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

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CHAPTER 4

Swimming on the Page: Image and Illustration in Marcus Élieser Bloch's *Allgemeine Naturgeschichte der Fische* (Berlin, 1782–1795)

In the preface to the sixth volume of his natural history of fishes, published in 1787, Marcus Élieser Bloch announced that it would mark the conclusion of his series of such books.[1] This ambitious project, the *Allgemeine Naturgeschichte der Fische* (1782–1795), was the result of decades of investigations into the nature of fish. The first five volumes had been received with enthusiasm on account of the exacting way in which species were described and depicted.[2] That he now announced a concluding volume was not because he truly thought his project was finished. After all, he still had more than a hundred unpublished drawings of fish in his possession, executed in the most beautiful colours, and many of the specimens in his impressive collection in Berlin were yet to be depicted.[3] Lack of research material was not the issue here. It also was not the case that his books piqued no interest with an audience: the subscription list for the first volume of the series counted no less than three hundred and seventy names included in his book, and is a testimony to the wide range of people that had expressed their interest in, and thus signed up for, the next instalment of Bloch's natural

[1] Marcus Élieser Bloch, *Allgemeine Naturgeschichte der Fische*, vol. 6 (Berlin: Realschule, 1787), sig. a2r; the series is henceforth abbreviated as *Allg. Nat. der Fische*.
[2] An anonymous reviewer of the first volume characterized it as an erudite, elaborate and exacting work: "D. M. E. Bloch, *Oecnomische Naturgeschichte der Fische Teutschlands*," *Allgemeine deutsche Bibliothek* 53, no. 2 (1783): 582–583.
[3] *Allg. Nat. der Fische*, vol. 6, sig. a2r.

history of fishes.[4] The European audience for "visually sumptuous and winningly designed volumes",[5] in the words of Benjamin Schmidt, was, after all, growing in the eighteenth century; Seba's *Thesaurus* (1734–1765) and Catesby's *Natural History of Carolina* (1729–1747), mentioned in the previous chapter, are among the many books that might be cited as examples here. Among the subscribers to Bloch's fish series were royals and nobles, government officials, bankers, apothecaries, physicians, preachers, and booksellers, as well as a Luxembourgian fishing guild.[6]

The series did not fall short on attention. The problem was, rather, that many of its subscribers had not actually paid their dues. Bloch had approached first bookseller Hesse, and later the Realschule Buchhandlung in Berlin, to print his series, but paid for the full publication process himself. He conceded that of the twenty thousand Reichsthalers he had spent out of his own pocket – a staggering sum – he had earned only about half back.[7] As he explained, he saw himself forced to put his project on hold to guard his family from further impoverishment.[8] While his explicit statement of financial duress may seem somewhat unusual to us, it fitted rather well with the cultural code of the learned community of the time, which considered that one published books as a service to the society, and did not involve even the slightest hint of a pursuit of profit.[9] Presenting the public with a well-made book was also an investment in one's name. It was only upon altering his publication strategies that Bloch ultimately managed to proceed his publishing project and deliver the final six volumes, bringing the series to completion with the twelfth. All in all, Bloch's commitment to getting his series out into the world in this particularly expensive, illustrated form is remarkable. This chapter argues that Bloch's fish series, with the coloured engravings as its unique selling point, were instrumental in the creation of his image as a naturalist, and as a specialist on fish in particular. As we will see,

[4] *Allg. Nat. der Fische*, vol. 1 (Berlin: Hesse, 1782), n.p.
[5] Schmidt, *Inventing Exoticism*, 18.
[6] *Allg. Nat. der Fische*, vol. 1, n.p.
[7] *Allg. Nat. der Fische*, vol. 8 (Berlin: J. Morino, 1791), sig. *2r.
[8] At this time, Bloch had three children: a son (whose name remains unknown) from his marriage to Breinche Rintel (1747–1769) in 1765, a daughter named Rose from wedlock with Cheile Ephraim (*c.*1757–1780) whom he had married in 1774, and his daughter Rebecca after marrying Rahel Bendix (1767–1833) in 1784.
[9] Phillips, *Acolytes of Nature*, 51.

while he continued the classificatory approach that Artedi and Linnaeus had promulgated in their works, he conceived of his own work as an improvement of theirs.

When perusing the entire series, it soon becomes clear why its production was such a costly venture. Where it was common practice for authors to copy illustrations, as we have discussed for example with Willughby and Ray, almost all of the engravings in Bloch's work had been designed anew by artists. The series encompasses no fewer than 432 plates. As Bloch proudly declared, every copy of the lavishly illustrated fish series had been coloured by hand.[10] He often prided himself in "having again spared no effort or costs to give [the volumes] the highest degree of perfection."[11] The previous chapter has shown that the inclusion of illustrations in natural historical works was a much-contested topic among naturalists, and that the works of Linnaeus and Artedi appeared virtually image-free. For Bloch, however, coloured illustrations lay at the heart of his project. In the introduction to the series, he declared: "I will restrict myself to those fishes, from which I am able to offer drawings done after nature."[12] In contrast to the fish books discussed earlier in this dissertation, therefore, the availability of illustrations drawn from the life was the decisive factor in designating which species were to be included in the *Allgemeine Naturgeschichte der Fische*. Bloch stands out in his rather innovative approach towards illustrations. For the printed images, the artists used a wide array of both established and new techniques: these included the mechanical printing of colour, the hand-colouring of engravings, the heightening of illustrations with paint made from silver and gold, as well as the use of cross-sectional views of specimens. No time or effort was spared because illustrations captured fish in their best possible shape – or so Bloch believed.

The case of Bloch's fish series offers an extraordinarily rich documentation that is only seldom available for other natural historical publications. Most of the drawings that Bloch possessed were based on the preserved specimens in

[10] *Allg. Nat. der Fische*, vol. 4 (Berlin: Realschule, 1785), sig. a2v.
[11] Original German: "[…] da ich weder Mühe noch Kosten gesparet, um demselben den möglichsten Grad der Vollkommenheit zu geben." *Allg. Nat. der Fische*, vol. 3 (Berlin: Realschule, 1784), n.p.
[12] Original German: "Ich werde mich indessen nur auf solche Fische einschränken, von welchen ich nach der Natur gemalte Zeichnungen zu lieferen im Stande bin […]." *Allg. Nat. der Fische*, vol. 1, sig. Ar.

his extensive collection, which numbered well over a thousand, and counts as the most expansive private collection of fish of the eighteenth century. Its specimens took the form of dried skins and preserved fish in jars, and they had come to Bloch from all corners of the world thanks to his wide-ranging network of correspondents. A considerable part of his collection is still extant in the Museum für Naturkunde in Berlin.[13] Besides the specimens, a significant share of the drawings made from them remain in the Historische Arbeitstelle of that same museum.[14] This means that the original specimens can be coupled with the species descriptions, drawings and engravings that were made from them. While it is impossible to give a definitive answer of how *exactly* the book and collection would have related to one another for Bloch and his contemporaries, this chapter investigates the interactions and intersections that occur between Bloch's fish volumes and his collection.

Both the assembly of the collection and the production of the twelve volume series were costly and time-consuming ventures for all those involved. What led Bloch to put so much time and money towards the creation of no fewer than four hundred and thirty-two images of fish, and what was involved in these extraordinary efforts? Who assisted him in the process, and for what reasons? To the extent that his fish oeuvre, both the bibliographical and the curatorial, have been engaged with by historians, this has mostly been to describe the formation processes of book and collection as a monumental actualization of eighteenth-century German natural history.[15] This interest has not, however, led to deeper

[13] An inventory has been compiled by Hans-Joachim Paepke, *Bloch's Fish Collection in the Museum Für Naturkunde Der Humboldt-Universität Zu Berlin: An Illustrated Catalog and Historical Account* (Ruggell: A.R. Gantner, 1999). The Zentralmagazin Naturwissenschaftlicher Sammlungen of the Martin-Luther-Universität Halle Wittenberg in Halle (Saale) is currently taking stock of which specimens in their collection derive from that of Bloch.

[14] Bound manuscripts of Historische Arbeitstelle of the Museum für Naturkunde (hereafter MfN), ZMB, VIII/423 and VIII/424.

[15] Richard Lesser, "Dr. Marcus Elieser Bloch: Ein Jude begründet die moderne Ichthyologie," in *Haskala: Die jüdische Aufklärung in Deutschland 1769–1812*, ed. Christoph Schulte (Wolfenbüttel: Wallstein, 1999), 238–246; Ellen B. Wells, "M.E. Bloch's Allgemeine Naturgeschichte der Fische: A Study," *Archives of Natural History* 10, no. 1 (1981): 7–13; Christine Karrer, "Marcus Elieser Bloch (1723–1799), Sein Leben und die Geschichte seiner Fischsammlung," *Sitzungsberichte der Gesellschaft Naturforschender Freunde zu Berlin* 18 (1978): 129–149; Hannelore Landsberg, "Eine Fischsammlung aus Tranquebar, die Berliner Gesellschaft Naturfoschender Freunde und deren Mitglied Marcus Elieser Bloch," in *Mission und Forschung. Translokale Wissensproduktion zwischen Indien und Europa im 18. und 19. Jahrhundert*, ed. Heike Liebau (Halle: Frankesche Stiftungen, 2010), 167–179.

inquiries into their underlying epistemologies. And while the illustrations have often been, and still are, praised for their beauty, they are seldom subjected to closer study.[16]

This chapter considers the connections between collection and series, paying special attention to the illustrations. In order to bring those connections to the surface, the chapter first introduces Bloch, his collection and his book of fish and embed him in the wider community of late eighteenth-century *Naturforscher*. It then takes a step back and considers how these specimens had reached the shelves of Bloch's cabinet in the first place, with a focus on the most active contributor of specimens outside of Europe, the German missionary Christopher Samuel John (1747–1813), who enlisted local assistants to collect fish in Coromandel and had his own reasons for participating in Bloch's project.[17] The last part of the chapter analyzes the way in which Bloch's fish collection was preserved on paper, with particular emphasis on the way in which the illustrations were designed and executed and for what reasons. Ultimately, the manner in which Bloch preserved his collection on paper served to make him an authority on the fishes of the world without requiring him to travel outside of his Berlin.

Bloch and His Collection

The most detailed biographical sketch of Bloch has been written by Christine Karrer, who has pieced it together from a variety of sources, including the letters and accounts of some of Bloch's contemporaries.[18] He was born in 1723 in Ansbach in Bavaria, and grew up in a rather impoverished, orthodox Jewish household.[19] Bloch's upbringing was traditional; while he was taught Hebrew, for example, he did not learn German, as in orthodox circles this was not encouraged.[20] Around 1743, he travelled to Hamburg, where he had obtained a position as teacher to the son of a Jewish surgeon. This is where he learned German and Latin, and

[16] An exception is Claudia Kreklau, "Travel, Technology, and Theory: The Aesthetics of Ichthyology during the Second Scientific Revolution," *German Historical Review* 41, no. 3 (2018): 589–610.
[17] John's correspondence with his superiors is held by the Frankesche Stiftungen in Halle an der Saale as part of their Missionsarchiv mit der Indien- und der Amerikaabteilung, AFSt/M.
[18] Karrer, "Marcus Elieser Bloch," 130–131.
[19] Ibid., 132.
[20] Steven M. Lowenstein, *The Berlin Jewish Community: Enlightenment, Family, and Crisis, 1770–1830* (Oxford: Oxford University Press, 1994), 189.

acquired his first basic medical knowledge. Although the specific year is unclear, he subsequently travelled to relatives in Berlin to study anatomy. When Bloch wished to pursue a doctorate in Medicine in 1760, he ventured to in Frankfurt am Oder; this city's university was the only one in Prussia that admitted Jews.[21] Having received his degree in 1762, Bloch settled in Berlin where he set up practice as a physician, married, and involved himself in the city's intellectual life.

Besides attending to his patients, Bloch also studied natural history. It is not known when exactly he began gathering specimens, but sources first mention his collection in the early 1770s.[22] Following the death of his first wife in 1769, he wedded the affluent Cheile Ephraim (1757–1780) in 1774, with whom he would have a daughter.[23] His first publication, a book of medical observations, appeared in that same year.[24] In the decades after, he established himself as prolific author of natural history.[25] He spent most of his time, however, on the study of fish: a subject which he believed had received too little attention from other naturalists, as will be discussed in more detail below. He collected species of fish, scoured the natural historical literature to see if they had already been described, and classified them according to Linnaean principles if that had not yet been done. The first volume of his fish series was published in 1782. By that time, his name had become established enough that various academies and societies accepted him as a member; the book's title page mentions those of Leipzig, Göttingen, Utrecht and Frankfurt, amongst others.[26] This first volume made quite a splash, and the Holy Roman Emperor Joseph II (1765–1790) responded to the receipt of a copy by awarding Bloch with a gold medal in recognition of what he perceived to be the book's great benefits.[27]

[21] Karrer, "Marcus Elieser Bloch," 132.
[22] It is mentioned in the *Tagebuch* entry of 17 August 1773 of the Gesellschaft Naturforschender Freunde. MfN, ZMB, GNF, S. Bloch, TB 1.
[23] Karrer, "Marcus Elieser Bloch," 134.
[24] Marcus Élieser Bloch, *Medicinische Bemerkungen, Nebst einer Abhandlung vom Pyrmonter Augenbrunnen* (Berlin: Christian Friedrich Himburg, 1774).
[25] Besides publishing his fish series, Bloch wrote, among other things, on opal, tortoises and bladder worms in the *Beschäftigungen* of the *Gesellschaft Naturforschender Freunde*. His full publication list, which is too extensive to cite here can be found on https://personenlexika.digitale-sammlungen.de/Lexika/Bloch,_Markus_Elieser_(GND_118663968) (last accessed 9 April 2021).
[26] *Allg. Nat. der Fische*, vol. 1, title page.
[27] Notice in *Magazin des Buch- und Kunsthandels, welches zum Besten der Wissenschaften und Künste von den dahin gehörigen Neuigkeiten Nachtricht giebt* (Leipzig: Johann Gottlob Immanuel Breitkopf, 1782) no. 7, 558.

It must have been a welcome endorsement, and in the subsequent decades Bloch expanded both his collection and his series of fish. The Jewish physician grew into a person of note. In 1789, he posed for the Swiss painter Anton Graff (1736–1813), well known for immortalizing princes and scholars in his portraits.[28] When the last volume of his series appeared in 1795, Bloch's memberships of learned societies had doubled, and included the Royal Society in London and the Musée d'Histoire naturelle in Paris.[29] In 1796, well into his seventies, he travelled to Amsterdam and Paris where he attended auctions, visited collections and even met the renowned naturalists Georges Cuvier (1769–1832), certainly one of the most celebrated *savants* of his time.[30] Bloch was in the process of producing a general classification system for all fish hitherto described when he died from a stroke in 1799. The work was published posthumously in 1801 as the *Systema ichthyologiae* by Johann Gottlob Schneider (1750–1822).[31] Where Bloch had, for his series, drawn on Linnaean principles for classifying fish which, as we saw in Chapter 3, entailed taking into account a careful combination of characteristics, he now proposed to look *solely* at the fins – Cuvier later described this work, somewhat snidely, as a 'curious production' that proposed a quite bizarre classification.[32] His classification system does not seem to have caught on.

Although Bloch's life has been relatively well documented, certain gaps remain.[33] It is not clear, for example, precisely *when* he began his collection, though it was certainly under way by 1772. It is, furthermore, not known exactly when he conceived of his plan to publish. That his collection preceded his book series is nonetheless obvious; the first volume, after all, appeared in 1782, at least a decade after he began collecting. From this moment on, his collection and his series nourished, influenced and reinforced one another. In the prefaces to the

[28] Karrer, "Marcus Elieser Bloch," 136–137.
[29] *Allg. Nat. der Fische*, vol. 12 (Berlin: J. Morino, 1795), title page.
[30] Karrer, "Marcus Elieser Bloch," 137.
[31] Marcus Élieser Bloch and Johann Gottlob Schneider, *Systema ichthyologiae iconibus CX illustratum* (Berlin: Bibliopolio Sanderiano, 1801). See also: Christine Karrer, Peter Whitehead and Hans-Joachim Paepke, "Bloch & Schneider's *Systema ichthyologiae*, 1801: History and Autorship of Fish Names," *Mitteilungen aus dem Museum für Naturkunde in Berlin* 70, no. 1 (1994): 99–111.
[32] Georges Cuvier, *Historical Portrait of the Progress of Ichthyology: From its Origins to our Own Time*, trans. Theodore W. Pietsch (Baltimore: Johns Hopkins University Press, 1995), 140; pages 147–148 offer an overview of Bloch's system.
[33] Karrer, "Marcus Elieser Bloch," 132.

volumes he published, Bloch solicited ever more fish specimens and drawings from his readers. They plainly obliged, as over the years in which his series was published, he continued to receive a good supply of specimens, which he in turn converted into descriptions and depictions in his series. Even though the development of the collection and that of the series were closely connected, we will first turn to the formation of the former, and only subsequently discuss the latter.

