Captured on paper: fish books, natural history and questions of demarcation in eighteenth-century Europe (ca. 1680–1820)

Trijp, D.R. van

CONCLUSION

Depending on who you asked, in the early modern period, the answer to the question 'what is a fish?' may have included a jellyfish, a perch, a flair, a mermaid, or a whale. Sixteenth-century conceptions of fish were to a large extent synonymous with *aquatilia*, i.e., animals that dwelled in the water. Ray, however, defined a fish as a creature without feet and with fins that never willingly came onto land. Artedi slightly altered that definition, but added that fishes might occasionally take to the land. Linnaeus, in the tenth edition of the *Systema naturae* (1756), declared whales to be separate from the fishes and included them with the newly created category of the mammals. Bloch declared that he would not follow this definition, and that he took whales and swimming amphibians as fishes. Lacépède would, in 1804, devote a separate series to the whales rather than discussing them in his books of fish.[1] In 1818, the question of whether whales were fishes was put to trial in New York. The defendant in the court case had purchased caskets of whale oil that had not been inspected before sale, as was required by law for fish oil. Among those testifying was the esteemed physician and naturalist Samuel Mitchill (1764–1831), who argued "that a whale is no more a fish than a man."[2] When pressed, however, he admitted that disputes in classification did exist. The jury eventually ruled that whales were fishes indeed.

Even the seemingly straightforward question of what constituted a fish thus yielded a variety of replies. It is the first level of demarcation we can discern in this dissertation, *viz.* that of the subject of study. As this dissertation has demonstrated,

[1] Bernard Germain de Lacépède, *Histoire naturelle des poissons*, and his *Histoire naturelle des cétacées* (Paris: Plassan, 1804).
[2] Graham D. Burnett, *Trying Leviathan: The Nineteenth-Century New York Court Case That Put the Whale on Trial and Challenged the Order of Nature* (New Jersey: Princeton University Press, 2007), 61.

the demarcation of the natural historical study of fishes was similarly a process of shifting boundaries. Ideas about how fishes should be studied, which knowledge about them should be captured and how this knowledge should be presented, and especially who was to decide and on the basis of what, were subject to continuous revision. At the same time, by the end of the eighteenth century, the study of fishes had become more defined as a field with its own particular rules, which required the attention of a specialized naturalist. In which ways did this demarcation take place? And what does that tell us about how knowledge of nature is created?

Before diving into these questions, however, it is worthwhile to stress that naturalists who studied fishes in the long eighteenth century seldom did so without taking the examination of other aspects of living nature into account. Each of the authors that passed in review were taken by the study of natural history as a whole, and were interested in natural philosophy. Natural philosophical ideas, for example mechanist philosophies, came to bear on the study and description of living creatures. Willughby and Ray examined plants, insects, fishes, birds and quadrupeds; Artedi was inspired by Tournefort's classification of plants and trees, and used it as a model in devising classification schemes not only for fishes but also for mammals; and Bloch's collection, despite its focus on fishes, in fact covered the whole range of nature, from polished stones, shells and insects to bird nests. Conversely, observations and experiments on fishes (like inserting specimens into an air pump, or examining spawn) could be used to prove or disprove theories on the nature of air or procreation. In the long eighteenth century, therefore, the study of nature remained an intertwined endeavour that accommodated a broad curiosity about the world and its creations.

To sustain this interest in and research of nature, as we have seen, appropriate funding was needed. Even though, from the sixteenth century onwards, natural history became more and more recognized as a matter worth studying for its own sake, a life dedicated to it did not come with an obvious career trajectory. A few professorships in natural history had been established here and there, but these were generally focussed on teaching rather than research. Those wishing to

undertake research thus had to find other ways to finance their work – with the exception, of course, of wealthy individuals like Willughby. Each of the other authors discussed in this dissertation grappled with how they could be recognized and remunerated for their studies. Making money from books, as we saw, was an uncertain path: publications could cost rather more in financial terms than they afforded the naturalist in terms of reputation. Naturalists pursued a range of other options, including securing patronage, as was the case with Ray, Artedi and Linnaeus, falling back on affluent in-laws or a wealthy wife, as with Artedi and Bloch, or holding on to one's day job, like Bloch who also continued his lucrative medical practice. The chapters have demonstrated how monetary considerations shaped how these different naturalists could conduct their studies.

