger/Rentmaister/Richter/Castner/Hofmarch/vnd ainnder Gerichtsherrn/Auch die Stett/vnnd Märcht an der Thünaw/wellichen daß die hanndthabung disee vnser ordnung vnd verayrnigung disco orts zůstet. oder beuolhen wirdet/je sonder vischer oder ainnder person hyeriber zů auffsehern bestellen. die jnen geloben vñ schwörn. Auf sölh ordnung vnd gepot vleissig auffsehen zůhabn. damit die gehalltten/vnnd die überfarer jrer dörigkait angesagt/vnd zů straff gebracht werdn.

Vnnser genädigt Herr vnd Beuch ist auch/das all vnser Prelaten die vorn Abl vnd ainnder die vnsern/so Vischlehen auf der thünaw haben/disse vnnsere ordnung vnnd gepot/in kain weyse verhindern/sonnder die für sich selbs vnd durch die jren/auch getreülich halltten vnd mit jren Vischern ernstlich verschaffen/vnnd dieselben darzů vermögen/sölcher ordnung vnd verayrnigung dermassen fürtan auch zůgeleben. Vnnd bey vermeydung vorgeschribner pene vnnd straff darwnder mit zůhanndln. Alls dann ain yeder/gemainen nutz/Landen vnnd Leiten/auch jm selbs vnd den seinen zů fürderung vnnd gůtem zůthün/wol schuldig ist.

Wir wöllen auch mit allen anstossennden Fürsten/herrnnonnenden nachpern/vnnd Comunen an der Thünaw gesessen/vnd allen andern/so uns mit vnnterwossen sind/hanndln lassen/damit diss ordnung vnd verayrnigung/staal bei desselben dörigkait/vnd die jren berüert/vnd erlernte massen auch angenomen/vnnd die bey derselben vnnterthanen alſo zehalltten ernstlich verfügt werde.

Wir gepieten auch vester allen vnsern Vndomen-Statthaltern/Pflegern/Rentmayrstern/Richtern-Castnern/vnd ainnern vnnsern Ambtleüten/so Gerichtsverwaltung an der Thünaw auch an den beligenden wassern darein gend haben/die disse sachen betrifft/sölch vnnser ordnung-saynng/vnnd verayrnigung/vnnsern Fron/vnd andern gemainen Vischern daselbst. hye zwyschen vnnd Mitnaassen negstkünfftig fürgehalten vnd zůuerkünden/vñ jnen darauf in ernst verschaffen/damit sy nach erschainung obuernelter zeit/solhem allem vnd yedem/wie vorstet gehorsame volziehung thün wöllen. Alls lieb ainem yeden sey vnnser schwäre straff vnnd vngnad/zů sambt hyrnnorgesetzter pene. zůuermeyden.

Doch vnns hyerin vorbehalten haben/sölch obuerschrben Ordnung vnd verayrnigung/zemern/zepessern/zůandern. oder gar aufzůheben/wie vnns dann nach gestalle der sachen vnd leuff/vnnsern Landen vnd Leiten/vnd gemainem nutz/für diennstlich vnd Rattsam ansehen wirdet. das dann zů yeder zeyt mit vnser obgenannter Fürsten aller vorwissen vnd gerticher beratschlagung beschehen. Aber ainer ausser des ainnbern/noch vnnsere Ambtleüt/somst hyerinn kain andern Fürnemen sollen/alles trewlich ongeuärde. Zů vrkunde haben wir disse ordnung vnnd verayrnigung in gegenwirtigen offenn brieffen bainnen lassen/vnd vnnsere Secrete/der wir vns als regierent Fürsten gebrauchen zů ende hyerfürgedruckt. Geben vnnd geschehen zů Jmmpfstatt an vnser lieben frawen tag zů Liechtmessen Alls man zalt von Christi vnsers lieben herrn geburd Fünffzehenhundert vnnd jm achtt vnnd zwannzigsten jare.

Hernachvolgen die Ma der mereren vischen so man haben/einsetzen/vnd verkauffen mag. Welich aber mit kopff vnd schwanz die lenng sollichs Mass nit haben/vnd in ainen vischzeüg tören/die sollen wider ein gewoffen werden.

Höchtl mas.

Karpffen mas.

Rotthüechen mas.

Pärbl mas.

Nöfling vnd Prächsen mas.

Managing seasonalities, natural and cultural: Rules set for the whole Zürichsee by treaty in 1386 protected small perch, roach/rudd (the taxonomy is ambiguous), and bleak from mid-April to the end of May (Amacher, *Zürcher Fischerei*, 387). On the north German Ratzeburger See a specific seine or trawl (*iagnette*) was since the thirteenth century outlawed while the smelt or bream were spawning (Lampen, *Fischerei und Fischhandel*, 118). Douai protected spawning pike and roach (Leguay, *L'eau dans la ville*, 291–292). See more French parallels in Sclafert, *Haut-Dauphiné*, 145–147, and Grand and Delatouche, *L'agriculture*, 544, while Mira, *Pesca nel medioevo*, 46, mentions more Italian cases. A variant strategy of annually rotated closures of lakes is reported in Brandenburg since 1311.[11] Municipal and regional authorities along Istrian and Dalmatian coasts and archipelagos used lotteries to control access to limited fisheries.[12]