Bloch assembled an impressive collection in his home on the Spandauerstraße, where the more prosperous Jewish inhabitants of the city lived.[34] A characterization by the printer Christoph Friedrich Nicolai (1733–1811), in his 1779 guide to notable places in the area of Berlin and Potsdam, gives an idea of what this collection encompassed.[35] It was kept in "eight glass cabinets and five drawered chests",[36] and consisted of a broad range of *naturalia*; from birds and their nests to shells, from four-footed animals to polished stones, and from amphibians to insects. In building this natural historical collection, Bloch was representative of a wider trend in eighteenth century Europe, in which increasing numbers of merchants, physicians, professors and others assembled objects in their households.[37] Nicolai describes 27 other collections in Berlin.[38] Over the years, Bloch's collection grew steadily in both size and fame. By 1795, Wilhelm von Humboldt wrote to Johann Wolfgang von Goethe about the 'Bloch'sche Cabinet', saying that he had not visited it but that he heard it held all kinds of rarities.[39] As James Delbourgo has shown for Hans Sloane, building a collection of note was a good way to establish one's name and forge connections.[40] Emma Spary has argued that collections were considered to represent the collector's

[34] Lowenstein, *The Berlin Jewish Community*, 16.
[35] Christoph Friedrich Nicolai, *Beschreibung der Königlichen Residenzstädte Berlin und Potsdam* vol. 2 (Berlin: Friedrich Nicolai, 1779), 599–601. An abbreviated, paraphrased translation can be found in Antoine-Joseph Dézallier d'Argenville, *La conchyliologie, ou, Histoire naturelle des coquilles de mer, d'eau douce, terrestres et fossiles* (Paris: Guillaume de Bure fils aîné, 1780), 828.
[36] Nicolai, *Beschreibung*, 599.
[37] For a recent overview of types of collections in eighteenth-century Europe, see: Eva Dolezel, Rainer Godel, Andreas Peča and Holger Zaunstöck, eds., *Ordnen – Vernetzen – Vermitteln. Kunst- und Naturalienkammern der Frühen Neuzeit als Lehr- und Lernorte* (Stuttgart: Wissenschaftliche Verlagsgeselschaft, 2018).
[38] Nicolai, *Beschreibung*, 598–609.
[39] Wilhelm von Humboldt to Johann Wolfgang von Goethe, 22 August 1795, *Goethes Briefwechsel mit den Gebrüdern Humboldt (1767–1832)*, ed. F. Th. Bratranek (Leipzig: F.A. Brockhaus, 1876), 7.
[40] Delbourgo, *Collecting the World*, xxviii.

personal character, and that orderly and aesthetically pleasing cabinets were especially appreciated.[41] Bloch must have been well aware of the connection between his collection and his prestige and reputation.

What made Bloch's collection stand out in particular was, naturally, its fish. On his death, the collection had grown to encompass almost 1,400 species.[42] About three quarters of the fish were specimens preserved in spirits. The rest of the specimens were dried; some were stuffed with hay, while others were loose skins, or skins mounted on wooden models. As explained above, Bloch may have started collecting the fish that dwelled in the Prussian states in the 1770s. Just as Willughby and Ray had done a century before him, Bloch obtained specimens at marketplaces and harbours.[43] He also acquired specimens through excursions to a nearby fishing village during his summer vacations, where he collected many useful observations from the fishermen. While Bloch initially intended to chart all of German fishes, he also received *fremde Fische*, with which he seems to have meant those fish not native to the German states.[44] Bloch boasted that people were sending him natural objects from all parts of the world: his vast network of correspondence consisted of government officials, physicians and missionaries abroad. His collection thus grew to encompass specimens originating from Scandinavia, Greenland, the North Atlantic, the Mediterranean, Africa's west coast, the Caribbean, Surinam and Brazil, North America as well as Southeast Asia.[45]

What, precisely, had led Bloch to collect fish? He answers this question on the very first page of the preface to the inaugural volume of his series.[46] He relates how he had been spending much of his leisure time perusing natural history. Then one day – he does not specify when – a friend sent him a species of salmon from the lake of Miedwie, in the Province of Pomerania bordering on the east

[41] Emma Spary, "The Naturalist Collecting Community in Paris, 1760–1789: A Preliminary Survey," in Dolezel, Godel, Peča and Zaunstöck, *Ordnen – Vernetzen – Vermitteln*, 310.
[42] Eva Dolezel, "Lehrreiche Unterhalting oder Wissenschaftliche Hülfsmittel? Die Berliner Kunstkammer um 1800. Eine Sammlung am Schnittpunkt Zweier Musealer Konzepte," *Jahrbuch der Berliner Museen* 46 (2004): 151–152.
[43] Wells, "M.E. Bloch's Allgemeine Naturgeschichte der Fische: A Study," 8.
[44] *Allg. Nat. der Fische*, vol. 3, n.p.
[45] Paepke, *Bloch's Fish Collection*, 27.
[46] *Allg. Nat. der Fische*, vol. 1, sig. *2r.

of Brandenburg.[47] After consulting his copy of Linnaeus' *Systema naturae* (he does not mention which edition), he found that it did not mention this species. This astonished him so much that he decided to look up some of the other fish common in the German states. He resolved to chart the piscine population of the German states, to draw up detailed descriptions and deliver truthful images on the basis of which species could be classified. Rather than developing a new system, however, – and this is important to stress – Bloch took part in the broader effort of perfecting the existing classification system for fish. During those hours in which he did not attend to his patients, he directed his attention to that part of natural history which he thought was rather poorly attended to, the history of fishes.

That Bloch was a significant figure in the learned landscape is underscored by the portrait engraving that the German physician and naturalist Johann Georg Krünitz (1728–1796) commissioned of him for the thirteenth part of his *Oeconomische Encyclopädie* (**Figure 4.1**), published in 1784.[48] As its title indicates, this series offered an encyclopaedic overview of all matters relating to 'oekonomie' – a term that encompassed all kinds of practical endeavours that contributed to socio-economic improvement in one way or the other.[49] Bloch deserved a place in this survey: as the text on the engraving declares, he was much loved as a physician, nationally renowned for his study of nature and an esteemed philanthropist.[50] While the various portraits of eminent figures commissioned by Krünitz for his encyclopaedia are similar in style, they each convey something that is specific to the person depicted. In the case of Bloch, the scenic backdrop against which his portrait is placed signifies his interest in the study of nature. A

[47] Ibid.

[48] The engraving was done by the artist Johann Conrad Krüger (1733–1791), who also made engravings of other notable figures including Moses Mendelssohn and Krünitz himself. See: Johann Georg Krünitz, *Oeconomische Encyclopädie* (Berlin: Joachim Pauli, 1773–1796).

[49] Phillips, *Acolytes of Nature*, 35.

[50] Original German: "Als Arzt, beliebt; als Forscher der Natur, berühmt bey seiner Nation nicht nur / als Menschenfreund, wie Mendelssohn geschäzt, ist Bloch, dem Wahrheit dieses Denkmal setzt: durch ihren Freund, Krünitz."; it is not clear whether the term 'Nation' refers to the Jewish community, in its usage in the Hebrew Bible, or an envisioned German state. Bloch himself uses this term in the preface to his first volume to refer to the various German states.

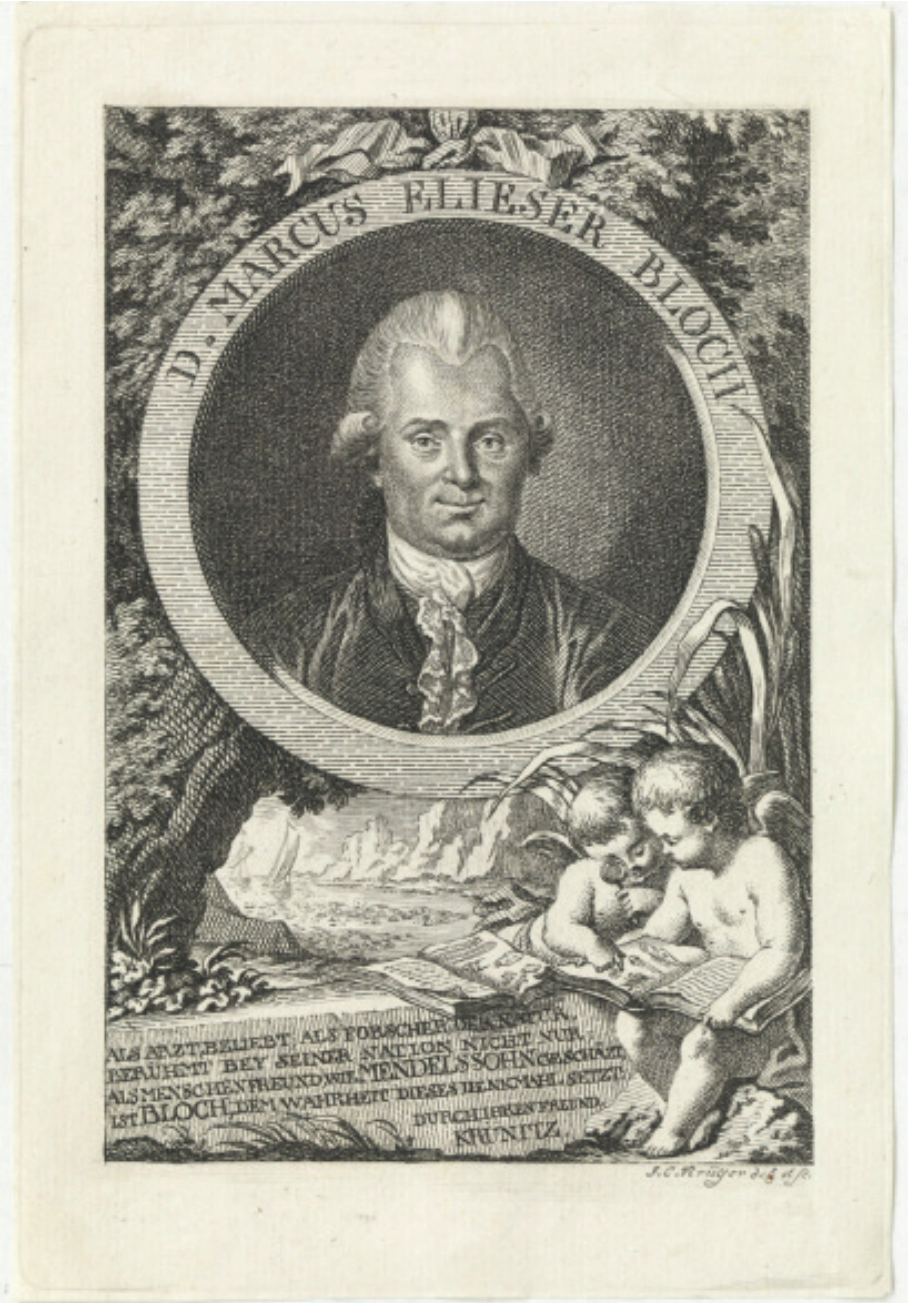

Figure 4.1 Portrait engraving of Marcus Élieser Bloch, Johann Conrad Krüger | Johann Georg Krünitz, *Oeconomische Encyclopädie* vol. 31 (Berlin: Joachim Pauli, 1778) | © Universitätsbibliothek Leipzig

pair of putti peruse natural historical volumes, one of them with a magnifying glass in hand; one can still make out the drawings of fish on the pages. They are a visual nod to the fish books that Bloch became widely known for.

The inclusion of Bloch's portrait among those of other reputable scholars is a confirmation of his place in the learned society of the German states in the late eighteenth century. He belonged to the wider community of *Naturforscher* or 'researchers of nature', the general label applied to those who investigated nature, be it physics, chemistry or one of the branches of natural history.[51] In her book *Acolytes of Nature*, Denise Phillips brings together this decentralized group of people consisting of, among others, physicians, apothecaries, merchants, and government officials – attesting to the fact that official, remunerated, positions dedicated to the study of nature remained relatively few and far between. These men nonetheless considered themselves as a community of *Naturforscher* with a joint cause, bound together by certain shared principles that pertained not only to the proper ways to study the natural world, but also how to present it to others. Bloch seemed well aware of these principles, and the treatment of his work in this chapter exemplifies some of them.

Besides this community of naturalists, Bloch belonged to a circle of Jewish thinkers. Soon after arriving in the city, he became involved in the Haskalah, also known as the Jewish Enlightenment, spurred by a group of intellectuals that had moved to Berlin due to its growing reputation as a centre of scholarship.[52] As home to the centre of Prussian government, the royal court, a military garrison as well as an emerging commercial hub, the city had been growing rapidly in the first half of the eighteenth century.[53] Among its varied population were migrants from different religious backgrounds.[54] Although the city was relatively open to newcomers, the Jews in the city, as elsewhere in Prussia, did not have full legal equality. The government curbed their rights to marry, buy property, found businesses, or attend university.[55]

[51] Phillips, *Acolytes of Nature*, 4–5.
[52] Lowenstein, *The Berlin Jewish Community*, 34, 49. On the Haskalah, see also Shmuel Feiner, *The Jewish Eighteenth Century: A European Biography, 1700–1750* (Bloomington: Indiana University Press, 2020).
[53] Lowenstein, *The Berlin Jewish Community*, 4.
[54] For example, French Huguenots and Austrian Protestants; ibid., 19.
[55] Ibid., 13.

One of the figureheads of the Haskalah, the philosopher Moses Mendelssohn (1729–1786), was a patient of Bloch's as well as a close friend.[56] Bloch was also well acquainted with the banker David Friedländer (1750–1834), who thought about and worked towards reforms to advance the legal status of the Jewish community in the city.[57] Bloch himself was one of the founders of Berlin's Jewish hospital.[58] He also dedicated one of the volumes of his series to the heir presumptive Frederick VI of Denmark (1768–1839) to thank him for bolstering the rights of his 'suppressed brethren.'[59] It is the only instance in which Bloch explicitly alludes to his Jewish background in his book series. A somewhat more implicit connection between his involvement in the Haskalah and his investigations into fish is the fact that the names of Mendelssohn and Friedländer figure in the list of subscribers to the series, along with those of a few other notable proponents of the Jewish cause, such as Jeremias Bendix (1735–1790) and Isaac Daniel Itzig (1750–1806).[60]

Bloch's Jewish background had other consequences for his position in the social, cultural and intellectual echelons of Berlin. It seems that the *Königlich-Preußische Akademie der Wissenschaften* (Royal Prussian Academy of Sciences) in Berlin admitted neither Bloch nor Mendelssohn as a member for that reason.[61] This may not have been an insurmountable blow, however, because Bloch had created his own club. He was one of the founding members of the *Gesellschaft Naturforschender Freunde* (Society of Friends of Nature Research) in 1773.[62] As its name reveals, this society consisted of people that were united by their interest in studying nature. This club was, on the one hand, open and egalitarian. It welcomed members from various backgrounds and religious denominations who

[56] Shmuel Feiner, *The Jewish Enlightenment* (Philadelphia: University of Pennsylvania Press, 2002), 117.
[57] Ibid., 315.
[58] Karrer, "Marcus Elieser Bloch," 135.
[59] Frederick VI of Denmark had decreed that Jewish pupils were to be granted access to apprenticeships with craftsmen, see: Marcus Élieser Bloch, *Allgemeine Naturgeschichte der Fische*, vol. 10 (Berlin: J. Morino, 1793), vi. See also Martin Schwartz Lauzen, *Jews and Christians in Denmark: From the Middle Ages to Recent Times* (Leiden: Brill, 2015), 89–124.
[60] *Allg. Nat. der Fische*, vol. 1, n.p.
[61] Lesser, "Dr. Marcus Elieser Bloch," 242.
[62] On the history of the Gesellschaft Naturforschender Freunde, see: Katrin Böhme, "Die Gesellschaft Naturforschender Freunde zu Berlin: Bestand und Wandel einer gelehrten Gesellschaft Ein Überblick," *Berichte zur Wissenschaftsgeschichte* 24, no. 4 (2001): 273.

wished to contemplate God's creation through the study of nature. Its statutes stressed that its members were considered equal without regard for birth, rank or standing.[63] On the other hand, the Gesellschaft Naturforschender Freunde did have a member policy. The founders were hesitant to admit people who were too affluent, as they feared that they would be too full of pride in their wealth and reputation to engage in debates in the spirit of equality and friendliness.[64] The membership of the Gesellschaft thus consisted largely of middle-class men, among them apothecaries, physicians, and government officials.[65] In order to join, these members had had to demonstrate that they were serious *Naturkenner*.