It is against this background of financial instabilities and uncertainties that these naturalists came to apply themselves to a specific field of study. As Rudwick has noted for the eighteenth century, *savants* came to apply themselves to (and establish their reputation in) one or two specific fields even if their interests might range rather more widely.[3] Artedi certainly presented himself as a naturalist who was specialized in fishes, and Bloch concentrated his collection around them. An individual's turn towards fishes might, as we have seen, been the result of several different reasons: naturalists may simply be fascinated by them, seeing them as useful creatures meriting more attention than they had so far received, or they may have seen in the study of fishes a vacant space that they could come to occupy. When authors had come to dedicate themselves to a particular subject, and subsequently to draw up a definition of it, they also had to decide what kind of knowledge should be observed and recorded regarding it.

This is the second level of demarcation: the process in which that which properly relates to natural history is distinguished from knowledge not deemed pertinent to natural history. For naturalists, this demanded devising a *method* with which to approach their subject matter. This does not mean, however, that such methods were necessarily unique to naturalists. As we saw in Chapter 2, the boundaries between 'theoretical' and 'practical' engagements with fishes could,

[3] Rudwick, *Bursting the Limits of Time*, 48.

in practice, be blurred. Willughby, Ray and their fellow Royal Society members focussed on the physical characteristics of species so as to demarcate one from the other, examined their properties through empiric observation and the performing of experiments. Fishermen and fishmongers sometimes did similar things; in the case of Baldner, he held the claims that had been made in written books up to scrutiny. It shows how natural history, as it was demarcated by learned naturalists through their methods, was not an activity inherently separate from other activities.

For each of the authors discussed in this dissertation, direct observation was central to their approach. In the sixteenth century, Gessner and his contemporaries took to cross-referencing authorative writings with the world they encountered around them. Noticing that the claims therein far from always matched their own findings, they subjected ever more texts to similar checks. Willughby and Ray also combined textual study with empirical experience. More so than their predecessors, however, they made direct observation the core of their study of fishes; explicitly inserting, for example, the act of witnessing into their species descriptions through *vidi* and *vidimus*. While Artedi announced that he had studied almost all of the fish described in his book in the flesh, he is, when compared to Willughby and Ray, less visible as observer in the species descriptions themselves – perhaps he considered this a way of conferring a certain universality onto his own observations. Lastly, Bloch explained that his series only included those species of which he was able to deliver an illustration that had been done after nature. In doing so, he emphasized that the knowledge presented in his work was derived from a close proximity to the object under study. Although they signalled their direct experience in different ways, for each of the authors discussed here, empirical observation lent legitimacy to their findings – even though, as we have seen, this ideal could be difficult to hold up in practice.

But what to observe? Changing ideas about what did and did not belong to natural history can be clearly seen from how authors drew up species descriptions. In the sixteenth century, renowned naturalists like Gessner and Aldrovandi held that a species of fish was best understood by taking into account all that had

been written about it in a wide variety of sources. Their species descriptions were encyclopaedic in nature, combining reports of morphological features with extensive philological discussions. As we saw in Chapter 1, Ray stated that he eschewed such 'humane learning', even if Willughby and he did include the occasional discussion of expressions, anecdotes, and fishing techniques. They focussed on characteristic marks, and carefully counted and measured the physical properties of species whenever possible. For Artedi, the practice of observing and counting pertinent physical characteristics became the basis of his system of classification. His species descriptions consisted of numerical lists of such characteristics, almost taking on the form of formulae – as he sought to make natural history somewhat less *historia* and more *scientia.* Over the course of the eighteenth century, the natural history of fishes thus moved from an encyclopaedic approach that incorporated historical and mythical associations to one that was quantative and mathematical. This corresponds to a wider development in the long eighteenth century signalled by historians of science, namely a growing conception of the world in which certitude was found in empirical observation, experimentation and counting. Daston, as we saw, characterized this period as one of description by omission.[4] Wolf Lepenies has analyzed how over the course of this century, natural history was stripped of its historical component, that is, the cultural meaning of species.[5] Historians have furthermore drawn attention to the increasingly quantitative bent and concern with method and order that, besides natural history, is also visible in other fields such as the study of medicine and of the weather. It was an epistemological shift that emphasized regularity over variety.