Restrictions on gear: The *Fuero* of Cuenca confined summer fishing to hook and line on one particular reach of the Jucar.[13] A 1494 rule of the small town of Daroca banning all but angling when trout spawned in the fall later in 1564 became law for all Aragon. But in 1489 the count-palatine of the Rhine prohibited set lines and most angling in his ordinance for the Neckar.[14] Franche-Comté banned the river-spanning seine called *regfaut* from the Saône.[15] In a marine setting protective regulation of gear was in force at Trieste in 1350, while prohibitions of bottom trawls from inshore waters in Languedoc date as much as a century earlier. Introduction of Sicilian-style fixed tuna traps (*tonayra*) to the Catalan coast around 1400 provoked much regulatory activity by municipal and regional authorities.[16] More bans on piscicides are known from Sardinia, (expressly in both fresh and marine waters), Piedmonte, Pistoia, and Old Castile.[17]

[11] "parcere in piscando" (Bestehorn, "Geschichtliche Entwicklung," 140).
[12] Fabijanec, "Fishing, consumption, and processing," 169–186.
[13] Cuenca *fuero*, xliii: §7 and 13–14 (ed. Ureña i Smenjaud, 820–823; tr. Powers, 216).
[14] Koch, "Geschichte der Binnenfischerei," 27 and works there cited; Rodrigo Estevan, "Fresco, frescal, salado, seco, remojado," 555.
[15] Kempf, "L'économie et la société," 44.
[16] Iona, "Istituti e alimenti," 627–628; Larguier, "Des lagunes à la mer," 197–198; Garrido i Escobar and Pujol i Hamelink. "Changements techniques," 25–26.
[17] Fois, "Annotazioni sull'alimentazione," 189; Nada Patrone, *Il cibo*, 325; Zdekauer, ed., *Statutum* , 131 and 139 (a reference generously provided by John Muendel); Casado Alonso, *Señores, mercaderes y campesinos*, 210

6.2.3 To What End?

The focus on management of local fish varieties is clear in the following tabulation of fishes mentioned in a sample of eight sets of regulations ranging from late twelfth-century Castile to the Lake of Constance in 1536. Here presented in a more understandable format than was published in Hoffmann, "Fisheries regulations," figure 5.1.

Fish taxa present in selected medieval fisheries regulations

			Cuenca, Castile, ca.1185/90	Lago Trasimeno & area, 1276-1342	France (Seine basin), 1268-1326	Zürichsee, 1386	Traun R, 1418	Chiemsee, 1448	Austrian Danube 1506	Bodensee, 1536
			Kg. Alfonso VIII, *Fuero de Cuenca* , cap.XLII:7-9	Perugia communal *statuti*	Kgs. Louis IX, Philip IV, Philip V	Compulsory sworn agreement among fishers	Agreement among master fishers	Dk. Henry VI, Bavaria-Landshut	Emperor Maximilian, *Patent* for Upper and Lower Austria	Fisheries agreement between Konstanz & Überlingen
PETROMYZONIDAE		lamprey			><					
ANGUILLIDAE	A. anguilla	eel	><	><	><					><
SALMONIDAE										
	Salmo trutta	(Brown) trout; Sea trout	><	><			><		><	><
	Hucho hucho	Huchen					><		><	
COREGONIDAE		whitefish						><		
	Coregonus lavaretus	Laveret				><				><
THYMALLIDAE	Thymallus thymallus	Eur. Grayling					><			
ESOCIDAE	Esox lucius	pike		><	><	><	><	><	><	><
CYPRINIDAE										
	Cyprinus carpio	(Common) carp			><				><	><
	Alburnus alburnus	Bleak				><				><
	Aspius aspius	Asp						><		
	Barbus barbus	Barbel			><			><	><	><
	Barbus spp.	barbel sp.	><							><
	Protochondrostoma genei	lasca		><						
	Leuciscus leuciscus	Dace			><	><		><		
	Leuciscus (Squalius) cephalus	chub		><	><					
	Rutilus rutilus	roach			><	><				
	Rutilus rubilio	Rovella, Triotto, Italian roach		><						
	Scardinius erythropthalmus	rudd		><				><		
	Tinca tinca	tench		><	><					><
SILURIDAE	Silurus glanis	Eur. Catfish, wels						><	><	
GADIDAE	Lota lota	Burbot						><	><	
PERCIDAE										
	Perca fluviatilis	perch				><		><		><
	Zingel spp.	Apron, Streber, Zingel							>< ?	
		NUMBER OF TAX NAMED*	3	8	9	6	4	9	8	10
		*Exclusive of distinctive names for different size or year classes	Powers 2000, Ureña y Smenjaud 1935	Biganti 1995, Scialoja 1910, Vincenti 2002	Rouillard 2004, Duples-Agier 1852, Lespinasse 1886	Amacher 1996, 387-390	Scheiber 1930, 152	Höfling 1987, 115-118	Hoffmann & Sonnlechner 2011	Zeheter 2014, 122-138

CHAPTER 7 AQUACULTURE

7.2 From Wildlife Management to Aquaculture

Additional instances of stocking natural or artificial waters with native species for growth and subsequent capture: Sicilian tidal ponds were stocked from locally taken small fishes,[1] while agents of the king of Navarre moved eel and also roach among freshwater fisheries.[2] The municipal official who managed Namur's network of channels and moats stocked them with small fishes obtained elsewhere.[3] Bavarian monasteries were accustomed to move fish from lake to lake.[4] In 1520 Swedish priest Petrus Magni, head of the Brigittine house in Rome, assembled instructions in the last chapter of an agricultural manual otherwise derived from classical Roman agronomist Columella. Fishponds in Sweden, he said, were made by closing off a bay or inlet holding fish – he liked tench and crucian carp – and feeding them butchers' waste, vegetables, or, in winter, black bread put into holes cut through the ice. As needed the fish could be caught by diverse means.[5]