A good way to do so was to collect natural historical objects. The ownership of a collection of natural curiosities [*natürlichen Seltenheiten*] was in fact a primary requirement for admission, as founding member Friedrich Wilhelm Heinrich Martini (1729–1778) declared in the statutes.[66] In the spirit of collaboration and cooperation, the collections, libraries, or other resources for the study of nature of members were to be made accessible to the other members.[67] Just as Spary has argued for the Parisian collecting community, the Gesellschaft Naturforschender Freunde likewise preferred that collections were suitably ordered. Nicolai's guidebook indeed wrote approvingly of Bloch's *wohlgeordenete Naturaliensammlung*, which by and large adhered to Linnaean systematics.[68] By ordering his cabinet in a systematic manner, Bloch literally showcased his knowledge of the Linnaean system, whereas an unscholarly arrangement would have reflected a lack of understanding of the current methods of classification.[69] Bloch and collectors like him thus displayed their expertise as they displayed their material possessions.[70]

[63] Anke te Heesen, "Vom naturgeschichtlichen Investor zum Staatsdiener: Sammler und Sammlungen der Gesellschaft Naturforschender Freunde zu Berlin um 1800," in *Sammeln als Wissen. Das Sammeln und seine wissenschaftsgeschichtliche Bedeutung*, eds. Anke te Heesen and Emma Spary (Göttingen: Wallstein, 2001), 64.
[64] Ludwik Lesser, *Chronik der Gesellschaft der Freunde in Berlin* (Berlin: Petsch, 1842), 46.
[65] Katrin Böhme, *Gemeinschaftsunternehmen Naturforschung: Modifikation und Tradition in der Gesellschaft Naturforschender Freunde zu Berlin 1773–1906* (Stuttgart: Franz Steiner, 2005), 29.
[66] Friedrich Wilhelm Heinrich Martini, "Gesetze der Hiesigen Gesellschaft," *Beschäftigungen der Berlinischer Gesellschaft Naturforschender Freunde* 1, no. 1 (1775): xxviii.
[67] Nickelsen, *Draughtsmen, Botanists and Nature*, 109.
[68] Nicolai, *Beschreibung*, 601.
[69] Phillips, *Acolytes of Nature*, 84.
[70] Ibid., 44.

As a Jew in Prussia, and having come from a modest background, it may have taken more effort for Bloch to find his place in the community of naturalists and scholars than for those members who found themselves in better legal and financial positions from the outset. It does not seem to have hindered him too much. He was well attuned to the ways in which one could display learned distinction, and conform to both subtle and more overt cultural codes of what it meant to be a *Naturforscher*. Both his collection of and his bibliographical series on fish were instrumental in Bloch's positioning of himself in the intellectual landscape. By converting his collected specimens into printed descriptions and finely executed illustrations, Bloch circulated his collection, and the knowledge contained within it, to a wide audience. We will now discuss the series in more detail.

Bloch's Series of Fish

Bloch's series of fish followed the expansion of his collection in close step. The first volume appeared in 1782 under the title *Oeconomische Naturgeschichte der Fische Deutschlands*. As we saw, Bloch paid for its publication out of his own pocket (or that of his wife, who was considerably more affluent than he) and it was printed by the bookseller Hesse in Berlin. It contained thirty-seven species descriptions and an equal number of engraved, hand-coloured plates. The plates, each of which corresponded to a specific species descriptions, were published in separate, bound volumes. Bloch had selected a large folio format so that all of the fishes' parts could be made clearly visible.[71] This inaugural volume was followed by two more volumes on German fish with the same title in 1783 and 1784 respectively; these were printed by Realschule Buchhandlung. Bloch's initial plan, as we have seen, had been to collect and describe all the fish of the German states. When he had done so, he still had a lot of fish in his possession that were not native to Germany. He thus continued his series by describing those foreign fishes of which he had drawings done 'after nature.' These descriptions of foreign fish were published in nine parts as *Naturgeschichte der ausländischen*

[71] *Allg. Nat. der Fische*, vol. 1, sig. *3r.

Fische. The first three of these appeared with the Realschule (1785–1787), the rest with the publishing house Johann Morino & Comp (1790–1795). On average, one volume appeared each year, with the exception of 1788 and 1789, which were those years following Bloch's announcement that he would pause the series. The combined series became known as the *Allgemeine Naturgeschichte der Fische*. When the twelfth and last volume was published in 1795, the series had classified, described and depicted well over four hundred species.

From Bloch's financial quandary that opened this chapter, we may deduce that his series was expensive to produce. Its exact margin of profit (or loss), however, is not known. To calculate it, we would have to know both the cost price and selling price per volume. An indication of the latter can be found in the price listings of late eighteenth-century sales catalogues. In 1792, publisher Morino put out an advertisement for the ninth volume of the series, which he announced would cost the same as the preceding volumes: 10 Reichsthaler for the folio, or 12 Reichsthaler for a slightly larger format.[72] That same year, a bookseller in Jena offered the set of 9 volumes that had been published so far for sale at a good discount for 70 Reichsthalers rather than the 120 he claimed it usually went for.[73] Leipzig bookseller Johann Gottlob Beygangs (1755–1823) advertised the series in 1797 and asked between 12 and 18 Reichsthalers per volume, depending on both the size and quality of the paper it was printed on.[74] These examples give a sense of the price range of the series – buyers should expect to pay at least 10 Reichsthaler per volume unless a seller made a sensational offer. For comparison: the aforementioned Beygangs priced an exegetical handbook of the Old Testament at about two thirds of a Reichsthaler.[75] The capital investment represented by Bloch's books of fish demanded no little precaution on the part of the bookseller. "Nota bene", bookseller Beygangs concluded his advertisement for the series, "this important work can, because of its too considerable expense, henceforth no longer be bought on credit, but purchased with exact money in

[72] Advertisement by Johann Morino, *Intelligenzblatt der Allgemeinen Literatur-Zeitung vom Jahre 1792* (Leipzig: Johann Gottfried Müllerischen Büchhandler, 1792), 338–339.
[73] Advertisement by Hn. Adv. Fiedler, *Intelligenzblatt der Allgemeinen Literatur-Zeitung vom Jahre 1792*, 767.
[74] Advertisement by Johann Gottlob Beygangs, *Intelligenzblatt der Allgemeinen Literatur-Zeitung vom Jahre 1797* (Leipzig: Johann Gottfried Müllerischen Büchhandler, 1797), 246.
[75] Ibid., 245.

cash."[76] As Bloch had also learned, an audience may be eager but that did not necessarily mean that it paid its bills.

Whereas it is relatively easy to get an idea of the selling price, determining precisely how much one volume cost to produce is more complicated. As we saw in Chapter 1, this depended on a variety of factors, which besides the quality of the materials used, from paper to binding, might include the wages of a plethora of craftsmen, artists and artisans. As none of Bloch's account books seem to be extant, it is difficult to assess if he (or his wife) bore the sole financial responsibility for the publication of the series, or whether he shared it with his publishers. There only remain general indications. Bloch himself asserted, as we saw, that he had spent 20000 Reichsthaler towards the publication of the first six volumes, which amounts to well over 3000 Reichsthaler per instalment. This means that, with the abovementioned price of 10 Reichstaler apiece, 330 copies of each volume would have to be sold just to recoup costs. In order to infer the cost price per actual book, we would have to know the print run of the work, which unfortunately is unknown; and even so, it is not clear if Bloch referred specifically to the expenditures of the printing process or that of his project in general, that is, the assembly and upkeep of his collection of fish.

And yet, even without precise numbers, it is beyond a doubt that the series was so expensive because of the hand-coloured engravings that accompanied each species description. The previous chapters have already addressed the financial implications of illustrations. As we saw, Willughby and Ray's *Historia piscium* was a tricky enterprise for the Royal Society on account of its many engravings, whereas Linnaeus opted to include none in his own works to keep them affordable. Hand-coloured engravings really drove the price up, as well. Bloch, who did not draw himself, employed several draughtsmen. Over the more than a decade that it took to publish his series, he hired no fewer than nineteen draughtsmen and engravers.[77] The signature of the painter Johann Friedrich August Krüger (*b*.1754)

[76] Original German: "NB. Dieses wichtige Werk kann wegen des zu grossen Kostenaufwand, fernerhin nicht mehr in Rechnung, sondern gegen gleich baare Bezahlung erlassen werden." Advertisement by Johann Gottlob Beygangs, *Intelligenzblatt der Allgemeinen Literatur-Zeitung vom Jahre 1792*, 348.

[77] Far from all of the names of these artists are known; Wells, "M.E. Bloch's *Allgemeine Naturgeschichte der Fische*," 9.

appears on many on the plates; he was also commissioned by Martini for a series on shells.[78] The drawings made by draughtsmen were turned into engravings by, among others, Johann Friedrich Hennig (*b.*1778), Johann Godlieb Schmidt (1750–1822), and Georg Bodenehr (dates unknown). It remains unclear who subsequently coloured in these engravings. At the time, it was common to hire women, or sometimes children, for this part of the process, because they were paid less.[79] In general, it is not known how much the artists involved in Bloch's project were paid nor whether these artists included women and children. It is nonetheless clear that Bloch expected much from them, as will be discussed in detail later in this chapter.

Bloch presented the three first volumes of his series as an oeconomic natural history. In the preface to his book, Bloch noted, not without astonishment, that while entire societies dedicated themselves to mastering the intricacies of bee-keeping, fish had received only scant attention.[80] "Do fishes not equally deserve", Bloch wondered, "our attention; do they not form an important part of our diet; have they not always been an important trade stuff?"[81] The German fish were certainly deserving of a series of their own. Bloch wanted his work to be useful not only to scholars [*Gelehrte*], but also to agriculturists [*Landwirthe*], and he therefore included a discussion of different types of fishing nets and how to use them.[82] Bloch also indicated which net to use for each fish, explained at what time of the year it was best to catch it and how it should be prepared.[83] Although he does not name his sources, it is probable that fishermen, cooks and housewives were among them. His interest in economic improvement through the advancement of agriculture was also evident from his membership to oeconomic and agricultural societies of Leipzig and Bavaria, among others, which were displayed on the title pages of each volume. These societies, devoted to agriculture or manufacturing,

[78] Claus Nissen, *Die Zoologische Buch-Illustration*, vol. 2 (Stuttgart: Anton Hiersemann, 1978), 153 and Wells, "M.E. Bloch's *Allgemeine Naturgeschichte der Fische*," 9–10.
[79] Nickelsen, *Draughtsmen, Botanists and Nature*, 62.
[80] *Allg. Nat. der Fische*, vol. 1, sig. *2v/*3r.
[81] Original German: "[…] verdienen aber die Fische nicht eben so wohl unsre Aufmerksamkeit; machen sie nicht einen grossen Theil unsrer Nahrung aus; waren sie nicht zu allen Zeiten ein wichtiger Handlungszweig?" Ibid.
[82] Ibid., 1.
[83] Ibid., 13.

had sprung up in the eighteenth century.[84] Rather than catering to a strictly Latinate audience, as Willughby, Ray and Artedi had done in their works of fish, Bloch decided to publish his series first and foremost in the vernacular, thus making it accessible to a wider, German-speaking public. This was, again, very much in line with the broader ideal shared by communities of *Naturforscher*, namely that one produced a work as an act of service to the community.[85]

At the same time, Bloch did not have a strictly German audience in mind. Not long after the first volume on German fish appeared, he arranged to have the series translated into French by Jean Charles Thibault de Laveaux (1749–1827), professor of French in Basel.[86] These volumes appeared between 1785 and 1797 as *Ichtyologie, ou, Histoire naturelle, générale et particulière des poissons*, with François de la Garde in Berlin.[87] The French edition follows the original German very closely: it retains its focus on German fish and does not contain a separate preface introducing the translation.[88] French was, of course, a language more widely read in international learned circles, and thus made his work accessible to a larger scholarly public. In 1787, Bloch's son undertook a journey to France and England to seek subscribers for this French translation.[89] Some years later, Bloch complained to a learned friend that he had lost money on the French translation; something for which he suspected the French Revolution was to blame (though he does not specify why).[90] It did not temper his ambition. A letter that Banks wrote to Bloch in June 1791 reveals that Bloch considered issuing an English translation, and had asked Banks whether that was a good idea. In his reply, Banks explained that while he was charmed by the idea "par amour de la science Ichtiologique" [*sic*], the British "Gens de lettres" for the most part understood

[84] See also: Verena Lehmbrock, *Der denkende Landwirt: Agrarwissen und Aufklärung in Deutschland 1750–1820* (Cologne: Böhlau, 2020).
[85] Phillips, *Acolytes of Nature*, 37.
[86] Ellen B. Wells, "M.E. Bloch's Allgemeine Naturgeschichte der Fische: A Study," *Archives of Natural History* 10, no. 1 (1981): 7–8.
[87] Marcus Élieser Bloch, *Ichtyologie, ou, Histoire naturelle, générale et particulière des poissons*, trans. Jean Charles Thibault de Laveaux (Berlin: François de la Garde, 1785–1797).
[88] The main difference appears to be that, in the German edition, descriptions and engravings were bound separately, while in the French edition, the engravings interleave the descriptions.
[89] Karrer, "Marcus Elieser Bloch," 136.
[90] Bloch to Johann Hermann, 2 February 1792, Universitätsbibliothek Leipzig (hereafter UL), Leipzig, ASL 213, f1.

either French or German or both so that it was doubtful whether he could find the number of subscribers needed for such a translation.[91] After Bloch's death, a Dutch translation was begun but never completed.[92]

From the onset, Bloch's series enjoyed a diverse audience. This can be deduced from the subscription list comprising three hundred and seventy names that was printed on the first few pages of the inaugural volume, as was customary at the time.[93] Listed among the subscribers was princess Anna Amalie von Preußen (1723–1787), who had an extensive library.[94] Martinus van Marum (1750–1837) purchased the whole set for the library of the Teylers Museum in Haarlem.[95] Working with subscription lists was a tried and tested publication strategy not only for multi-part natural historical works, but more generally for long-lasting editorial enterprises (of which Diderot's *Encyclopédie*, of which the first volume was published in 1751, was among the most famous ones). As such, it had several advantages. It could first of all soften the blow of a financially risky publication, especially if subscribers paid up front.[96] If the list contained eminent subscribers, which authors often aimed for, it also functioned a way of advertising one's connections, which lent the work authority and prestige which would help to draw new subscribers in.