In order to render variety regular, *classification* was key. While the sixteenth century saw a vivid tradition of sorting species of *aquatilia* into various groups, based on a wide range of principles, Willughby and Ray proposed that they

[4] It should be noted that this trend of sparse descriptions was by no means absolute; the *Histoire naturelle* series of Georges-Louis Leclerc de Buffon (1707–1788) took a more diametrical approach to describing nature. His complex relationship with description is analyzed in Joanna Stalnaker, *The Unfinished Enlightenment: Description in the Age of the Encyclopedia* (Ithaca: Cornell University Press, 2010), 31–67.

[5] Wolf Lepenies, *Das Ende der Naturgeschichte: Wandel kultureller Selbstverständlichkeiten in den Wissenschaften des 18. und 19. Jahrhunderts* (München: Hanser Verlag, 1976), 29–30.

need look only at morphological features in assembling species into groups and delineating one from the other. Ray also drew up a definition of what a species was, a concept that had seldom been defined, despite having been in use for centuries. Artedi established and defined the taxonomical ranks of classes, order, genera, species and varieties for fishes, just as his friend Linnaeus did for other animals, as well as plants and minerals. According to Artedi, the one and only goal of natural history was to divide species into genera – which meant that he equated the natural historical study of fishes, which he called ichthyology, with his own method. His system was adopted and subsequently refined by other naturalists; Bloch was one of them. As we saw, classification was pursued with different goals in mind. For Willughby and Ray, their wish to instil order into the world of species was driven by a wish to return to a prelapsarian state of knowledge, a concern they shared with their contemporaries. Bloch's initial plan to classify and chart all the fish living in the German states was clearly spurred by oeconomic motivations.

Classification is a form of demarcation: not only of one species from the other, but also of pertinent from non-pertinent knowledge. This is particularly apparent in Artedi's classification system, which strongly emphasized the counting of certain parts of the fish, like teeth or fins, rather than paying attention to other features, such as their colour or habitat. Selecting those particular features was practical, because matters like colour and habitat could no longer be gleaned from a fish once it had been taken out of its environment and preserved as a specimen in a collection. Artedi's classification method also suggested a certain reliability, perhaps even a replicability: everyone so inclined could try to find an exemplar of the species under discussion, count the rays in the fin, and ascertain the validity of the reported observation for oneself. It reflects his quantitative rather than qualitative approach to studying species: what counted were the number and relative position of differentiating characteristics such as its fins. In the process, Artedi left out all kinds of knowledge that had been part of natural historical studies of fishes for centuries. This included artisanal knowledge of fishes, as we have seen, which, as we saw in Chapter 3, he deemed 'amethodic'. Furthermore,

what earlier authors had written about fish was only relevant to the extent in which their species descriptions were commensurable with his own.

We can also discern a development from encyclopaedic collections to more specialised collections. A wide variety of kinds of collections has come into view in the chapters of this dissertation: Felix Platter's cabinet of curiosities, the Repository of the Royal Society, the rarities that James Salter displayed in his coffee house, the neatly ordered collection of father and son Gronovius, and of course Bloch's expansive collection of *naturalia*. This last individual was not unique in concentrating his collection on one subject; towards the end of the eighteenth century, naturalists seem to have placed their focus on collecting specimens from one particular class of species rather than from all of them, perhaps because the number of species that were known had grown to such an extent that it was no longer considered possible to strive for a complete collection of all classes of plants and animals.[6] Findlen has argued that the fact that naturalists 'stopped seeing', as she calls it, made collections exclusive rather than inclusive as it meant that they passed up on breadth.[7] The specificities and nuances in this development have received more attention by historians over the last few years,[8] and it merits further research.