7.2.2 Emerging Technologies: Engineering, Practices, Fish

Besides what is in the text of this section, normative operational and managerial details of thirteenth–early fourteenth-century French seigneurial pond enterprises are provided in financial accounts and treated in specific local studies. Multi-pond rotations were employed on royal ponds under Philip IV and a generation later on those of the last Capetian duke in Burgundy and of Queen Dowager Jeanne de'Évreux in Brie.[6] Not all French pond systems were entirely devoted to carp: that of the count of Artois at Hesdin in the 1290s–1330s provided also pike and bream, as did some royal ponds.[7] During the 1330s–40s both large and small carp from the St.-Seine pond went into restocking the two ponds immediately below it and also were used to 'empoissoner' other

[1] Bresc, "Peche et les madragues," 169–173, and his *Monde méditerranéen*, 261.
[2] Serrano Larráyoz, *Mesa del rey*, 200–203.
[3] Lentacker et al., "Historical and archaeozoological data," 84–85.
[4] Kisslinger, *Chronik*, 98–100. [5] Svanberg and Cios, "Petrus Magni."
[6] Rouillard and Maupoume, "Étangs royaux"; Hoffmann, *"Carpes pour le duc,"* 38–39; Hoffmann, "Aquaculture in Champagne," 72, using Longnon, ed., *Documents*, III: 379–457.
[7] Farmer, "Power and the 'natural' landscape," 659–62; Dowling, "Landscape of luxury," 375–379; Rouillard and Maupoume, "Étangs royaux."

ducal waters along the Saône. The same managers also stocked wild-caught pike.[8]

Regarding the belated entry and environmental insignificance of medieval carp in England and elsewhere: A relative lag crossing the Channel fits other evidence that the carp had not yet reached northwestern France before the 1204–1206 collapse of the Angevin realm split Anglo-Norman estates into different lordships and social networks. England received the pond technology in the twelfth century but not the carp in the thirteenth.

Carp are nowhere in thirteenth-century records of English fish pond enterprises (Roberts, "Bishop of Winchester's fishponds") nor do they feature in discussion of fish ponds in the estate management treatise *Fleta*, II:73 (ed. Richardson and Sayles, p. 247). Their absence is evident and sometimes noted in Dyer, "Consumption of fresh-water fish"; Steane, "Royal fishponds"; Bond, "Monastic fisheries," 93–95; and Serjeantson and Woolgar, "Fish consumption," 124–126.

The earliest mention of carp in Britain of which I am aware occurs in the manuscript Plea Rolls from 1395, in which an accused was acquitted of poaching 1,500 fish, among them "carpes," from a pond in Middlesex three years earlier.[9] This record inspires much greater confidence than the quite possibly interpolated option "baken breme or carpe" in the so-called "Ancient Cookery" collection which the Society of Antiquaries published from Ms Arundel No. 344 as *A collection of Ordinances*, 499, and said to be a copy done shortly after 1399 of an older text from the English royal household. The two fish-rich recipe collections more confidently linked to the court of Richard II do not mention carp (Hieatt and Butler, eds., *Curye on Inglysch*, 19–30, 81–91, and 93–145).

Live carp along with other species are present in considerable numbers in management records of 1462–1472 for the duke of Norfolk's fishponds (Turner, ed., *Manners and household expenses*, 560–564 (facsimile Crawford, ed., *Household Books of John Howard*, same pagination). They antedate both the carp served at Richard III's coronation banquet in 1483 (Sutton and Hammond, eds., *Coronation of Richard III*, 294–295 and 300), and those in the *Treatyse of fysshynge* which Wynkyn de Worde printed in the 1496 second "Boke of St. Albans" (the manuscript from mid-century lacks the relevant passages). For the latter see McDonald, *Origins of Angling*, 214–215.

[8] Hoffmann, *"Carpes pour le duc,"* 41.

[9] TNA, KB 27/536 Pasche 18R2, m 9. I am grateful to Stuart Jenks and Suzanne Jenks, University of Erlangen, for sharing with me this valued byproduct of their archival research.

No carp have been found among fish remains from twelfth–fourteenth-century St. Albans (Dale Serjeantson, personal communication) nor other contemporary and likely English sites. The earliest bones known to me still come from an early sixteenth-century midden in Surrey (Bullock, "Evidence for fish exploitation"). Factual errors vitiate the otherwise interesting discussion in Currie, "Early history of the carp."

Nor did medieval carp penetrate significantly into Spain (where they are believed a sixteenth-century introduction) or Italy. Carp are absent from the army of aquatic creatures mustered by Doña Caresme in her battle with Don Carnal (Lent vs Carnival) as described by Juan Ruiz in his 1343 *Libro de Buen Amor*, stanzas 1067–1127, and likewise from the extensive list of fifteenth-century urban supply contracts assembled by Sánchez-Quiñones, *Pesca y Comercio*, 274–277. Likewise Crescenzi, *Ruralia commoda*, fails to mention the species in discussions of ponds or of fishing (lib. 9, cap. 81, and lib 10, cap. 28–30; Richter, ed., vol. III, pp. 125–127 and 204–210). Italian cookbooks of the fourteenth century also lack carp; it there first occurs in the mid-fifteenth-century 'Libro de arte coquinaria' by the Lombard Maestro Martino (Faccioli, ed., *Arte della cucina*, vol. 1, pp. 19–204, notably 194, and Boström, ed., *Anonimo Meridionale*).