What, precisely, had these subscribers signed up for? We will now to take a closer look at the structure and the contents of the work, and consider the method that Bloch applied to the study of fish. In the first volume of the series, Bloch gave his own definition of the subject: "I take the word *fish* in its common parlance, and understand by it all those water dwellers that move through their element with fins. To it [fish] therefore belong also the whales and swimming amphibians,

[91] Joseph Banks to Bloch, dated 24 June 1791, Abteiling Historische Drucke of Staatsbibliothek zu Berlin (hereafter SBB), Berlin, Sammlung Darmstaedter Weltreisen 1768: Banks, Sir Joseph, f1r.
[92] The first part was printed by Cornelis Nozeman and Johann Christiaan Sepp under the title *Afbeeldingen en beschrijvingen van in- en uitlandsche visschen M.E. Bloch; gevolgd naar het Hoogduitsch* in Zaltbommel in 1804. I thank Esther van Gelder for drawing my attention to it.
[93] A rudimentary overview of these subscribers can be found in Wells, "M.E. Bloch's Allgemeine Naturgeschichte der Fische," 10–11.
[94] A part of this library still exists; see: Marc Serge Rivière and Annett Volmer, *The Library of an Enlightened Prussian Princess: Catalogue of the Non-Music Sections of the Amalien-Bibliothek* (Berlin: Spitz, 2002).
[95] Wells, "M.E. Bloch's Allgemeine Naturgeschichte der Fische: A Study," 12.
[96] David R. Brigham, "Mark Catesby and The Patronage of Natural History in the First Half of the Eighteenth Century," in *Empire's Nature: Mark Catesby's New World Vision*, eds. Amy Meyers and Margaret Beck Pritchard (Chapel Hill: University of North Carolina Press, 1998), 109.

which Linnaeus saw fit to separate from the fish in the twelfth edition of his natural system."[97] He continued that he would not actually discuss the whales in his series, however, because he expected that Johann Christian von Schreber (1739–1810) would already do so in his natural historical series on mammals, and – as was of utmost importance to Bloch – deliver images of them.[98] Bloch then proceeded by giving brief, general discussions of the inner and outer parts of fish (from gills to swim bladder), just as Willughby, Ray and Artedi had done in their works. As said, he then discussed the procreation and growth of fish, and the nets that could be used to catch them. Each of the later volumes includes a preface in which Bloch explains what had come to pass since his last publication, and thanked those individuals who had been especially helpful to the creation of the latest volume. This preface is then followed by a brief index of the species described, before Bloch moves on to the species descriptions.

Bloch's descriptions vary in length. For instance, the species description of a carp that he had received from Malabar barely takes up one page, whereas that of the common carp, a fish well-known across the German states, stretches out over fifteen pages.[99] The descriptions adhere to the same general format. They open with the vernacular name of the fish, its Linnaean binomial, a reference to its corresponding plate, and one sentence describing its main characteristics (which will be discussed below). The first paragraph gives a more elaborate description of the main characteristics – a focus on differentiating marks that we also saw in the works Willughby and Ray, Artedi and Linnaeus. On describing a species, Bloch first ascertained whether earlier naturalists had already described it. If a species had indeed been described before, he would only correct the existing accounts where necessary. He then listed all the authors who had described the species, thus showing his extensive knowledge of the natural historical literature. His references go back as far as Aristotle and Pliny, as well as Gessner and other

[97] Original German: "Ich nehme das Wort *Fisch* nach dem gewöhnlichen Sprachgebrauche und verstehe darunter alle diejenigen Wasserbewohner, welche sich mittelst der Flossen in ihren Elemente bewegen. Es gehören daher auch die Wallfische und schwimmende Amphibien mit in meinen Plan, welche Linné in der zwölften Ausgabe seines Natursystems davon zu trennen für gut fand." *Allg. Nat. der Fische*, vol. 1, 2. Contrary to Bloch's claim, however, this separation had been suggested already in the 10th edition of the *Systema naturae*.
[98] Johann Christian von Schreber, *Die Säugthiere in Abbildungen nach der Natur mit Beschreibungen* (Erlangen: Wolfgang Walther, 1774–1804).
[99] *Allg. Nat. der Fische*, vol. 12, 50 and *Allg. Nat. der Fische*, vol. 1, 92–107.

sixteenth-century naturalists, but more often cite the work of Willughby and Ray, and Artedi.

He refers to Artedi's work well over hundred times over the course of the series. Mostly this is to refer to where in the *Ichthyologia* the Swedish naturalist had described the species at hand. In some cases, however, Bloch explains how his characterization of a particular species differs from Artedi's. For example, he stated how the tail fin of the carp consisted of 11 rays rather than the 9 rays that Artedi had reported.[100] Bloch speculated that Artedi must have copied this number from Willughby, who neglected to include the smaller rays at the end of the tail in his count.[101] Each of Bloch's species description includes discussions of the external parts of the fish; sometimes, these are supplemented by reports on their inner parts. As said, the descriptions also contain discourses of how fish can best be caught, when they are best eaten, and recipes; in the case of the common carp, it contains an elaborate account of how they are bred in ponds. All species descriptions conclude with a summary of the names given to the species in other languages.

Just as the fishes in Bloch's material collection were ordered according to Linnaean principles, so were the fishes described in his series. Bloch conceived his work as a continuation of the taxonomical system that Linnaeus had presented, stating in the introduction to his series that he would follow the Linnaean format as closely as possible, making additions where necessary. Linnaeus had by that time published the twelfth edition of his *Systema naturae*.[102] The classification system for fish in this edition diverged from that of the first edition, which had effectively presented the system of Artedi, in a few respects. Most changes had occurred on the level of orders, all of which Linnaeus replaced with his own.[103] He also added new genera.[104] The underlying aims and principles, however, where not altogether different from those of the *Ichthyologia* – it was just that

[100] *Allg. Nat. der Fische*, vol. 1, 44.
[101] Ibid.
[102] Carl Linnaeus, *Systema naturae*, ed. 12 (Stockholm: Lars Salvi, 1766–1767).
[103] Linnaeus had relegated the order of the *Plagiuri* to the class of mammals, and that of the *Chondropterygii* to the amphibians. He did away with the *Malacopterygii* and *Acanthopterygii* (a division based on soft or thorny rays). His newly established orders *Apodes*, *Jugulares*, *Thoracici*, and *Abdominales* were all based on the presence and position of pelvic fins. Linnaeus, *Systema naturae*, ed. 12, 422.
[104] See: ibid., 423–424.

other characteristics were selected as the basis for certain taxonomical ranks. The number of fins and their relative position to one another, as well as the number of rays in a fin, remained especially salient features for deciding genera and species. This is why Bloch's species descriptions open by enumerating the number of rays in each and every fin. He does so in an abbreviated and almost formulaic manner: in the case of a species of oarfish from Goa, for example, he noted 'Br. 8, B. 2, S. 13, R. 17', referring to the pectoral fin [*Brustflosse*], ventral fin [*Bauchflosse*], tail fin [*Schwanzflosse*], and back fin [*Rückenflosse*] respectively.[105] In some cases, the number of rays has been represented as a fraction: in these instances, the number above the dividing line indicated the number of rays that were bony as opposed to cartilaginous. While Bloch had likely taken this style of notation from Linnaeus, who used it in his *Systema naturae*, it is a clear example of the quantitative focus that had governed Artedi's work, and had also been visible in that of Willughby and Ray.

But there was a catch. Even though Bloch agreed with the crucial importance of classifying fish on the basis of physical marks, he did not think that Artedi and Linnaeus' decontextualized manner of description was necessarily sufficient for the purpose of demarcating species. For as he explained in the inaugural volume of his series, he had noticed that many of the fish that he came across, "could not be determined from the works of Linnaeus nor Artedi, nor of the older ichthyologists, because the descriptions in the first two are in respect to certain fish too short, and the latter are often unreliable because of their bad and unfaithful images."[106] From this critical assessment of earlier authors, we can extrapolate what Bloch envisioned as the best approach for the study of fish. His aim was to both offer descriptions of fish with elaborate morphological detail and to produce good and reliable illustrations. The largest contrast between Linnaeus and Artedi on the one hand, and Bloch on the other, was the importance attributed to illustrations. Contrary to these naturalists, indeed, Bloch did not consider description, even if

[105] *Allg. Nat. der Fische*, vol. 12, 95.
[106] Original German: " […] dass sich viele Fische, […] weder nach dem Linné und Artedi, noch nach den ältern Ichthyologen bestimmen liessen, da die Beschreibungen der erstern in Ansehung mancher Fische zu kurz, und leztre wegen der Verwechselungen der Namen und der schlechten und ungetreuen Zeichnungen, öfters unzuverlässig sind." *Allg. Nat. der Fische*, vol. 1, sig *2r.

detailed, sufficient in and of itself. The anecdote opening this chapter confirms how the illustrations were an indispensable part of his series - so much so, that Bloch would not include any fish for which he did not have a drawing made from the life. He thus deemed an illustration essential in representing a fish.

These differences come clearly into view when we look at the matter of colour. In seeking to refine the existing classification system as much and as well as he could, he did not follow Linnaeus and Artedi to the letter. He accorded weight to characteristics that these Swedish naturalists had not cared for. They, for example, had only occasionally commented on the colouration of fish in their species descriptions, as they deemed colour too unstable a quality for use in classification. Artists and naturalists alike grappled with the subjective qualities of colour, and attempts to codify it either visually or textually it proved complicated at best.[107] Bloch nonetheless did consider colour to be a valuable characteristic for recognizing species and paid it a lot of attention in both word and image. In some instances, he took colouration as the defining mark of the fish, for example in the case of a new species he described and which he named the red mackerel (*Scomber ruber*).[108] "The red colour", Bloch wrote, "sets this fish apart from the others of this department [that is, the genus]."[109] He continued "[o]n the back and on the sides until the lateral line, the red colour predominates, through which the silver colour shines through, but from thereon however, the proportion is the other way around. The fins are yellow, and play into purple."[110] As will be discussed in the last part of this chapter, he exerted himself and his artists to bring out colours the best way possible in the illustrations.

From the eighth volume (1791) onwards, plates are inscribed with the names of those who financed the engraving. Bloch opted for this publication strategy when the production of his book had become too costly. He cites

[107] On these efforts, see, for example, Richard Mulholland, "The Mechanism and Materials of Painting Colour ad vivum in the Eighteenth Century," in Balfe, Woodall and Zittel, *Ad vivum?*, 328–3355; and Joachim Rees, *Die Verzeichnete Fremde. Formen und Funktionen des Zeichnens im Kontext europäischer Forschungsreisen 1770–1830* (Paderborn: Wilhelm Fink, 2015), esp. chapter 4 entitled "Kodiertes Kolorit," 153–230.
[108] *Allg. Nat. der Fische*, vol. 10, 75–76.
[109] Original German: "Die rothe Farbe unterscheidet diesen Fisch von den übrigen dieser Abtheilung." Ibid.
[110] Original German: "Am Rücken und an den Seiten bis an die Seitenlinie hat die rothe Farbe die Oberhand, durch welche die Silberfarbe durchschimmert, von da weiter aber, verhält es sich umgekehrt. Die Flossen sind gelb, und spielen in's Violette." Ibid.

Willughby and Ray's *Historia piscium* as one of his examples.[111] The archive of the Berlin-Brandenburgische Akademie der Wissenschaften holds a circular soliciting plate subscriptions for Bloch's series.[112] Although undated, it is probable that the leaflet was published as a response to Bloch's 1787 announcement that he would cease publication. The document, likely drafted by scholars and publishers close to Bloch, is addressed to friends and patrons of learning. It encouraged "that every favourer of this enterprise subscribes to pay the costs for as many plates, for 2 Louis d'Or each [worth roughly 10 Reichsthalers][113], as his love for the completion of his work inspires him to."[114] The circular, which does not seem to have yet been cited by historians, offers a fascinating insight into the reasons that made the series one considered worthwhile. It strikes a tone of national pride. It explains that Bloch's series, "a work, that because of its accuracy has received the best reviews in Germany, France, England and every foreign country, and has universally in natural history been declared a classic work", might otherwise be left uncompleted.[115] This, the authors argued, would be a shame, for it could take centuries before another scholar might emerge who was able to combine such a unique possession of materials with the right approach, as was the case for Bloch, who was already so well established in the field.[116] Subscriptions were solicited "for only 200 plates, […] with which this work will be completed for Germany's honour."[117] Judging from the number of plates on which names are engraved, the appeal was successful. The Königliche Akademie der Wissenschaften, for example, although unwilling to admit Bloch as a member, was prepared to

[111] *Allg. Nat. der Fische*, vol. 8, sig. *3r.
[112] Circular in Berlin-Brandenburgische Akademie der Wissenschaften (hereafter BBAW), Berlin, PAW 1700-1811–I-XII-11.
[113] This equivalent is given in the newspaper *Der Anzeiger: Ein Tagblatt zum Behuf der Justiz, der Polizey und aller bürgerlicher Gewerbe, wie auch zur freyen gegenseitigen Unterhaltung der Leser über gemeinnützige Gegenstände aller Art* 19, no. 19–20 (1792): 154.
[114] Orginal German: " […] dass jeder Beförderer dieses Unternehmens die Kosten für so viele Platten, eine jede zu 2 Louisd'or zu bezahlen unterchreibt, als ihm seine Liebe zu der Vollendung dies Werks eingiebt." BBAW, PAW 1700-1811–I-XII-11, f1v.
[115] Original German: " […] ein Werk, das sowohl, wegen seiner Richtigkeit, in Deutschland als auch in Frankreich, England und jedem Auslande die besten Recensionen erhalten hat, und durchgängig in der Naturgeschichte für ein klassisches erklärt wird […]" ibid., f1r.
[116] Original German: " […] und Jahrhunderte verstchreichen, ehe wieder ein Gelehrter aufstände, wo sich Besitz der Materialien und der nehmliche richtige Standpunkt auch so vereinigten, wie bey dem in diesem Fache schon so rühmlich bekannten Herrn Doktor Bloch?" Ibid.
[117] Original German: "Für 200 Platten wird nur Subscription angenommen, als womit dieses Werk zu Deutschlands Ehre vollendet seyn wird." BBAW, PAW 1700-1811–I-XII-11, f1v.

financially support his work.[118] Other names, titles and institutions inscribed on the plates include those of the Duchess of Württemberg (1748–1811), Prussian diplomat Ewald Friedrich graf von Hertzberg (1725–1795) and the Hamburg city library.[119]

Together with the book's subscriptions lists, these engraved names are testimony to how Bloch's fish project resonated with a large audience. As we saw, what had started as a project to chart all fish from the German states branched out into a project that aimed to collect, describe and depict as many fish as possible, regardless of their geographical origins. This expansion was only possible because of Bloch's network correspondents who sent him specimens from various corners of the world, and this network depended on a global infrastructure that had been forged largely from imperial impulses. Because Bloch almost always remembered to mention in his species descriptions the names of those who generously gave him the specimen at hand – according to the principle of *do ut des* – we can, to a degree, reconstruct this network. We will now trace the trajectory that a significant share of his foreign specimens followed, *viz*. from Coromandel to Berlin. It offers insight into the effort that Bloch's correspondents took in collecting, preserving and circulating specimens, and why they busied themselves with this in the first place.