To summarize, the authors discussed in this dissertation agreed that what it took to be an authority on fishes in the eighteenth century was to observe species closely, examine their morphological features, and describe their physical parts in exacting detail (but preferably not too much of it) so that it could be assigned into its rightful place in an ordered system. This is what Artedi offered as a definition for an 'ichthyologist.' This process, of course, promotes a certain circularity: namely, that one proclaims oneself an ichthyologist – which does not (yet) constitute a clear category or job title – on the basis of a certain authority, for example deploying a particular method, and in turn use this (self)designation

[6] Dominik Hünniger, "'Extolled by Foreigners': William Hunter's Collection and the Development of Science and Medicine in Eighteenth-Century Europe," in *William Hunter and the Anatomy of the Modern Museum*, eds. Mungo Campbell, Nathan Flis and María Dolores Sánchez-Jáuregui (New Haven: Yale University Press, 2018), 135.
[7] Findlen, *Possessing Nature*, 405.
[8] See, for example, the essays in Ellinoor S. Bergvelt and Debora J. Meijers, eds., *Teyler's Foundation in Haarlem and Its 'Book and Art Room' of 1779*, (Leiden: Brill, 2020).

as an ichthyologist as a claim to further authority. It would be interesting to compare this process with further, specialized case studies in other fields.

For all the wider developments outlined above, such as the importance attached to observation, to classification and to quantification, it has become clear that authors also very much had their own ideas how to best capture fish on paper. The above discussions have already shown how the authors far from agreed on all counts. This serves as the third level of demarcation: that in which authors distance themselves from earlier authors. All of the authors discussed in the chapters of the dissertation were explicit about how they envisioned their own approach to fishes, and how this differed from those of earlier authors that had written about the topic – and why their particular way of going about it was the best.

A recurring tension has been the epistemological uses of illustrations and objects. The way in which fishes were preserved over the course of the early modern period did not change drastically,[9] and it continued to be exceptionally difficult if not near impossible to conserve them in lifelike fashion. It was perhaps for this reason that illustrations were much sought after, even if Artedi did not seem to particularly care for them. Throughout the early modern period, fishes continued to be depicted according to a rather stable pictorial convention: portrayed from the side against a white background. We also saw that it was preferred that a fish was depicted while alive (or at least still relatively fresh) and illustrations drawn from the life continued to carry special weight from Belon to Bloch. There were nonetheless different visual strategies designed to convey that a drawing had been done from life. In Chapter 1, we saw how an illustration was endowed with a 'rhetoric of the real' by having the depicted object cast a shadow on the page. Chapter 4 has argued that Bloch's inclusion of colour may have been a way to suggest that they had been done after living specimens (even if this was not always the case). The visual techniques used in Bloch's series, such as the expensive hand-coloured engravings occasionally heightened with silver or gold,

[9] These same techniques of drying fish and preserving their skins continued to be used in the nineteenth century: Maria Eulàlia Gassó Miracle, "Temminck's Order: Debates on Zoological Classification (1800–1850)" (PhD diss., Leiden University, 2019), 108.

the rendition of cross sections, and the indications of actual size, were attempts to convey the material dimensions of the specimens in his collection. Illustrations thus supported claims made by naturalists through visual rhetorical strategies that suggested a proximity to the object at hand.

The above discussions on collecting, classifying, describing and depicting fish have made clear that different ways of obtaining and presenting knowledge about fish were evaluated variously depending on the author. They are thus not as uniform in their approach as one may suspect when considering that each explicitly builds upon the another. This can be explained by the fact that communal codes of what it took to be a good naturalist were context-specific. The concern of authors to abide by such shared codes can be seen on their title pages, and in their prefaces and epilogues. Take, for instance, Ray's express statements that only empirical observations of reliable witnesses had been included, Artedi's presentation of his method as one that can be demonstrably proven, and Bloch's emphasis on the usefulness of his study for the wider community, to name a few examples that have been discussed in this dissertation.

The fourth and final level of demarcation to be discussed here is that on the part of the historian, who decides how we should study the formation of knowledge in the eighteenth century, and on which (and on whose) terms. This dissertation has tried to take a broad approach, focussing not only on the authors and their books, but also considering the broader social context which made it possible to produce such works. Besides the authors of fish books, this dissertation has been populated by fishermen, fishmongers, artists and missionaries. They engaged in the study of fishes in distinct ways, even if not all their contributions can be traced back to specific individuals. Contributions of unnamed individuals consisted of catching and collecting fishes, turning species into specimens and illustrating them, as well as delineating between species, and explaining how certain species were best caught as well as how they could be cured for trade and consumption. These are matters that resurface when perusing the pages of eighteenth-century fish books, but which can be drawn out further by combining a study of these books with that of surrounding sources. Chapter 4, for example,

has looked at Bloch's larger network of correspondents, considering John and his mission assistants, and their underlying motivations and dynamics. Such an approach brings to light the indispensable role played by people across the social spectrum, and who have traditionally fallen outside the purview of studies of natural history.