7.2.3 Diffusion of Innovations

Although carp were on the market in Constance during the Council, natural rivers and lakes continued to provide most fish for Swiss consumers. Ponds to hold and grow native fishes were common. Only from about the mid-fifteenth century did landowners across the Swiss lowland invest in more elaborate pond systems for managed production of carp and other varieties.[10]

7.3 Aquaculture As Ecological Revolution

7.3.1 Demand: Live Fresh Fish for Inland Elites

In the course of the fifteenth century household managers for the archbishop of Esztergóm switched the normal fish service from sturgeon and

[10] See Amacher, *Zürcher Fischerei*, 98–106; Häberle and Marti-Grädel, "Teichwirtschaft"; Hoffmann, "Karpfen in die Schweiz"; and Häberle and Plogmann, "Archaeological and historical evidence."

predatory species to cyprinids, both small varieties and what look like cultured carp. No remains of marine taxa appear in the palace midden.[11]

7.3.3 Adaptive Economic Structures

More expert builders and managers are known by name in thirteenth-century England and early fourteenth-century Lorraine, Namur, and Brie.[12] Deligne, "Carp in the city," 295–298, identifies specialized managers of large noble pond enterprises in Brabant and Hainaut during generations around 1400, while Guérin, *La vie rurale*, 134–135, mentions whole lineages of skilled *bessons* working in fifteenth-century Sologne.

Significant quantities of carp shipped directly to the lord's establishment also include 3,700 from one pond near Namur to the count's table in 1356. In the 1340s the queen dowager's ponds in Brie sold thousands of carp and lesser numbers of pike and *blancs poissons*, together a large but incalculable share of their Lenten harvests, to merchants from towns along the Marne and with connections in Paris. More French sales of cultured fish are found in Hoffmann, "*Carpes pour le duc*"; Gresser and Hintzy, "Les étangs du domaine comtal"; Guérin, *La vie rurale*, 137; Mattéoni, "Pêche des étangs"; Benarrous, *Grande Brenne*, 244–250; and Theurot, "Approche de la pêche." English deliveries commonly numbered only in the hundreds.[13]

[11] Bartosiewicz and Gál, "The Archbishop's dinner?"

[12] McDonnell, *Inland Fishery*, 19–20; Steane, "Royal fishponds," 46; Collin, "Les ressources alimentaires," 64–65; Balon, "La pêche," 28–31; and Hoffmann, "Aquaculture in Champagne," 75–76.

[13] Balon, "La pêeche," 30; Hoffmann, "Aquaculture in Champagne," 73–75 (using Longnon, ed., *Documents*, III: 375–457); Roberts, "Bishop of Winchester's fishpond"; Steane, "Royal fishponds," 49–50; McDonnell, *Inland Fisheries*, 19–24.

CHAPTER 8 OVER THE HORIZON

8.1 Innovation on Marine Fisheries Frontiers

8.1.1 Networks for Silver

Albertus Magnus on herring, *c.* 1250: *De animalibus*, lib 24, §2 (Stadler, ed., p. 1518). *Allec piscis est maximae multitudinis in Occeano quod partes Galliae et Angliae et Teutoniae et Dacia attingit: et est piscis quasi palmae unius qui dum in tot grege natat, capi pree multitudine non potest. Dum autem post aequinoctium autumnale acies se dividunt,capitur: et aliquando tunc in magnis et multis sagenis colligatis concluduntur, quod funes retium incidi oportet eo quod trahi retia non possunt.*

Hic piscis squamosus et sapidus est, non habens intestinum nisi ieiunum …

8.1.1.1 Early Export Centres Saxo's *Gesta danorum*, preface, 2:4 (ed. Friis-Jensen, vol. 1, pp. 10–11), reads *Ab huius ortiuo latere occasiuum Scaniae media pelagi dissicit interruptio, opimam prede magnitudinem quotannis piscantium retibus adigere soliti. Tanta siquidem sinus omnis piscium frequentia repleri consueuit, ut interdum impacta navigia vix remigii conamen eripiat nec iam preda artis instrumento, sed simplici manus officio capiatur.*

Lesser early production centres:

Butcher, *Medieval Lowestoft*, reminds us that ports besides Yarmouth played a role in the fourteenth-century East Anglian fishery.

For much of the thirteenth century fishers of herring off Rügen in Pomerania (see Chapter 5) competed with Scania to supply Lübeck and its exports, but by the 1280s that stock had declined to become an essentially local fishery for Stralsund and vicinity.[1]

Between the 1270s and 1310s a fishery for post-spawn North Sea fish in the Skagerrak off Bohuslan, then Norway's southeasternmost province, also supported large catches, but subsequently almost vanished. When a like boom-and-bust cycle occurred in later centuries, it seems to correlate with colder conditions.[2]

8.1.1.2 The Interplay of Technologies and Regional Success Others besides Netherlanders could also learn the technology and exploit

[1] Jahnke, *Silber*, 20–38; Jahnke, "Medieval herring fishery," 168–170; Lampen, *Fischerei*, 163–171.