The Coast of Coromandel

Bloch's announcement of 1787, that he would halt the publication of his fish books, was read wearily by one of his correspondents in South India. The German Pietist missionary Christoph Samuel John (1747–1813) had prepared a parcel of fish drawings and prepared specimens, which would now have to remain with him in Malabar. He had reached out to Bloch after having acquired one of his fish books from the *Nachlass* of his late fellow missionary Johann Gerhard König (1728–1785), and offered to help him collect specimens.[120] König had been

[118] Plates CCCXXVIII–CCCXXX, CCCXXXII–CCCXXXIII, CCCXXXV, CCCXXXVIII–IX, Hans-Joachim Paepke, "Ein jüdischer Untertan des Preußenkönings Friedrich II. studiert die Fischfauna der Welt," in *Klasse, Ordnung, Art: 200 Jahre Museum für Naturkunde*, eds. Ferdinand Damaschun, Sabine Hackethal, Hannelore Landsberg, and Reinhold Leinfelder (Rangsdorf: Basiliskenpresse, 2010), 87.
[119] These are, respectively, plates CCC, CCCXXVII, and CCCXL–CCCXLII.
[120] Christoph Samuel John to Johann Ludwig Schulze, 18 October 1787, AFSt/M 1 C 28 : 87.

a former student of Linnaeus and had spent his time in the mission studying nature.[121] In their engagement with natural history, these two clergymen were not untypical: missionaries from various religious denominations had taken to studying the natural surroundings of their new locales in the early modern period.[122] It reminds us how, besides commercial aims, religious aspirations were no negligible factor in a growing global knowledge infrastructure. As Bloch's series drew to a close, John had become his top supplier of foreign fishes. More than fifty species descriptions mention him as donor, more than a tenth of the total of species discussed in the series.[123] The descriptions were based on specimens that John sent from Malabar, sometimes accompanied by (unfortunately no longer extant) descriptions and drawings. These included species and even an entire genus that had not been described according to the Linnaean system before; a feat that Bloch honoured by naming said genus *Johnfische*.[124]

In order to understand John's motivations for participating in Bloch's project, and how he went about it, we can turn to his aforementioned correspondence in the archives of the Franckesche Stiftungen (Francke Foundations), as well as to published reports from his hand.[125] His incentive was primary located in the religious realm, serving his missionary purpose. After studying Theology at the University of Halle, John had worked at the Foundations erected by the Lutheran pastor August Hermann Francke (1663–1727) in 1698 and served to educate and elevate orphans through Pietist faith.[126] Francke strove to unite the subjective love for God with pious, scholarly labour.[127] The orphanage was furnished with a cabinet of curiosities through which its pupils could contemplate the wisdom

[121] Anne-Charlott Trepp, "Matters of Belief and Belief that Matters: German Physico-Theology, Protestantism, and the Materialized Word of God in Nature," in Blair and Von Greyerz, *Physico-Theology*, 135.
[122] See, for example, Andrés I. Prieto, *Missionary Scientists: Jesuit Science in Spanish South America, 1570–1810* (Nashville: Vanderbilt University Press, 2011); Florence C. Hsia, *Sojourners in a Strange Land: Jesuits and Their Scientific Missions in Late Imperial China* (Chicago: University of Chicago Press, 2009).
[123] Arthur MacGregor, "European Enlightenment in India: An Episode of Anglo-German Collaboration in the Natural Sciences on the Coromandel Coast, Late 1700s– Early 1800s," in MacGregor, *Naturalists in the Field*, 378.
[124] Or, in Latin, *Johnius*. *Allg. Nat. der Fische*, vol. 10, 132.
[125] Such reports frequently appeared in the *Neue Hallesche Berichten*, the printed periodical of the mission. A general discussion of source material regarding the mission can be found in Erika Pabst and Thomas Müller-Bahlke, *Quellenbestände der Indienmission 1700–1918 in Archiven des deutschsprachigen Raums*.
[126] For a history of the Francke Foundations, see: Holger Zaunstöck, ed., *Gebaute Utopien, Franckes Schulstadt in der Geschichte europaischer Stadtentwürfe* (Halle: Frankesche Stiftungen, 2010).
[127] Jonathan Sheehan, *The Enlightenment Bible: Translation, Scholarship, Culture* (New Jersey: Princeton University Press, 2005), 60.

of God.[128] Francke's religious and societal ideals stretched out far beyond the city's borders. Together with the Danish King Frederick IV (1671–1730), he had established the Danish-Halle-Mission at the coast of Coromandel, in South-India. In 1771, John boarded ship to India to become part of this mission and settled in a Danish colony named Tranquebar. This was in fact the fishing village Tarangambâdi, 'village of the singing waves' in the Tamil language.[129] Upon arrival, John was tasked with the conversion of local inhabitants and with teaching at the mission schools, which were attended by both European and Indian pupils. It was in this context that John took up the study of nature. He began, for example, to teach the school children botany.[130] Gradually, he seems to have come to consider the study of nature as an effective tool of conversion, perhaps even more so than reciting or discussing Scripture.[131]

John amassed a collection of natural specimens containing aquatic animals, reptiles, amphibians and insects as well as stuffed birds and mammals.[132] He also possessed a considerable number of shells, some of which had been procured for him by Tamil divers.[133] The collecting of *naturalia* was a widespread practice among the various European mission posts in India such as the United Brethren of the Moravian church.[134] Besides Köning and John, the missionary Johann Peter Rottler (1749–1836), for example, was active in trading specimens. These and other nature-minded missionaries met each other in the Tranquebarian Society, founded in 1788, together with government officials and private merchants.[135]

[128] See: Stefan Laube, "Privilegierte Dinge für Unterprivilegierte? Die Kunstkammer im Waisenhaus," in Dolezel, Godel, Peča and Zaunstöck, *Ordnen – Vernetzen – Vermitteln*, 49–72.
[129] Daniel Jeyaray, "Mission Reports from South India and Their Impact on the Western Mind: The Tranquebar Mission of the Eighteenth Century," in *Converting Colonialism: Visions and Realities in Mission History, 1706–1914*, ed. Dana L. Robert (Cambridge: William B. Eerdmans, 2008), 23.
[130] Heike Liebau, *Cultural Encounters in India: The Local Co-Workers of Tranquebar Mission, 18th to 19th Centuries* (London: Routledge, 2017), 399.
[131] Karsten Hommel, "Physico-Theology as Mission Strategy: Missionary Christoph Samuel John's (1746–1813) Understanding of Nature," in *Halle and the Beginning of Protestant Christianity in India*, vol. 3, eds. Andreas Gross, Y. Vincent Kumaradoss, and Heike Liebau (Halle: Franckesche Stiftungen, 2006), 1115.
[132] Ibid., 1112.
[133] MacGregor, "European Enlightenment in India," 377.
[134] John was inspired by the collection of the Herrnhut missionaries, which also functioned as a deposit of objects for John's own collection. Thomas Ruhland, *Pietistische Konkurrenz und Naturgeschichte: Die Südasienmission der Herrnhuter Brüdergemine und die Dänisch-English-Hallesche Mission (1755–1802)* (Herrnhut: Herrnhuter Verlag, 2018), 256.
[135] Niklas Thode Jensen, "The Tranquebarian Society: Science, Enlightenment and Useful Knowledge in the Danish-Norwegian East Indies, 1768–1813," *Scandinavian Journal of History* 40, no. 4 (2015): 535.

The exclusive access to the natural riches of Tranquebar and surrounding islands these missionaries enjoyed made them invaluable for European naturalists. There was an intricate infrastructure in place through which several collectors on different continents could exchange objects. John not only collected for Bloch, but also sent items to other collectors, including the Danish preacher and naturalist Johann Hieronymus Chemnitz (1730–1800), who also seems to have acted as John's agent in transporting specimens throughout Europe.[136] By 1800, more than eight European learned societies had welcomed missionaries as corresponding members.[137] Both John and Rottler, for example, were elected to the Academy of Sciences Leopoldina, at that time based in Erlangen, as well as to the Gesellschaft Naturforschender Freunde in Berlin.[138]

John's decision to collect fishes, rather than other *naturalia*, seemed mostly a matter of practicality. A letter to his superior in Halle, the director of the Orphanage Johann Ludwig Schulze (1734–1799) reveals his reasons for doing so. First of all, John had agreed with Rottler that the latter would concern himself with the field of botany, and that he would focus on the study of animals.[139] Among the animals, John opted for those specimens which would not take too much time to collect.[140] Fishes fulfilled that requirement, as they, along with other aquatic animals, were among the easiest type of natural specimen to come by, or so John submitted.[141] Secondly, he had noticed that hitherto fish had not been deemed not a subject considered particularly deserving of attention, which made it relatively easy to stumble on as yet undescribed species.[142] For catching these fish, John drew on local fishing communities. In a letter to Bloch in February 1792, published in the enlightened, monthly magazine *Berlinische Monatschrift*, he describes organizing a fish-collecting session for which he ordered fishermen to

[136] On Chemnitz, see: Trepp, "Matters of Belief and Belief that Matters," 132.
[137] Hanco Jürgens, "Van God's Akker tot Spiegel der Natuur: Veranderende Percepties van de Indiase Natuur in Berichten van Duitse Zendelingen," *De Achttiende Eeuw* 36, no. 2 (2004): 82.
[138] Ibid., 81.
[139] John to Schulze, 20 January 1790, AFSt/M 1 C 31a : 21.
[140] Ibid.
[141] Ibid.
[142] Ibid.

take specimens from the mission garden ponds, the rivers, and the sea.[143] In other instances, the European and Malabarian pupils in his mission school collected fishes.[144] John also sent a 'black Natural Philosopher', a young boy, to the Nicobar Islands to collect fishes, among other things.[145]

While fishes might be relatively easy to catch, their preservation was far from straightforward.[146] The previous chapters have already discussed the difficulties that the preservation of fishes presented. In the tropics, however, the preservation of specimens was an even more trying undertaking. In one of his letters to Bloch, John describes in detail how his freshly collected fish soon became foul, and how the humid climate had accelerated the rotting process.[147] Bloch included an excerpt of this letter in the preface to the first book on foreign fishes to convey some of the hardships that naturalists working in the tropics had to endure – hardships that those naturalists working in Germany (such as Bloch himself, perhaps) could hardly imagine.[148] John complained about how, in Tranquebar, they had nearly nothing and could scarcely get anything required for preserving specimens. He was in want of appropriate knives and other such instruments necessary for stuffing animals, needles to pin up insects, glass jars and the cork to close these with, and cases to pack specimens in, as well as paper of adequate quality to preserve plants with. John had to import these materials from Halle at his own expense. Glass jars needed to be filled with expensive arak or other spirits; dried specimens needed to be varnished with expensive cajeput oil.[149] While John explained that he was eager to learn the *holländische Kunst* of stacking skins of fish amid wooden plates, he lacked the thin plates required for this method.[150] It is quite likely that here he meant the ichthyarium method of Gronovius, which utilized such wooden plates.

[143] Christoph Samuel John, "Einige Nachrichten von Trankenbar auf der Küste Koromandel. Aus einem Briefe von dem Missionarius Hrn John an Hrn Doktor Bloch in Berlin," *Berlinische Monatschrift* 20 (1792): 587.
[144] John to Schulze, 20 January 1790, AFSt/M 1 C 31a : 21.
[145] Ruhland, *Pietistische Konkurrenz*, 296.
[146] MacGregor, "European Enlightenment in India," 375.
[147] Christoph Samuel John, "Einige Nachrichten von der Küste Koromandel. Auszug eines Schreibens des Hrn Missionarius C.S. John an Hrn D. Bloch in Berlin," *Berlinische Monatschrift* 24 (1794): 357.
[148] *Allg. Nat. der Fische*, vol. 10, n.p.
[149] Ruhland, *Pietistische Konkurrenz*, 263.
[150] Christoph Samuel John, "Einige Nachrichten von der Küste Koromandel. Auszug eines Schreibens des Hrn Missionarius C.S. John an Hrn D. Bloch in Berlin," *Berlinische Monatschrift* 24 (1794): 357.

A little over twenty of the fishes collected by John are still extant.[151] They include both wet and dry specimens. An example among the latter category is a species of lizardfish, which Bloch named Tumbil (*Salmo tumbil*) (**Figure 4.2**).[152] It is a stuffed exemplar, furnished with a layer of varnish, that displays an impressive row of teeth; its fins and their rays appear somewhat withered. Another one of John's dried specimens is a species of carp that he and his helpers had lifted from the mission pond. The Tamil called it the *Sölköndei* (**Figure 4.3**) and Bloch named it *Fransenmund*, because of its fringed mouth.[153] It has been preserved in a very peculiar way.

Figure 4.2 Specimen of *Salmo tumbil* in Bloch's collection, ZMB 32625 | © Museum für Naturkunde, Berlin

[151] Paepke, *Bloch's Fish Collection in the Museum Für Naturkunde*.
[152] Specimen of *Salmo tumbil*, MfN, ZMB 32625. Described in *Allg. Nat. der Fische*, vol. 12, 112–113.
[153] Specimen of *Cyprinus fimbriatus*, MfN, ZMB 8794. Described in ibid., 50.

Figure 4.3 Specimen of *Cyprinus fimbriatus* in Bloch's collection, ZMB 8794 | © Museum für Naturkunde, Berlin

The specimen consists of the skin of the carp, which rather than being pressed flat on a page, has been curved a little so as to retain the original shape of the fish. In order to achieve this curve, it may well have been mounted onto a piece of wood especially made for the purpose; if so, this cast is no longer extant. A label – sadly no longer legible – has been pasted into the inner part of the skin. While this was a rather labour-intensive technique, it was also relatively cheap because less material was needed to make the specimen and it was easier to transport than glass. At the same time, the preservation method also rendered the specimen somewhat fragile: fins might tear or break, which would hinder identification and classification. Turning the frail bodies of fish into stable specimens was a challenge even under ideal conditions; doing so in the tropics near impossible.

As we have seen in previous chapters, another way to preserve a specimen was to draw it. John occasionally had drawings made of fish which he sent along with the specimens. Naturalists and the artists whom they employed were well aware that time was of the essence in illustrating fish. They started drawing the specimen as soon as possible after it was caught, and developed several tricks to aid

naturalistic rendition. In the preface to his natural history of Carolina, Catesby, whose pictures Gronovius deemed to be painted very well, explained that: "fish, which do not retain their colours when out of their element, I painted at different times, having a succession of them procur'd while the former lost their colours."[154] Ferdinand Lukas Bauer (*c.*1760–1826), one of the artists accompanying the naturalist John Sibthorp (1758–1796) on his expedition to the Mediterreanan, deployed a sort of painting-by-numbers technique which allowed him to indicate the shades of colour of specimens without having to actually paint them on the spot.[155] So, although Artedi and Linnaeus had considered colour as of secondary importance, other naturalists and their artists continued to put considerable time and effort into the capturing of colour.

Unfortunately, the drawings that John himself sent to Bloch appear to have been lost.[156] We thus do not know what visual strategies he used. He does mention enlisting an Indian *Zeichenmeister* as well as instructing his European pupils to draw the *naturalia* that he had collected.[157] The latter often did not know how to draw 'after nature', and as soon as they had mastered this skill to some degree they would leave again, much to John's dismay.[158] The strains that were put on his research are a recurrent theme in his letters to his superiors. On multiple occasions, John entreated his superiors to supply him with research funding.[159] One of the items on his list of desiderata was a colour-box. In a letter to Gottlieb Friedrich Stoppelberg (d. 1797), who oversaw the accounts of the Franckesche Stiftungen, John explained that he had thus far been unable to secure any good paints from Germany, and that he required an English paint cabinet costing around 30 Reichsthalers, which he thought both his pupils at the mission schools and his draftsmen could put to good use.[160]

[154] Mark Catesby, *Natural History of Carolina, Florida and the Bahama Islands* (London: W. Innys and R. Manby, 1729–1747), xi.
[155] Rees, *Die Verzeichnete Fremde*, 199.
[156] Karrer, "Marcus Elieser Bloch," 146.
[157] Christoph Samuel John, "Fragen des Herrn Professor Forster in Halle an die Missionarien in Trankenbar, und Herrn Johns Antworten darauf," *Neuere Geschichte der evangelischen Missionsanstalten zu Bekehrung der Heiden in Ost-Indien* 4, no. 43 (1793): 655.
[158] John, "Einige Nachrichten von der Küste Koromandel," 352.
[159] Liebau, *Cultural Encounters in India*, 264; in a response, Schultze explained that the natural historical works were too expensive to be sent, see: Schultze to John, 19 August 1790, AFSt/M 1 C 31b : 30.
[160] John to Stoppelberg, 15 September 1791, AFSt/M 1 C 33a 87; to give some context, John's annual salary in the 1780s would have been 400 Reichsthalers; Liebau, *Cultural Encounters in India*, 193.

In John's view, the study of nature was closely intertwined with and a logical component of his assignment at the mission. His superiors did not necessarily agree with him, however, and despite continued requests supplied few of the materials he asked for. John was therefore dependent on exchange with European naturalists like Bloch and Chemnitz to procure such items as he needed for his studies. The accumulation of a small library in Tranquebar facilitated the process of collecting: natural historical books served as a list from which could be inferred those species still to be obtained, and those which were already identified.[161] It was also practical to have copies of Bloch's books because questions that John received from his correspondents would often refer to the series.[162] Through his natural historical efforts, John gained access to several communities of *Naturkenner*, both in Tranquebar itself as well as in Germany. Just as was the case for Bloch, then, John had his own motives for collecting specimens, which for him entailed ensuring access to natural historical communities so that he could continue studying and teaching Scripture through nature.