A discussion of the limitations of this study is in order. The first lies in its corpus: although the selection of fish books that were analyzed in this dissertation has been justified in the introduction, these works are not necessarily representative for each and every natural historical study of fishes published during the long eighteenth century. If other works had been included in this study, other facets may well have emerged. Due to their universal and synthetic pretensions, however, the examined works do nonetheless encompass the key developments in the study of fishes over this period. Another limitation that requires discussion is the extent to which we can extrapolate the insights gained in this study to other fields of natural history, or beyond. Which of the conclusions drawn in this dissertation are particular to the study of fishes, and which apply to birds, insects, the earth or the weather? Both the particularly perishable nature of fishes, and the impossibility of peering into the depths of the water, as we saw, had no little impact on the ways in which they could be studied, whereas other fields of study came with their own (dis)advantages. It is in its attention for the different levels of demarcation, as laid out in this conclusion, that this dissertation hopes to present a way to study similar developments in other fields of knowledge. To be attuned to the human efforts involved in demarcation, after all, is to understand that the process of the separation and specialisation of knowledge that we can discern both in and after the eighteenth century is a profoundly historical one.[10]

We will close by briefly looking ahead. By the end of the eighteenth century, discussions on what precisely a fish was, and how it should be studied, had by no means subsided. In his *Tableau historique des progrès de l'ichtyologie depuis son origine jusqu'à nos jours*, published in Paris in 1828, Cuvier offered a history

[10] For the value of appreciating the historical nature of such processes, see: Wijnand Mijnhardt, "'The World We Have Lost': In Praise of a Comprehensive Concept of Science and Scholarship," in Bergvelt and Meijers, *Teyler's Foundation in Haarlem and Its 'Book and Art Room' of 1779*, esp. 84–86.

of the development of, as he explicitly called it, ichthyology.[11] Cuvier had been appointed professor of comparative anatomy at the Muséum National d'Histoire Naturelle in 1802. Besides writing on comparative anatomy, he scrutinized fossils, theorized about the age of the earth and studied fishes. His 'historic tableau of the progress of ichthyology' marked the opening of his own natural history of fishes, the *Histoire naturelle des poissons* that would sprawl out over no less than twenty-two volumes, and which he regarded as the very culmination of all those fish studies that had been carried out before him.[12] Writing such an overview offered Cuvier the opportunity to construct the natural history of fishes from his own vantage point, selecting those people and ideas he thought to be worthwhile, and leaving out or dismissing those that were not. In this, Cuvier fits well into a process we saw with earlier authors of fish books.

The context in which Cuvier wrote his fish series, however, was rather different. He did so from a salaried position at a national institute, the Muséum National d'Histoire Naturelle. Much like the British Museum in London, this institute was a collection of collections: private collections that, through auctions and bequests, had found their new home in public collections – though it should be noted that the contrast between 'private' and 'public' is at times rather overblown.[13] The pertinent movement here is not so much that of private to public, but rather that of the individual to the institution. Indeed, whereas collections of *artificialia* and *naturalia* had hitherto mostly been in the hands of individuals, be it nobles, naturalists or merchants, by the early nineteenth century institutions had started to take over that role. Said institutions became the locus not only for collections, but also for the natural historical study that the specimens in their display rooms and storages invited. Of course, natural historical investigations continued to take place well beyond the scope of museums;[14] but such institutions