[2] Jahnke, *Silber*, 281–293; and MacKenzie et al., "Ecological hypotheses," 176–177.

northern schools. In peacetime (1460s–80s) the yearly catch at Dieppe oscillated by about 25 percent around a 400-tonne median[3]. Barrelled herring were an important innovation in late fourteenth-century Scotland which from the mid-fifteenth century sustained a significant export trade.[4] Danish fishers enjoyed some decades of success during the later fifteenth and sixteenth centuries taking herring off Heligoland and from the Limfjord at the tip of Jutland at those times it was open to the sea.[5] All of these fisheries exploited North Sea, not Baltic, stocks. Meanwhile as framed more fully in the published text of this chapter, ships from southwestern England were from at latest the early 1400s working both the Irish Sea and waters to the west of Ireland to catch herring themselves or buy the catches of local fishers. Some vessels departed with their own salt and processed their catch at sea.

8.1.1.3 An Evolving Consumer Base Italians other than Francesco Datini also traded in herring by around 1400. Local tradesmen in Prato retailed these fish. Another contemporary, Saminato de Ricci of Florence but resident in Genoa in the 1390s, reported *aringhe* on sale at Bruges for 6 lb.gr the *last* (*il lascho*) of 10,100 fish, ten *balli* of 1,010 fish each. Added expenses brought the cost to 7 lb.gr., but on delivery to Porto Pisano they would go for 10 florins the *last* or 1 florin the *balle*. Herring arrived at Bologna in the 1400s.[6]

8.1.2 The Stockfishsaga and Other Tales of Codfishes

8.1.2.1 Norse Fisheries and Trades Early Viking Age Norse settlers in Orkney also followed, possibly even pioneered, the same transition in the eleventh and twelfth centuries from subsistence use of cod to an intensified fishery that seemingly served export, not domestic consumption needs. Subsequent loss of competitive ability unwound Orcadian socio-economic structures. Publications by James Barrett and associates are essential.[7]

[3] Mollat, *Commerce maritime Normand*, 313–317 and 598–599.
[4] Gemmil and Mayhew, *Values in Scotland*, 317–323.
[5] Poulsen, "Peasants of West Jutland," 47–50; Poulsen, "Herring fisheries off Heligoland"; Holm, "Catches and manpower," 180–182; Mackenzie et al., "Ecological hypotheses," 202–203.
[6] Marshall, *Local Merchants*, 16 and 34; Borlandi, ed., *Il manuale … di Saminato*, 129; Pucci-Donati, "Mercato del pesce."
[7] Barrett, "Fish trade"; Barrett *et al.*, "Archaeo-ichthyological evidence," 360–374; Barrett *et al.*, "What was the Viking Age," 16–19; Simpson *et al.*, "Interpreting the Viking Age"; Barrett, "Farming and fishing"; Cerón-Carrasco, "Investigation"; Cerón-Carrasco, "Fish and marine shell"; and Barrett, *Being an Islander*, 275–291.

Thorhallsson and Kristinsson, "Iceland's external affairs from 1400," 114–128, frame in political theory a solidly detailed narrative of fifteenth-century relations and conflicts in Iceland among Icelanders, the (weak) Danish state, English merchants and fishers, and German merchants, climaxing in English vs Danish–Hansard warfare after 1460 and final defeat and expulsion of the English in 1530.

8.1.2.2 Who Ate Which Medieval Codfishes? The oldest known German cookbook, assembled at Würzburg about 1350, does provide instructions for preparing stockfish.[8]

Jean de Boeckenheim worked for Pope Martin V from 1417 to 1431. His recipe: "*Sic prepara* ***stocbisch*** [*sic*]. *Recipe eum, et mitte eum stare in aquis per noctem, quod mollis fiat. Et tunc fac eum modicum bulire, et eice aquam, et munda eum bene; et tunc fac eum plene bulire, cum cepis, et petrocilino; et tunc mitte superius zepharanum, cum aliis speciebus bonis. Et erit pro Thuringis et Hassis et Suevibus.*"[9]

An occasional stockfish appears after 1450 in purchases by Austrian abbeys and in cookbooks of similar provenance.[10]

The *Menagier* reports: *Morue n'est point dicte a Tournay s'elle n'est salee, car la fresche est dicte cabeleaux, et se mengue et est cuicte comme dit sera cy apres de morue. Item, quant icelle morue est prise es marces de la mer et l'en veult icelle garder .x. ou .xii. ans, l'en l'effondre et luy oste l'en la teste, et est seichee a l'air et au soleil, et non mye au feu ou a la fumee. Et ce fait, elle est nommee stofix.*.[11]

Further words on medieval names for cods are in order. In Old Norse *stokfisk* refers to the northern dried cod, preserved without salt. The term may derive from the poles (*stok*) on which the carcasses were hung to dry. This became *stockvisch* in the Hansards' Middle Low German and 'stockfish' in English, attested since 1290.

Medieval Latin *strumulus* is a synonym for stockfish, at least according to Diefenbach *Glossarium Latino-Germanicum*. This term appears in neither DuCange nor Niermeyer, only in some Latin-language texts from the Empire, mainly the north, dating from the late thirteenth into the sixteenth century.

[8] Adamson, "Medieval Germany," 168–173; Adamson, ed., *Buoch von gùter spise*, text p. 64, translation p. 96.

[9] Laurioux, "Le 'Registre de cuisine'," pp. 741–742 (recipe nr. 69).

[10] Jaritz, "Zur Sachkultur," 152; and Jaritz, "Reiner Rechnungsbücher," 182–187; Aichholzer, "*Wildu machen ayn guet essen…*," 381–386, is a concordance to ingredients in the three major compilations from Mondsee, Innsbruck, and St. Dorothea in Vienna, of which she also publishes full texts.