In considering these movements of objects, Bruno Latour's notion of a 'centre of calculation' might come to mind. This idea of a centre where maps, specimens, diagrams etc. are accumulated and turned into universal knowledge so as to act at a distance[163] has long since been complicated by historians, who have demonstrated that the control of those residing in the centre of calculation was far from absolute.[164] Kapil Raj has stressed that new knowledge was created in contact zones where Europeans and South-Asians interacted rather than in the more unidirectional movement Latour envisages.[165] The collaborative and at times messy process of collecting and 'stabilizing' fishes substantiates these conclusions. In attempting to reconstruct the far-flung connections that made Bloch's collection possible, however, the limits of such a reconstruction also

[161] Anne Mariss, *A World of New Things: Praktiken der Naturgeschichte bei Johann Reinhold Forster* (Frankfurt am Main: Campus, 2015), 350.
[162] Ruhland, *Pietistische Konkurrenz*, 337.
[163] This concept is developed in Latour, *Science in Action*, 215–257.
[164] Lissa Roberts, "Introduction: Centres and Cycles of Accumulation," in *Centres and Cycles of Accumulation in and Around the Netherlands During the Early Modern Period*, ed. Lissa Roberts (Berlin: LIT, 2011), 6.
[165] Kapil Raj, *Relocating Modern Science: Circulation and the Construction of Scientific Knowledge in South Asia and Europe* (Basingstoke: Palgrave Macmillan, 2007).

have to be acknowledged. While John's mission activities are relatively well documented, we often lack proper insight in what was at stake for the individuals who assisted them. Historians, in general, still know very little about the men, women (and, as we saw with the young boy sent to the Nicobar Islands, children) local to the regions where European naturalists settled, and who are mentioned in the letters and publications of their letters as contributing to their projects in some shape or form (though hardly, if ever, by name).[166] These contributors, vital as they may have been to the natural histories that were being produced, would not have new species or genera named after them. It is not always clear what they would stood to gain by this, or whether their involvement in these activities were a matter of choice, coercion, or something in between.[167]

John summarized the activities that he and his assistants carried out as collecting, preserving, drawing, describing and packing.[168] The vignette on the title page of the tenth part of Bloch's series (**Figure 4.4**), set in a hilly landscape with a lake, is a stylized depiction of the latter.[169] It depicts various putti engaged in the process of either packing or unpacking a wooden crate, the lid of which reads 'Tranquebar' – referring to the origin of many of the species described in the volume – and which contained fish submerged in glass jars. One of the putti examines one of the specimens while two others study a drawing of a fish. In this engraving, the cupids stand in for those who actually did the collecting – those people who were John's local and largely unnamed collaborators. Steven Shapin has argued this for seventeenth-century prints of the air pump of Otto von Guericke (1602–1686), where the instrument is operated by putti representing the invisible technicians.[170] When John and his assistants had a collection of fishes ready, the crates would be loaded onto the first available ship sailing for Denmark and delivered to Chemnitz in Copenhagen, who would forward the packed fish

[166] Winterbottom, *Hybrid Knowledge in the Early East India Company World*, 136.
[167] On the matter of coerced diving, see James Delbourgo, "Divers Things," esp. 159–176.
[168] Ibid.
[169] Every volume of images carries its own vignette. Some of these are modelled after prints of Theodoor de Bry, published in his reprint of Thomas Hariot, *A Briefe and True Report of the New Found Land of Virginia* (Frankfurt: Johann Wechel, 1590). I thank Kim Sloan for pointing out this connection.
[170] Shapin, "The Invisible Technician," 556; elsewhere, he and Schaffer have argued that the depiction of such cherubs is a standard convention in baroque illustrations, to imply that the depicted process of knowledge production was divine, see: Shapin and Schaffer, *Leviathan and the Air-Pump*, 334–335.

to Bloch in Berlin to be incorporated into his collection. Having passed through the hands of Indian fishermen and German missionaries, the specimens assumed a new role in Berlin.

To Capture Fishes on Paper

After the fringed carp that John's helpers had taken from the mission pond was converted into a specimen for Bloch's collection, it was described and depicted in the last volume of the series.[171] It can be assumed that most of his specimens were subjected to a similar process. We will now take a closer look at the process of illustrating specimens and turn to the depiction strategies used by Bloch and his artists. Despite the centrality of illustrations to Bloch's project, these strategies have never been examined in detail before. An analysis of them is thus long overdue. The illustration process is richly documented compared to that other of many natural historical publications.

Figure 4.4 Vignette, Johann Carl Wilhelm Rosenberg (artist) and Daniel Berger (engraver) | Marcus Élieser Bloch *Allgemeine Naturgeschichte der Fische*, vol. 10 (Berlin: J. Morino, 1793) | © Universiteitsbibliotheek Leiden

[171] *Allg. Nat. der Fische*, vol. 12, 50.

This is, first of all, because the original drawings for a considerable proportion of the specimens in Bloch's collection are still extant, as are, of course the engravings subsequently published in the series – object, drawing and engraving can thus be compared. The second reason is that Bloch was quite explicit in formulating his ideas about what made a good illustration.

Bloch outlined his illustration policy in the preface to the first volume of the series. The three pages that he devotes to it show he had given a lot of thought to how one could produce the best visual representation of a species. A good drawing, in fact, began before lead or brush had touched the paper, by selecting the most suitable specimens. These were, according to Bloch, fresh as well as fully grown exemplars, because these best showed the species' distinguishing marks.[172] Bloch argued that such a meticulous approach to illustration was necessary because fishes tended to look alike, making it hard to distinguish one from the other.[173] He thus required his artists to be attentive to even the slightest deviations in a specimen. All details needed to be recorded on paper as they were relevant to get a proper understanding of the depicted species.

Bloch highlighted six further areas to which contributing artists were to pay particular attention First of all, he stated, they needed to convey the proportions of the specimen properly. Secondly, they had to represent the position and the shape of the fins correctly, particularly that of the tailfin; these were, after all, important marks for classification. Thirdly, the precise number of bones in the gill flap as well as the number of rays in the fin were to be clearly represented. Bloch explained the reason that both were to be delineated in the same terms as Artedi, noting that the former was necessary for deciding genera, and the latter for deciding species.[174] The fourth rule was to give a truthful representation direction of the lateral line (the thin line on the side of the fish stretching from its head to its tail).[175] The fifth rule was that the artist had to consider several different elements to ensure they showed the fish's scales accurately: their size, placement,

[172] *Allg. Nat. der Fische*, vol. 1, sig. *3r.
[173] Ibid., sig. *3v.
[174] Ibid.
[175] Ibid., sig. *4r.

and shape as well as any pattern of stripes or dots they might display.[176] The sixth and last item on the list of instructions was that artists should always include the 'natural colour' of the fish.[177]

These were the pictorial ideals that needed to be put into practice. The process began with the creation of a drawing of a specimen in preparation for the engraving. Fortuitously, some two hundred of these of *Originalzeichnungen* still exist in the Historische Arbeitstelle of the Museum für Naturkunde.[178] These drawings are assembled together in two volumes, with many of them being carefully pasted onto the bound pages.[179] Each drawing has been executed in colour – sometimes in watercolour, other times in what appears to be a thicker, gouache-like paint. Let us take a look at one particular drawing: the one that Johan Friedrich Hennig made for the lizardfish that John had sent to Bloch (**Figure 4.5**).

The drawn fish corresponds to the preserved specimen in its shape (although the depicted specimen is somewhat more plump) and its open mouth displaying rows of teeth. While the position of the fins in the drawing correspond to their placement on the specimen, their aspect does not: while the fins on the specimen have dried out, the drawings show them fanned out, as they would have seemed when the fish had still been under water. The most striking difference between specimen and drawing, however, is to be found in the palette of colours used by the colourist. As no traces of colour remained in the specimen, and John's rendition of its colours seemed similarly bereft, Hennig was put in a delicate position when deciding the appropriate colours. He opted for a brownish, grey colour with maroon overtones.

The drawings were subject to revision. Given Bloch's very clear opinions on the subject, it seems unlikely that a drawing would be sent to the engraver without his stamp of approval. It was common for naturalists to closely supervise

[176] Ibid.
[177] Ibid.
[178] Bound volumes with drawings of fish for plates CCI to CCCCDDDI (with some gaps), ZMB, VIII/423 and VIII/424. It seems that there were originally two more of these volumes, according to Karrer, "Marcus Elieser Bloch," 145.
[179] A practice also used in the drawings of *aquatilia* in the Gessner-Platter albums mentioned in Chapter 1 and 2.

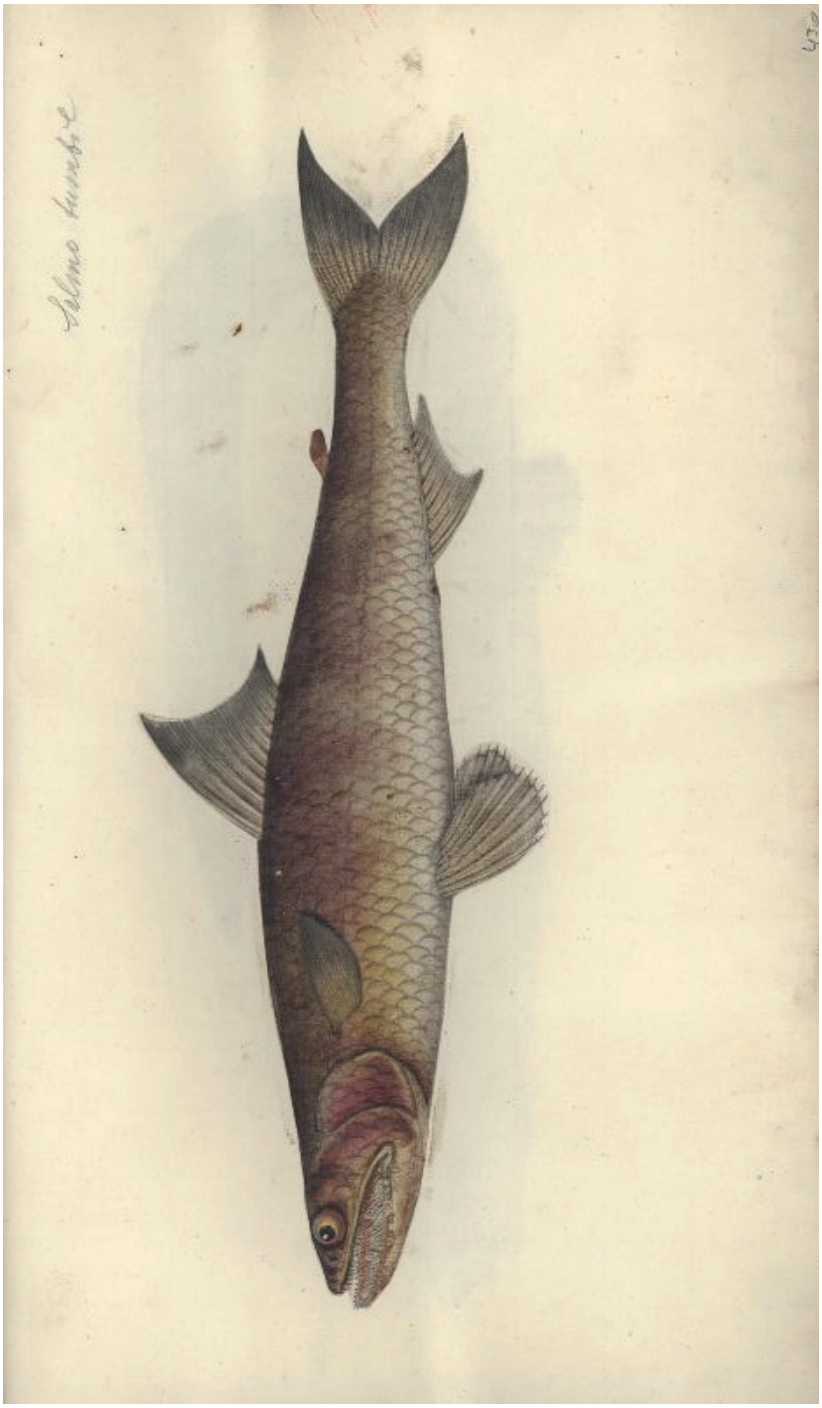

Figure 4.5 Original drawing of *Salmo tumbil*, Johann Friedrich Hennig | ZMB VIII/424 96 | © Museum für Naturkunde, Berlin

their draughtsmen, making sure that they drew the relevant, correct features.[180] A symbiotic collaboration between artist and naturalist with regard to drawing would result in, as Lorraine Daston and Peter Galison have put it, 'four-eyed sight'; the head of the naturalist fusing with the hand of the artist.[181] That there must have been at least some discussion between Bloch and his artists is evidenced by the drawings themselves. A few of them contain corrections in graphite or sometimes ink.[182] In some instances, Bloch or one of his draughtsmen might alter a fish's shape. In one image, a graphical edit was suggested, indicating that the fish's eye might be placed more accurately (**Figure 4.6**).[183] Clear evidence of the assertion of Bloch's third rule, which focussed on the correct representation of the number of rays in the fins, can be found in the annotations included in some drawings besides each of the fins of the fish that indicate how many rays it has, and how many of these rays are spikey.[184]

Bloch wanted his illustrations to be precise enough for naturalists to be able to identify and classify any fish based on its image alone where possible. His intention was thus very much the opposite of that Artedi, whose descriptions rendered drawings superfluous. Bloch's wish to cater to a broader audience than a literate or Latinate one may have been one of the reasons why he found images so expedient.

After drawings had been approved, the next step was to engrave them. Although the engravings do, as one can reasonably expect, differ somewhat in colouration between physical copies of Bloch's works, overall they are chiefly consistent especially with regard to the considerable intensity of the paint.[185] Overall, the engravings follow the model drawings closely, in everything except colour.[186] The colours of the original drawings seem more subdued that those of their engraved counterparts. This might be a result of the specific pigments or

[180] See, for example: Fransen, "Antoni van Leeuwenhoek, His Images and Draughtsmen," 493.
[181] Lorraine Daston and Peter Galison, *Objectivity* (New York: Zone Books, 2007), 88.
[182] Karrer, "Marcus Elieser Bloch," 146.
[183] Drawing of *Chaetodon nigricans*, ZMB, VIII / 423, 3.
[184] Drawing of *Bodianus maculatus*, ZMB B VIII /424, 21.
[185] I base this statement on having perused physical copies at the Universiteitsbibliotheek Leiden, Artisbibliotheek and Teylers Museum alongside digitized copies at Biodiversity Heritage Library (which can be found at https://www.biodiversitylibrary.org, last accessed 9 April 2021). Although the engravings included in this chapter stem from French edition in possession of the UBL, the captions offer the German titles to avoid confusion around publication dates.
[186] Karrer, "Marcus Elieser Bloch," 146.