[11] Georges Cuvier, *Tableau historique des progrès de l'ichtyologie depuis son origine jusqu'à nos jours* (Paris & Strasbourg: F. G. Levrault, 1828).
[12] He worked on the series together with Achille Valenciennes (1794–1865), who carried on the project after Cuvier died in 1832.
[13] On the permeable boundaries between public and private collections, see: Samuel Alberti, "Owning and Collecting Natural Objects in Nineteenth-Century Britain," in *From Private to Public: Natural Collections and Museums*, ed. Marco Beretta (Sagamore Beach, Mass.: Science History Publications 2005), 141–154.
[14] See, e.g., Anne Secord, "Coming to Attention: A Commonwealth of Observers during the Napoleonic Wars," in Daston and Lunbeck, *Histories of Scientific Observation*, 421–444.

did become more present and powerful. In The Netherlands, for example, heady naturalists sought to affiliate themselves to the Rijksmuseum van Natuurlijke Historie that was established in Leiden in 1820 and in which previously existing collections were merged.[15]

We can further trace this development through the fate of Bloch's collection. As we saw, the contents of his cabinet were relocated from his home at the Spandauerstraße to King Friedrich Wilhelm III's *Kunstkammer* in the Berlin Palace in 1802. Eight years later, the natural historical specimens of Bloch's collection were parcelled up. They were transported to the newly opened Universität zu Berlin, established by the King at the instigation of Wilhelm von Humboldt, to form part of its zoological museum. This museum had the dual purpose of educating students on the natural world and facilitating research.[16] After a few decades in the research and teaching collection at the university of Berlin, Bloch's natural historical specimens moved house once again. This time, they were stored in the Museum für Naturkunde in Berlin where they remain today. Since then, all of the objects in his collection have been divided according to the class to which they belong: Bloch's fishes are part of the fish collection, his reptiles reside among the collection of reptiles and amphibians, and so on. His capacious collection has thus been separated into distinct categories, broken down into specialized departments. This development is in no way unique to the Museum für Naturkunde, but is rather illustrative for the contemporary emphasis on disciplinary categories visible in other heritage institutions, too.[17]

The naturalists discussed in this dissertation marvelled at the sheer abundance and richness of species that dwelled in the vast wildernesses of water, and tried to capture them in their books. Their natural historical ventures were often of a

[15] A dissertation on this topic focussing on the fish collection is in preparation by Robbert J. Striekwold at Leiden University.

[16] Peter Giere, Peter Bartsch, and Christiane Quaisser, "From Humboldt to HVac – The Zoological Collections of the Museum für Naturkunde Leibniz Institute for Evolution and Biodiversity Science in Berlin," in *Zoological Collections of Germany: The Animal Kingdom in its Amazing Plenty in Museums and Universities*, ed. Lothar A. Beck (Dordrecht: Springer, 2018), 95.

[17] The project *A Window on Nature and Art: A Historical Study of the Brandenburg-Prussian Kunstkammer*, supervised by Anita Hermannstädter at the Museum für Naturkunde, seeks to reassemble the *Kunstkammer* collection (including Bloch's specimens) that was distributed across multiple specialized institutions. It runs from 2018 to 2021.

collaborative nature, and accommodated a variety of perspectives and approaches. These books matter to us today. They matter because they can serve as a reminder of how learned naturalists can, nevertheless, themselves learn from communities of practice; some biodiversity scientists today indeed do so in protecting marine species of risk.[18] They are also important because ecologists can profit from natural historical works like these in their inquiries into biodiversity, as they offer insight into the presence of certain species in previous centuries, and indicate whether these, for example, were still common stock in regions from which they have since disappeared. Historical evidence has proven useful for showing the long-term developments of species populations.[19] What is more, however, the study of these books matters because it shows how even something as deceptively simple as what a fish is, is a historical question.

[18] See, for example: Andrea Saénz–Arroyo, Callum M. Roberts, Jorge Torre and Micheline Carinõ-Olvera, "Using Fishers' Anecdotes, Naturalists' Observations and Grey Literature to Reassess Marine Species at Risk: The Case of the Gulf Grouper in the Gulf of California, Mexico," *Fish and Fisheries* 6, no. 2 (2005): 121–133.
[19] Floris P. Bennema and Adriaan D. Rijnsdorp, "Fish Abundance, Fisheries, Fish Trade and Consumption in Sixteenth-Century Netherlands as Described by Adriaen Coenen," *Fisheries Research* 161 (2015): 384–399.