[11] *Menagier*, II:v, §194, Brereton and Ferrier, eds., p. 237.

Medieval Latin also had the name *cabellauwus*, attested in Flanders since the twelfth century (DuCange). By 1278 *cabillaud* appears in French, perhaps a bit later than Flemish/Dutch *cabelau*, which is thought the root for fourteenth-century German *Kabeljau*, a codfish. Also in Flemish the word *bakkeljaw* evolved by metathesis and spread thence into French and other Romance languages, notably as *bacalao* (Portuguese and Spanish) and *baccalà* (Italian), both of which are understood generally as dried codfish (gadids).[12]

Haberdine, appearing in English about 1300, is reported in various current dictionaries as an obsolete term for dry salted cod, but not stockfish. It is absent from *OED* 1989. *OED* 1961, however, asserted it resembled Middle Dutch *abberdaen* and *labberdaen*, and alleged a derivation from Basque *Laberdanus*, an ancient name of Bayonne, because Basques were 'the first to engage in the cod fishery'. The latter error and chronology would militate against such an origin. An unlikely association with Scottish Aberdeen also lacks evidence.

A fish name 'cod' appears in English in the late fourteenth century. Its origins remain speculative. Earlier English texts employed 'mulvel', 'melwel', 'mywell' or the like, attested from 1228 and derived from Old French *muluello*, itself a diminutive of French *morue*, from medieval Latin *morua*, *moruca*, *moruta*, etc. All meaning cod.[13]

Old Norse *þorskr* (dry, dried) is the root for German *Dorsch*, the term for a small cod, especially in the Baltic.

The wide-ranging linguistic discussion of Sayers, "Some fishy etymologies," disappoints. Entirely focused on words, it ignores the known history of the cod fishery and stockfish in Europe and relies on mythic claims of medieval Basque presence in North America. As documented below, cod remain absent from medieval Basque written and archaeozoological records long after northern Europeans commonly traded and ate them.

8.1.3 Diverse Opportunities for Innovative Competitors

8.1.3.1 In Eastern Atlantic Waters Except for the Atlantic islands (Madeira group, Azores) opened up from the 1460s or so, Portuguese marine fishing primarily exploited relatively nearby fish stocks to sustain mainly local consumption. Artisanal organization

[12] See Wartburg, *Französisches Etymologisches Wörterbuch*, vol. 2: *"Kabeljauw"*; Pfeifer et al., *Etymologisches Wörterbuch*: "*Kabeljau*"; Kluge et al., *Etymologische Wörterbuch*: "Kabelau"; and Real Academia Española, *Diccionario de Autoridades*: "*baccalao.*"

[13] *OED*; Kowaleski, "Early documentary evidence," 31.

prevailed. Fish markets offered fresh specimens of familiar regional fishes (sardine, hake, conger, shad, diverse inshore species) and, at latest by the fourteenth century, preserved imports from the north, mainly herring, obtained in exchange for salt. Porto traded fish with Lisbon, Setubal, Galicia, Vizcaya, and Barcelona. But smoked and salt dried sardines were the staple. Cod enter the commercial and culinary record only around and after 1500.[14]

Absence of late medieval Basques from distant water fisheries and of products from those fisheries in Spanish diets is clear. As put by historian Michael Barkham, "Following in the wake of Portuguese, Norman, Breton and some English mariners who pioneered the cod fishery in Terra Nova, the earliest known Terra Nova voyage with apparent French or Spanish Basque participation was undertaken in 1517."[15] Meanwhile the kitchen of Carlos II of Navarra (1411–1425) served many and diverse fishes, so the king and his courtiers dined often on Biscayan hake, but nary a cod (under whatever name).[16]

Late medieval European cod remains, including those from the Basque country, are of small coastal fish and of Norwegian/Icelandic stockfish. Composition of Iberian catches and menus would change only with the start of the sixteenth century, when distinctively large specimens from the newly opened fisheries of the northwest Atlantic suddenly appear. The oldest known cod remains (four bones from processed fish of 55–57 cm) together with much processed hake and even more locally caught and prepared inshore fishes are found in waste deposits dated to the turn of the fifteenth–sixteenth centuries at a Carthusian house in Seville. All indicators still point to a northern European origin. Thereafter the Plaza Orientale at Madrid has yielded cod bones of

[14] See Oliveira Marques, *Hansa e Portugal*, 64–75 and 148–149 and *Daily Life in Portugal*, 8, 21, and 189–200; Oliveira Marques and Ferro, "L'alimentation au Portugal du moyen age"; Gomes Filho, *Um Tratado de cozinha portuguêsa*; Catarino, "Abastecimento," 19–27; Amorim, "Portuguese fisheries," 279–283, and "Evolution of Portuguese fisheries"; Madureira Franco, "Les dynamiques familiales … dans un village de pêcheurs"; Pereira, "Pesca maritima "; and the pioneering work of Tavares, "Pescados, pinnípedos, cetáceos … en los archipiélagos." Da Costa Dominguez, "Harvesting in holy waters," confirms the prevalence in Portugal into the sixteenth century of traditional local artisanal fishing for sardine in estuaries and near shore.