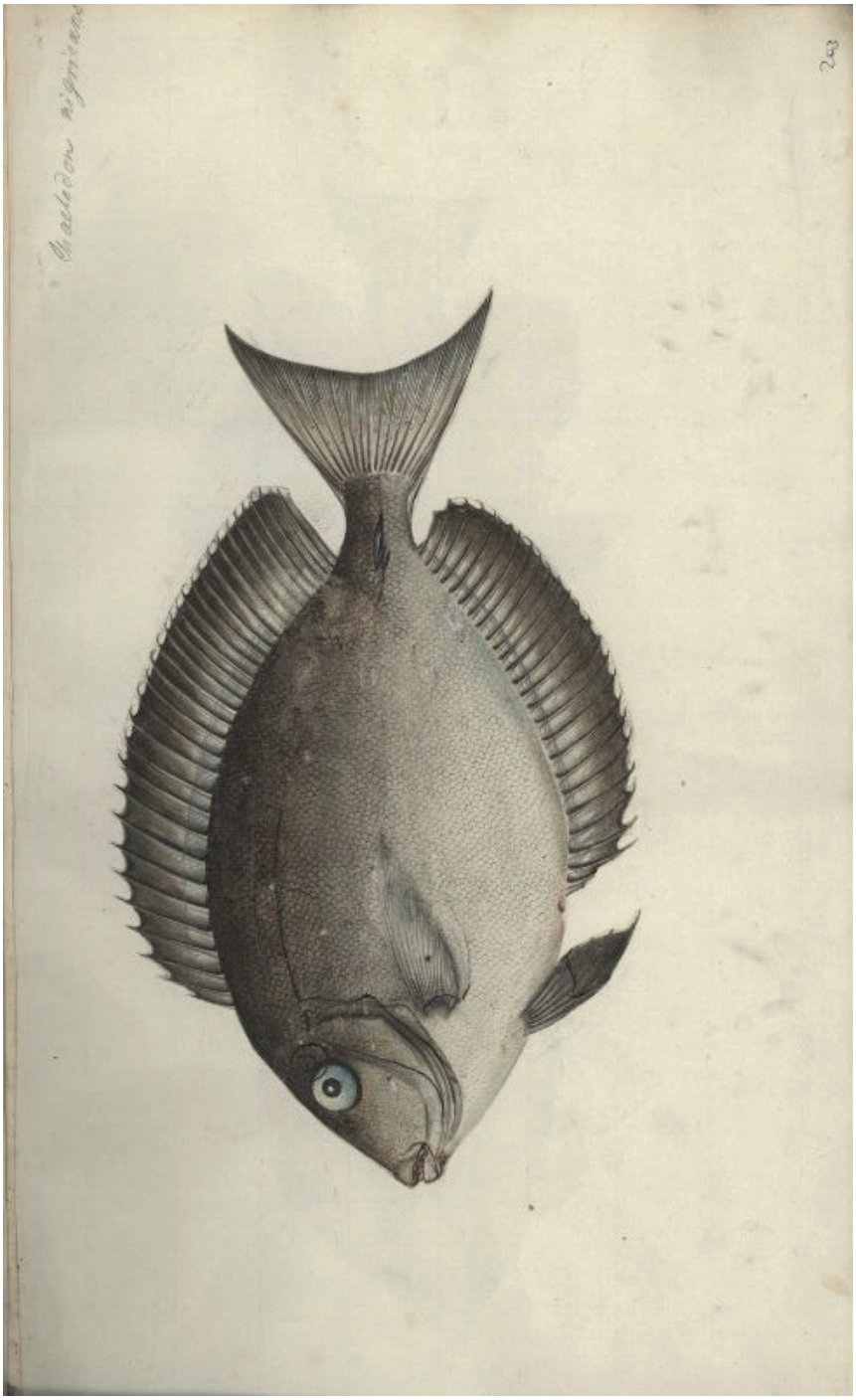

Figure 4.6 Original drawing of *Chaetodon nigrus*, Friedrich August Krüger | ZMB VIII/424 3 | © Museum für Naturkunde, Berlin

paints used, but may also have to do with whether or not a layer varnish was applied, as well as the mode of storage used; lengthy or recurrent exposition to sunlight would cause the colours to fade. Although it is of course impossible to ascertain the extent to which the colours of these engravings and drawings have altered over the past centuries, however subtly, these differences between drawings and engravings seem significant considering the very specific demands placed by Bloch on replicating the natural colour of the specimen.

Although the sixth rule, which specified that artists should portray the natural colour of the fish was quite straightforward in principle, obeying it in practice was not quite so simple. First of all, it could be a tricky exercise to exactly replicate the natural colour of a fish. In his description of the golden tench, a gift from the palace pond of Elisabeth Christine, Queen of Prussia (1715–1797), Bloch lamented the fact that the artists, despite their substantial skill and best efforts, had not managed to truly capture the beauty of the specimens' natural colour.[187] Of course, such a response would have been entirely appropriate considering the effectively royal status of the fish as gift, but it also exposes a certain tension underlying the work of colouring fishes. Bloch could of course only have assessed whether colours had been mixed correctly when he had a living specimen at hand for comparison. That was not the case for any fish that was sent to him by a correspondent. In the case of the aforementioned fringed carp, its species description reveals that the specimen had been accompanied by a drawing from the life on which Bloch's draughtsmen could base their engraving of the fish. Unfortunately, not one of the illustrations sent over by John has survived.[188] Even in those cases where John's drawings are mentioned in a species description, no indication is made of whether or not they included colour; recall John's difficulties in securing proper paint. In the cases such as the lizardfish, where no accompanying drawing is mentioned, Bloch's draughtsmen must have had to make do with the preserved objects themselves and the verbal descriptions that possibly accompanied them. Exactly how draughtsmen and colourists went

[187] Original German: "Ich muss bekennen, dass, ohnerachtet die Künstler bei dem Ausmalen desselben allen Fleiss angewendet, sie doch noch weit zurück geblieben sind, die Schönheit der natürlichen Farben zu erreichen." *Allg. Nat. der Fische*, vol. 1, 90.
[188] Karrer, "Marcus Elieser Bloch," 146.

about the business of replicating the exact colourings of any individual fish when all they had to go one was an essentially monochrome preserved specimen (and perhaps some verbal description), is a question that cannot be fully answered.

Colour was applied both during the printing process and after. As discussed in Chapter 1, early modern printed works occasionally included colour: this could be due to the use of coloured printing ink, but in most cases, colour was applied by hand.[189] In Bloch's series, however, we find a unique combination of both types of colour administration. Mechanical colour printing had by this time become a more established technique.[190] Although most of the plates are printed in black or grey ink, some 10% of the plates were printed in brown, orange, red, and green.[191] Colour printing was still relatively crude, however, and not suitable for displaying sophisticated gradations and variegations. This is why all Bloch's prints were also coloured by hand. The function and effect of colour printing can be seen on the engraving of the red mackerel (**Figure 4.7**). For this fish, a striking red has been used – as discussed earlier, Bloch had stipulated that its red colour set this species apart from other mackerel.[192] The ink used for the printing of the plate is red.[193] This gave the engraved illustration the correct undertone, on which the colourists could layer their own colouration.[194] The effect is an intense red colour, which is especially striking when compared to the subtle tints of the original drawing made for this species (**Figure 4.8**).[195] A similar contrast can be see in the case of the lizardfish, where the original drawing (**Figure 4.5**) offers distinctly subdued colouration when compared with the published engraving (**Figure 4.9**).

At the same time, one has to be careful in assuming what was and what was not known about the actual colourings of specimens. Although Claudia Kreklau

[189] See also: Kusukawa, *Picturing the Book of Nature*, 69–81.
[190] For the historical development of colour printing, see Elizabeth Savage and Ad Stijnman, "'Material Colour': The Heritage of Colour Knowledge in Seventeenth- and Eighteenth-Century Printshops," in *Colour Histories: Science, Art, and Technology in the 17th and 18th Centuries*, eds. Magdalena Bushart and Friedrich Steinle (Berlin: De Gruyter, 2015), 95–113 and Margócsy, *Commercial Visions*, chapter 4 "Knowledge as Commodity: The Invention of Color Printing," 167–199.
[191] 43 of the total of 432 plates use coloured ink rather than black. I have counted the illustrations of the copy at UBL, 137 A 1/ 6, but have not been able to verify these exact numbers for other copies.
[192] *Allg. Nat. der Fische*, vol. 10, 75.
[193] Engraving of *Scomber ruber*, *Allg. Nat. der Fische*, plate CCCXLII.
[194] I am indebted to Sabine Hackethal for this insight.
[195] Drawing of *Scomber ruber*, ZMB B VIII / 424, 342.

has argued, for example, that the dried exemplars of foreign fishes, with their brown hues, "fit comfortably in the naturalists' worldview of a dark and dreary underwater world",[196] it appears that Bloch, at least, was not prejudiced by such a dismal outlook. Bloch repeatedly marvelled at the splendid colours displayed by the fishes of faraway regions. In the preface to the ninth volume, for example, he exclaimed that its plates dedicated to foreign fishes distinguished themselves from those made after German fishes by their beautiful colours.[197] He confidently stated this without ever having seen a living fish from, say, the East Indies in the flesh. Bloch's statement is reminiscent of a broader exoticist discourse, which lauded the spectacular colours of plants and animals in the warmer climes.[198]

As Kreklau seems to overlook, however, that while stay-at-home naturalists like Bloch could not glimpse the original, dazzling colours from preserved specimens, they may well have had access to coloured drawings of either these or similar species, as well as colourful descriptions of them in letters or other textual works. These second or even third-hand colourisations of foreign fishes would become part of the visual repertoire of both naturalists and their artists, and would literally colour any subsequent encounters with specimens from a similar 'exotic' origin.

Bloch purposefully sought out other illustrations of fishes. At a public auction in Berlin, for example, he obtained a collection of drawings of Caribbean (although he calls them American) fishes by the French missionary Charles Plumier (1646–1704).[199] He also visited the city's Royal Library to peruse manuscript volumes containing drawings of fish from the West-Indies, made under the auspices of Johan Maurits van Nassau-Siegen – an expedition discussed in Chapter 1.[200] While Bloch prided himself on offering original illustrations in his works, created under his direction in his own studio after fresh or preserved samples of fish, he did have his artists copy drawings from the abovementioned manuscripts. As he explained in the preface of one of his volumes, "both [authors]

[196] Kreklau, "Travel, Technology, and Theory," 596.
[197] *Allg. Nat. der Fische*, vol. 9 (Berlin: J. Morino, 1792), sig *2r.
[198] Schmidt, *Inventing Exoticism*, 11–12.
[199] Theodore W. Pietsch, *Charles Plumier (1646–1704) and His Drawings of French and Caribbean Fishes* (Paris: Publications Scientifiques du Muséum, 2017), 83.
[200] This material is discussed in more detail in Whitehead and Boeseman, *A Portrait of Dutch 17th Century Brazil*, 40–43.

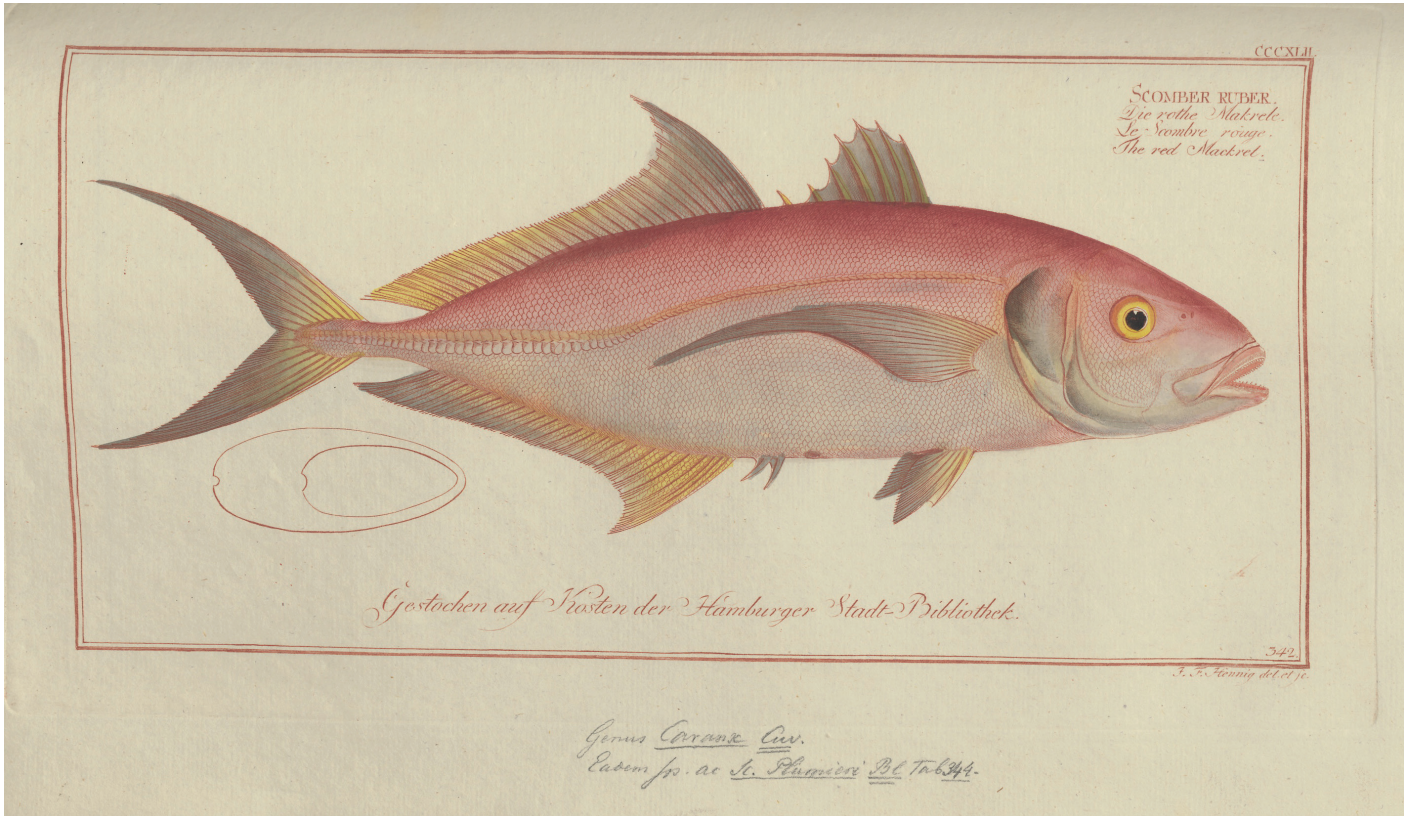

Figure 4.7 Engraving of *Scomber ruber,* Johann Friedrich Hennig | Marcus Élieser Bloch, *Allgemeine Naturgeschichte der Fische*, vol. 10 (Berlin: J. Morino, 1793), plate CCCXLII | © Universiteitsbibliotheek Leiden

Figure 4.8 Original drawing of *Scomber ruber*, Johann Friedrich Hennig | ZMB VIII/424 030 | © Museum für Naturkunde, Berlin

Figure 4.9 Engraving of *Salmo tumbil*, Johann Friedrich Hennig | Marcus Élieser Bloch, *Allgemeine Naturgeschichte der Fische*, vol. 12 (Berlin: J. Morino, 1795), plate CCCCXXX | © Universiteitsbibliotheek Leiden

had faithfully depicted the fish on the spot and painted them in lively colours."[201] That the drawings had been made *ad vivum* made them reliable enough to merit inclusion in Bloch's own work. Chapter 1 has shown that it was, in fact, quite common to use one illustration as a reference drawing for the other. Nickelsen has argued for such 'copying links' that they are not merely derivative drawings, but the outcome of a conscious process of including and excluding certain elements of the initial illustrations.[202]

One of the most striking aspects of Bloch's illustrations is that a considerable proportion of them have been heightened in silver and gold. This means that silver and gold paint is applied to certain parts of the fish, for example its scales and certain parts of its head; just as Baldner's artists had done with white in Chapter 2. Substituting white with gold and silver was not a completely new practice, but was still altogether rare.[203] The paints were, in all likelihood, made by mixing powdered silver or gold leaf with a binding medium such as gum arabic.[204] This was an expensive procedure, and one that an eighteenth-century painting manual therefore advised should only be used for special occasions.[205] Bloch seemed to believe that these costs were warranted. One reason for this might have been the luxuriousness that it added to his series. Another reason may have been the particular effect that it produced. This has to do with the luminescent qualities of silver and gold: the metals in the paint capture and reflect light. In applying the paint judiciously to the parts of a fish that would naturally catch the light, such as the edges of its scales and its gill cover, the artist endowed the illustration with some of the vivacity, as the silver or gold pigments imitated the glistening sunlight on the wet scales of the fish as it is plucked from the water. Others sought to replicate this technique. When requesting the purchase of a

[201] Original German: " […] beide haben die Fische an Ort und Stelle getreu abgebildet, und nach lebendigen Farben ausgemalt." *Allg. Nat. der Fische*, vol. 6, sig. a2r.
[202] Nickelsen, *Draughtsmen, Botanists and Nature*, 203–214.
[203] An early example of applying gold to natural historical drawings of fish is John White (1539–1593). See: Kim Sloan, *A New World: England's First View of America* (Chapel Hill: University of North Carolina Press, 2007).
[204] This technique was also known as 'shell gold', because the ingredients were often mixed in shells. See also: Michèle Seehafer, "Shimmering Virtue: Joris Hoefnagel and the Uses of Shell Gold in the Early Modern Period," in *Materialized Identities: Objects, Affects, and Effects in Early Modern Culture, 1450–1750*, eds. Susanna Burghartz, Lucas Burkart, Christine Göttler and Ulinka Rublack [forthcoming].
[205] Willem Goeree, *Verligterie-kunde, of regt gebruik der water-verwen* (Amsterdam: Andries van Damme, 1705), 22.

colour-box for his draughtsmen, John added that he also lacked sufficient silver and gold colour for them to draw the fishes.[206]

Another remarkable aspect of Bloch's fish illustrations is the degree to which they consider the fact that the specimens which they reproduce exist in three dimensions. The majority of plates contain a representation of the fish in cross section. While Hooke had already included this visual technique in depicting ammonites in the seventeenth century,[207] Bloch seems to be the first to have included such sections for fish.[208] An example can be seen on the engraving of the red mackerel (**Figure 4.7**). It is a schematic depiction of what you would see if you were to cut the fish in half at its thickest point. In his illustration policy, Bloch explains, in one sentence, the purpose of these contours: to offer an idea of whether a species was thick or thin.[209] That cannot have been the sole intent, however. For even though Bloch does not mention it, besides outlining the circumference of the fish's body, the sections also indicate the shape and location of its spine and abdominal cavity.[210] The dissection of a fish, which as we saw in Chapter 1 could be a rather complex process, revealed those parts not usually visible. The technique of the cross section offered a neat, abstracted representation, and was more widely used to portray the properties of both human and animal tissue.[211] To create such a cross section for fish required the cutting of at least one specimen in half – the specimen would then, of course, no longer be intact. This might explain why almost all of the plates of German fish, but only around half of the foreign ones, of which Bloch could not easily attain a wide sample of each

[206] Original German: "An einen guten Quantität Silberfarbe und etwas Goldfarben fische zu zeichnen fehlt es mir auch sehr eigentlich an feine Pinseln." John to Stoppelberg, 15 September 1791, AFSt/M 1 C 33a : 87.
[207] Sachiko Kusukawa, "Drawings of Fossils by Robert Hooke and Richard Waller," *Notes and Records of the Royal Society of London* 67, no. 2 (2013): 124.
[208] These cross sections also appear in later works of the 1780s, for example Pierre Joseph Bonnaterre's *Tableau encyclopédique et méthodique des trois règnes de la nature: Ichthyologie* (Paris: Mme Veuve Agasse, 1788). Bonnaterre also prepared the fish illustrations in Diderot's *Encyclopédie* depicting similar sections.
[209] Original German: "Damit man aber auch wissen möge, ob der Fisch dick oder dünn ist; so habe ich einen Umriss van stärksten Theile deselben beygefügt." *Allg. Nat. der Fische*, vol. 1, sig. *4r.
[210] The cross section also offered an indication on both the muscle mass and the amount of meat of the fish – possibly useful knowledge for consumption. I thank Martien van Oijen for this insight.
[211] For examples, see: Domenico Bertolini Meli, *Visualizing Disease: The Art and History of Pathological Illustrations* (Chicago: Chicago University Press, 2017), 79 and Matthias Bruhn, "Beyond the Icons of Knowledge: Artistic Styles and the Art History of Scientific Imagery," in *The Technical Image: A History of Styles in Scientific Imagery*, eds. Horst Bredekamp, Vera Dünkel and Birgit Schneider (Chicago: Chicago University Press, 2015), 41.

species, include this cross section. It also required a complete specimen: making such a cross section was not possible from dried exemplars, from which all flesh and intestines had already been removed.

Besides showing the thickness of species on the engraved plates, Bloch also indicated their magnitude. Many of the plates indicate whether the engraved image reflected the species' true size [*natürliche Grösse*], or whether it offered a reduced [*verkleinerte*] view.[212] This attention to the actual shape and size of a specimen was of course far from new in natural historical depictions. The representation of the 'true size' of observed entities had been a pressing problem especially for early microscopists of the seventeenth century, who often included illustrations of the naked eye view alongside the magnified drawing one to indicate the scale.[213] Bloch's specimens were not microscopic entities, however, and his size indications are less exact in nature: his aim was only to indicate that a specimen was either larger or smaller than the illustration made from it. Taken together, the decisions to include cross sections of and size indications for the specimen helped the onlooker to envision the general size and shape of the actual, three-dimensional object on which the engraving was based from its two-dimensional representation on the page.

In sum, the coloured engravings were the result of carefully measured decisions on part of Bloch and his artists. The artists set to work capturing the properties of the specimens on paper in detail – filling in the gaps where necessary. As we saw with the lizardfish from Tranquebar, a specimen and a drawing of an individual species might differ markedly, especially with regard to shape and colour, while the metamorphosis from drawing to engraving was most likely to affect a fish's colouration. Certain features could be altered in this in this three-stage act of preservation, while others might be lost irrevocably. Even though some naturalists considered illustrations to be suitable substitutes for objects, they were mediated by necessity. It is not now possible to recover the full extent of this mediation: historians cannot hope to determine just how much

[212] *Allg. Nat. der Fische*, vol. 1, sig. *4r.
[213] Fransen, "Antoni van Leeuwenhoek, His Images and Draughtsmen," 506–509.

the physical state of these materials has changed over the past two centuries, to what degree the specimens, drawings and engravings look the same as they did in the eighteenth century.

Bloch was aware that even the most truthful (*allergetreuesten*) illustrations could not always express all those marks that were of pertinence for classification, as for some species of fish these were located inside the body.[214] While the illustrations thus might help in classification, that was not their only function.

To understand why Bloch considered the time and costs incurred in these efforts worthwhile, the notion of a 'paper museum' can be useful. Historians have used this term to describe various paper formalizations of collections from the seventeenth up to the nineteenth century.[215] Debora Meijers has succinctly defined it as "a group of drawings whose coherency stems from a deliberate effort of conservation."[216] Bloch's series did not only preserve the fishes in his collection in their splendid, living state (albeit in mediated form), it also preserved the collection as a whole. Just like specimens themselves, after all, natural historical collections conceived as a whole were also in danger of disintegration. The fate of Seba's collection is a case in point. While his first collection had been purchased by Peter the Great, the apothecary's death led to his second collection being auctioned off piecemeal, its specimens dispersed into the collections of a wide variety of naturalists.[217] Many other collections suffered a similar (or worse) fate. The quarto volumes bearing Seba's name, however, with its coloured illustrations of the objects accompanied by brief descriptions, outlived his physical collection and, in a very real sense, preserved it much as he had preserved its individual specimens in the first place. Creating a visual record of the objects in one's

[214] *Allg. Nat. der Fische*, vol. 10, sig. 2r.
[215] Francis Haskell and Henrietta McBurney, "The Paper Museum of Cassiano dal Pozzo," *Visual Resources* 14, no. 1 (1998): 1–17; Debora J. Meijers, "The Paper Museum as a Genre: The Corpus of Drawings in St Petersburg within a European Perspective," in *The Paper Museum of the Academy of Sciences in St Petersburg c. 1725–1760*, eds. Renée Kistemaker, Natalya Kopaneva, Debora J. Meijers and Georgy Vilinbakhof (Amsterdam: Royal Netherlands Academy of Arts and Sciences, 2005), 19–54; Martin Rudwick, "Georges Cuvier's Paper Museum of Fossil Bones," *Archives of Natural History* 27, no. 1 (2010): 51–68.
[216] She distinguishes between "real" paper museums, which are representations of objects existing in an actual collection, and "wish-list" paper museums in which drawings act as substitutes for objects not in the possession of the collector. Meijers, "The Paper Museum as a Genre," 25.
[217] The fate of the objects of Seba's second collection has been traced in Boeseman, "The Vicissitudes and Dispersal of Albertus Seba's Zoological Specimens," *Zoologische Mededelingen* 44, no. 13 (1970): 177–210.

collection brought particular advantages. A paper museum that displayed the plants in a botanical garden, for example, as Meijers explains, "showed them in their unchanging beauty, alive and intact, and blooming all at the same time."[218]

As the discussion of the difficulties of making drawings from specimens has highlighted, it is important not to assume the (perceived) vicarious quality of drawings. While Martin Rudwick has contended that drawings of fossils could act as a stand-in for actual specimens, he attaches the caveat that "an effective proxy experience was necessarily mediated by the social and artistic conventions that underlay any pictorial representations in a given historical and cultural context."[219] This process of mediation, as has been discussed earlier in this chapter, obscured some parts of the depicted object, highlighted others, and might even add something new (whether wittingly or unwittingly). It is not difficult to imagine that the creation of a paper museum held an appeal to Bloch, as it both preserved the collection itself and made its general circulation possible. The fish specimens on the shelves in Berlin were thus only one manifestation of his collection – the book series was another.

Bloch's project was in some ways iterative in nature. As soon as a volume had found its way into bookshops and from there into the libraries of barons, countesses, physicians, merchants and naturalists, it invited its readers to send ever more specimens Bloch's way. At least some of the volumes travelled to John in Malabar. This becomes clear from his correspondence to his superior, whom he asked to send him the newest volume of the series because he only had an older, incomplete copy, as well as from a published letter in which he thanks Bloch for sending him the latest volume.[220] The missionary, it seems, used the books as reverse catalogues, reference works from which he could infer which species remained undescribed: "I was most eager to see how far the East Indian fish were known, and to support his work through bringing to light

[218] Meijers, "The Paper Museum as a Genre," 33.
[219] Martin Rudwick, *Bursting the Limits of Time: The Reconstruction of Geohistory in the Age of Revolution* (Chicago: Chicago University Press, 2005), 76.
[220] John to Stoppelberg, 15 September 1791, AFSt/M 1 C 33a 87 and John, "Einige Nachrichten von der Küste Koromandel," 351; unfortunately, he does not mention which particular copy he has received.

more [of them]."[221] In this, the series' illustrations played an essential role – the coloured engravings allowed, as John explained, for "every dumb fisherman and journeyman" to collect the desired specimens.[222] Due to their size and worth, the volumes probably would not have been taken into the field, but John used the illustrations to communicate to his collectors who were not able to read the species descriptions nevertheless. It is illustrative for how, up until the moment of the publication of the very last volume of the series, the series and the collection reinforced one another. Considering what purposes these illustrations served, even beyond Bloch's own intentions for them, allows for a better appreciation of the ways in which the publication of his series of fish books was a dynamic process rather than a static, linear one.

Conclusions

In writing to Bloch in 1794, John described the admiration that Bloch's series elicited in all those who saw it. His letter, published in the *Berlinische Monatschrift* for all of the periodical's enlightened audience to read, stated that the fishermen who had assisted him in collecting "were astounded by how lively their fishes swam about on the page."[223] Whether this exchange actually took place, this was an exaggerated account of it, or John just wanted to present Bloch a flattering fiction, the terms that he used are significant. After all, Bloch had selected each and every illustration in the series because it had, at some point at least, been done after nature. The engravings had been carefully coloured in by hand in order to capture how the species must have looked before death and subsequent decay, effectively reanimating the fishes on the paper – even if, as we saw, to do so was not a straightforward matter in practice.

With the *Allgemeine Naturgeschichte der Fische*, Bloch had expanded the list

[221] Original German: "Ich war just am begierigsten darauf um zu sehen wie weit die Ostindische Fische bekannt wären und sein Werk durch die Bekantmachung mehrere zu unterstutzen." John to Schulze, 12 October 1789, AFSt/M 1 C 30a : 2.
[222] Original German: "Hat man Werke mit gemahlten Zeichnungen, so kann jede dumme Fischer und Tagelöhner samlen halfen wie ich bey Chemnitz Conchylien Werk und Blochs Naturgeschichte der Fische ofte erfahre." John to Schulze, 20 January 1789, AFSt/M 1 C 30c : 24.
[223] Original German: " […] und meine schwarzen Fischer können nicht genug erstaunen, wie ihre Fische itzt [jetzt] auf dem Papier so lebendig herumschwimmen." John, "Einige Nachrichten von der Küste Koromandel," 351.

of known fish by no fewer than 250 species, and he created several new genera.[224] He may not have been an outstanding systematist, but he was a serious annotator to the system that Artedi first developed and Linnaeus later adjusted. As we saw, Bloch did not imitate their approach to the study of fish uncritically. He wanted his own work to offer more elaborate descriptions as well as precise illustrations that contributed to a facile identification of species. His intention was, and this is an important difference, to cater to a broader, vernacular audience. On the whole, both Bloch and his series withstand forthright categorization. The series was a genuine contribution to the natural historical study of fish, advanced oeconomic improvement, and it also did not look out of place on a display in one's library. The book and the illustrations in it thus fulfilled several functions simultaneously, depending on who was regarding them.

A striking variety of people engaged with the series in one way or the other. This variety can partially be reconstructed either from the names mentioned in the book, that is, its subscription lists and engraved plates, or in correspondence. Joseph II and other monarchs expressed their interest in and support of the project, as did government officials, naturalists, and those who worked with nature in a more practical way, like a fishing guild. It is conceivable that a part of the audience was primarily attracted to the luxuriously executed plates. For naturalists, the carefully executed illustrations were a useful work of reference because of the care that had been taken to depict those characteristics that were salient for classification, for example correctly portraying the number of rays in the fins. As we saw, John used the illustrations as a way to communicate to his assistant collectors which species still needed to be gathered, and so the plates had mnemonic value. Collectors, missionaries and others helped to amass material for the series, and artists represented it; as did other, unnamed, characters such as fishermen, draughtsmen and colourists.

Bloch was well positioned in this vast network, and it was by virtue of it that he could establish himself as an authority on fish. For him, the series may have acted as a paper museum to his collection, the illustrated fish far surpassing

[224] According to an estimation cited in Wells, "M.E. Bloch's Allgemeine Naturgeschichte der Fische: A Study," 9.

the beauty of that of the specimens stowed away on the shelves of his cabinet. He asserted himself as an expert on the natural history of fishes not only by virtue of his grasp of the natural historical literature and his proficiency in Linnaean classification, but also of his possession of all the fishes described in the book. Furthermore, because he only used drawings that had been done after nature, he could claim first-hand knowledge of the depicted species, even if only via images. The fact that these illustrations were so lively in terms of their colours helped to emphasize his near-vicinity to first-hand experience. As this chapter has submitted, by portraying fish Bloch also represented himself. His collection and his series were closely connected to his reputation as a *Naturkenner* in Berlin, the German states and in the wider enlightened circles of Europe. One of Bloch's eulogists called his fish oeuvre "the crowning glory that placed him among the ranks of our illustrious naturalists."[225] Bloch became a recognized authority on all the world's known fish without having to leave Berlin.

By the time he passed away in 1799, Bloch had become a celebrated figure in a country that did not allocate him full legal equality. Friedländer was involved in handling his legacy, which entailed finding a fitting home for the collection.[226] He, together with a dozen or so members at the Gesellschaft Naturforschender Freunde appealed to King Friedrich Wilhelm III (1770–1840) to purchase Bloch's cabinet.[227] Friedrich Wilhelm was in the process of turning his *Kunstkammer* into Berlin's first public museum.[228] In their letter to the king's representatives, the Gesellschaft members argued that Bloch's cabinet, and specifically his collection of fishes and amphibians, was the only one of its kind and that it formed an

[225] Original French: "Mais son immortel ouvrage sur l'ichthyologie acheva de mettre le comble à sa gloire, en le plaçant au rang de nos illustres naturalistes." Antoine-Jean Coquebert de Montbret, "Éloge de Monsieur Bloch," *Rapport général des travaux de la Société philomatique de Paris* 4 (1800): 145.
[226] The transfer is documented in "Acta betr. die Übergabe des Blochschen Kabinetts an Prof. Walter. 1804", BBAW, PAW 1700-1811-I-XV-30; f49r-54v contains a floor plan for the room in which Bloch's collection was to be displayed, that shows a designated spot for the chests of drawers in which dried fish could be held. The file also contains a design for these cabinets.
[227] Martin Heinrich Klaproth and David Friedländer to the King's Secretary, undated, BBAW, PAW 1700-1811–I-XV-29, f10r.
[228] See also: Eva Dolezel, *Der Traum vom Museum: die Kunstkammer im Berliner Schloss um 1800: eine museumsgeschichtliche Verortung* (Berlin: Gebr. Mann, 2019).

'exquisite ornament' to the city of Berlin.[229] They entreated the king to make haste; if he did not procure the collection before it was put to auction, they argued, it might be dismantled at the hands of eager buyers, or worse, remain intact but carried off abroad by one those foreign collectors that had been anticipating the collection being put up for offer.[230] Their attempts to save it from such a glum fate were eventually successful: Friedrich Wilhelm bought it (although he managed it to secure it for the sum of 4500 Reichsthalers, half the asking price) and Bloch's collection became, officially, a national asset.

[229] *Tagebuch*, MfN, ZMB, GNF S. Bloch 1, TB 6, 67 B 3102 a-g, 108r/v; I have made use of the transcription by Doreen Bombitzki, dated 16 June 1999 in ZMB, S. Bloch 1, bd. 4, 23–24.
[230] Ibid.