[15] Barkham, "Offshore and distant-water fisheries," 236, continues with multiple source references. Assertions to the contrary demonstrably rest on tales concocted in and after the late sixteenth century. Sadly the careful critical scholarly assessment of Juan Gracia Cárcamo, "El sector pesquero en la historia del Pais Vasco," 176–179, wholly escaped the wishful Basqueophile Kurlansky, *Cod*, 17–29.

[16] Serrano Larráyoz, *La mesa del rey*, 200–207.

sixteenth–nineteenth-century date.[17] Grafe, *Distant Tyranny*, 57, voluminously confirms the chronology of the bones.

8.1.3.3 On the Southern Frontier Between 1384 and 1410 Francesco Datini received at northern Italian ports fifty-one shipments of *tonnina* (individually numbering up to 200 barrels). At least 40 percent had originated in Sicily, 15 percent from Provence and less from Andalusia.[18] Late medieval Tuscans visibly eat *tonnina* in Balestracci, *Renaissance in the Fields*, p. xxii; La Ronciere, *Prix et salaires à Florence*, 65; and Marshall, *Local Merchants of Prato*, 34.

On behaviour of bluefin in Provençal waters see Maunier, "Evolution," 184–189. Surviving tuna there had until the fifteenth century only to evade the long boat seines (*cienche*) of local fishers, who lacked access to some of the urban capital behind their Sicilian rivals and began only from about 1400 to adopt the fixed *madrague* (i.e., tonnara) on the Sicilian model.[19]

Further west in Catalan waters tuna traps (*tonayra*) on the Sicilian model appeared in the late fourteenth century and spread more rapidly, together with a growing fishery for other pelagic species such as swordfish and bonito. Barcelona and neighbouring municipalities responded in 1391–1410 with legislation to deny exclusive individual control of access to the rich stocks by setting out areas and seasons for use in the common interest.[20] Down the coast in Valencia the technology seems more ambiguous, for fifteenth-century complaints about tuna fishing claimed the *almadrabas* "burned the sea" (*com cremen los mars*) by indiscriminate killing of diverse fishes.[21] Though also referred to as *tonayras* the purported damage implies a seine or trawl, not a trap.

8.2 Markets and Ecosystems, Expectations, and Experiences

8.2.2 New Structures in the Fisheries

Further signs of permanent specialized coastal fishing settlements: By the early fifteenth century most households in several villages on the Breton

[17] Ferreira Priegue, *Galicia*, 147–48; Morales et al., "Sobre la presencia del bacalao," 17–24; Desse and Desse-Berset, "Pêches locales, côtières ou lointaines," 119–126; Roselló Izquierdo et al., "La Cartuja/Spain: anthropogenic ichthyocenosis," 323–31; Morales-Muniz et al., "Pesquerias medievales hispanas," table 1; Barkham, "Offshore and distant-water fisheries," 236. All of these refute Kurlansky, *Cod*, 17–48.

[18] Nigro, "Mangiare," 121–122 and 136–139.

[19] Bresc, "Pêche et coraillage"; Hocquet, "Pêcheries médiévales," 65.

[20] Garrido i Escobar and Aleret, "Evoluzione," 120; Garrido i Escobar and Pujol i Hamelink, "Changements techniques," 26–27.

[21] Aparisi, "Fishing in medieval Valencia," 227–229.

shore were those of fishers, people whom a papal bull of 1428 described as "ex piscatione vitam sibi procurant." Similar permanent fishing villages formed on fifteenth-century Danish coasts.[22] Sørheim, "Birth of commercial fisheries," describes post–thirteenth-century movement of people from inner waters along Norway's central coast to outer islands with better access to the fishery. About the same time commercial fishing villages exploiting herring and other species (*strekfus*?) likewise appeared in the Finnish archipelago and Ostrobothnia.[23]

8.3 Unanticipated Concomitants, Unintended Consequences

8.3.1 Risky Business

Original of the Lübeck chronicle (Koppmann, ed., "Rufus-Chronik," 226–227) reads: "*dar ghink nen heringh an dem Sunde; dar umme konden de visschere nicht gripen alle de titd, dat se dar weren … also de vorbisteringhe des heringhes uthe deme Sunde, blef langhe jar na, … unde quam nicht wedder; men he delede sik in de zee und quam en dels in Vlanderen, en dels by Hilghelande unde desgheliik mengher wegheue, dar he grepen wart; men hew en habbe nerghene de art unde gude, de he in Schonessiden plach te hebbende.*"

Besides the common medieval clerical attribution of damaging natural events to human sinfulness, the occasional 'disappearance' of herring schools in particular was since the fourteenth century reportedly blamed on fishers 'insulting' the king of the herring, who then led his armies elsewhere. ('Herring' is associated with the German root *Heer*, meaning 'army'.)[24] Some sixteenth-century versions identified the herring king as a small but very speedy herring, which had won a race for kingship of all fishes. Others describe the monarch as what is now called a 'ribbonfish', a much larger and unusual plankton eater known for occasional appearance among herring feeding near the surface in hours of darkness. The likeliest candidate in the North Sea and Baltic is the giant oarfish (*Regalecus glesne*), the longest known bony fish, reaching up to 8 meters (27 ft) but with a laterally compressed strap-like shape only 15–30 centimeters (a foot or so) deep and a few cm thick. The small head carries a crown-like crest of red fin rays. A fisher pulling herring nets in full darkness out in the North Sea would surely remember encountering one of those, especially since specimens are often found with injured tails

[22] Touchard, *Commerce maritime breton*, 59–60. Hybel and Poulsen, *Danish Resources*, 49.
[23] Immonen, "Monasticism in a border landscape," 314–318.
[24] Heinrich, "Information about fish from tales and myths," 18–19; Jagow, "Heringfischerei," 19–23, and "Hering im Volksglaube," 220–223.

(autotomy). Also possible is the dealfish (*Trachipterus arcticus*) of similar shape and habits but deeper habitat and only some 3 m (10 ft) long.[25]

8.3.2 Herring, People, Climate, and Weather, c.1350–1540.

Sea surface temperatures are inferred from stable isotope and other proxies derived from Greenland ice cores and remains of microscopic shelled marine organisms taken in bottom cores.

This evidence suggests the North Atlantic remained fairly stable under a positive NAO during the MCA and then went into a downward trend from the 1270s to 1390. The latter included high variability with major cooling events in 1330-1345 and later deep troughs in the 1380s and first decade of the fifteenth century. Researchers now see 1400–1420 as completing a fundamental climatic shift to the primarily negative NAO typical of the LIA with increased regional storminess. Strong cooling during the 1440s–70s sent sea temperatures to record lows by the 1480s. A brief recovery was followed by another general and deep nadir from the 1520s to 1550s. Note that these estimates encompass multiple and variant local studies at some distance from the principal herring fisheries and using methods with limited chronological precision.[26]

8.4 Infinite Fish?

Pope, *Many Landfalls*, 11–42, set straight some important context on Caboto (p. 13): "… start with the following facts. First of all, he wasn't John Cabot, of course. On the other hand, he wasn't Jean and he wasn't even Giovanni, as biographers like to call him. He was Zuan Caboto. Although a citizen of Venice, he was not born there but naturalized circa 1472." This is a useful reminder of the *European* quality of maritime enterprise at the end of the Middle Ages.

The original report on the Caboto discovery sent by Raimondo de Raimondo de Soncino to the duke of Milan, 18 December 1497, reads

[25] See www.fishbase.net, sub *Regalecus glesne* and *Trachipterus arcticus*.

[26] Since Campbell's discussion in *Great Transition*, 200, based on earlier research, more treatments of North Atlantic SST include Dawson et al., "Greenland (GDIP2) ice core"; Cage and Austin, "Marine climate variability," 1643–1645; Holland et al., "Decadal variability of the North Sea"; Cunningham et al., "Reconstructions of surface ocean conditions"; and Mary et al., "High frequency environmental changes."

… et affirmanno che quello mare è coperto de pessi, li quali se prendenno non solo cum la rete ma cum le ciste, essendoli alligato uno saxo ad cio che la cista se impozi in l'aqua, et questo io l'ho oldito narrare al ditto messer Zoanne. Et ditti inglesi suoi compagni dicono che portaranno tanti pessi che questo regno non havera piu besogno de Islanda, del quale paese vene una grandissima mercantia de pessi che si chiamanno stochfissi. (Biggar, ed. and tr., *Precursors of Jacques Cartier*, 17–19).

CHAPTER 9 LAST CASTS

Further thoughts re the 'North Atlantic Fish Revolution (ca. AD 1500)', Holm et al. 2019.

The "Fish Revolution" rightfully highlights the broad socio-economic consequences for Europe and North America of especially the early modern Newfoundland and Grand Banks fishery. The article concentrates more on those environmental conditions which facilitated the revolution than on its subsequent ecological effects. Like most research in the historical tradition in which it is rooted, it views Europe from the perspective of the fishing countries of the northwest and neglects both consumption and competition elsewhere. There is as well a tendency to conflate well-documented later seventeenth- and eighteenth-century conditions with those two centuries earlier. The singular effects of a post-1500 fish revolution are however neither its causes nor its origin story, which belong to an earlier time. Only those effects which derive from specific features of the northwest Atlantic ecosystem *c.*1500/50, which could not be known to the first voyagers, differentiate those ventures from the other innovative and growing fisheries of the late fifteenth century. Too much present-day hindsight (the historians' 'retrospectoscope') distorts the past.

All of those fisheries and their products were deeply embedded in broader European cultural evolutions at the close of the Middle Ages. Literate management and records of ponds or voyages have counterparts in business and military affairs. Innovations in information technology (print) and shipbuilding affected much more than fishers and fishmongers. Secular authorities both urban and sovereign intervened 'for the common good' in resource management, social welfare, and even religious practice. Teleconnections across space and time linked humanist intellectuals across Europe and with ancient counterparts just as different sites of production and consumption bridged but also accentuated the distance separating natural organisms and ecosystems from human users.

So I would see this fish revolution as opening a new period in European / North Atlantic / global fisheries history but itself as emerging from medieval European experiences while carrying forward only some of the adaptations Europeans had earlier learned.

Sixteenth-century movement of cod biomass from New World waters to Europe was a different order of magnitude from transfer of genetic information (seeds) from American crop plants to European gardens and fields. Only the offspring of maize, manioc, potato, and tomato later went to Old World consumers. Furs did follow the fish, while the history of

sugar cane – resulting in one of the largest early modern transatlantic exports of non-human biomass but itself an Old World plant– then reversed the process.

The role of marine protein in European demography of the sixteenth through eighteenth centuries (with a plateau in the seventeenth) remains to be established. Who did eventually eat the Newfoundland cod? How much of it stayed in Europe or went to feed, for instance, enslaved Africans? How much did it augment or replace protein from other sources, be they domestic livestock or the diverse marine and freshwater fisheries being actively pursued across Europe in 1500?