

Figurations animalières à travers les textes et l'image en Europe

*Du Moyen Âge à nos jours
Essais en hommage à Paul J. Smith*

Edité par

Alisa van de Haar
Annelies Schulte Nordholt



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The Fish That Could Climb Palm Trees

Observation, Rumour and Colonial Hearsay in Nineteenth-Century Ichthyology

Johannes Müller

Nineteenth-century European ichthyologists seldom had the opportunity to study live specimens of fishes from other continents and often had to rely on more or less reliable travel accounts and reports from colonial administration posts. The discovery of the respiratory organs of air-breathing fishes illustrates the difficulty to examine questionable information. Paradoxically, it was the very distrust in reports from far abroad that led to the discovery of the respiratory behaviour of these animals. Accounts of the climbing perch (*Anabas testudineus*), a fish that reportedly could climb into trees to drink palm wine required explanations for such incredible claims and inspired more research on this topic. In addition to comparative analyses of other species, zoologists were also dependent on information that required stringent forms of source criticism. As this case shows, rumours and hearsay could play a catalytic role in a discipline that typically relied on empirical methods and direct observation.

Les ichtyologistes du XIX^e siècle avaient rarement l'opportunité d'étudier des spécimens vivants de poissons provenant d'autres continents. Ils n'avaient à leur disposition que des récits de voyage plus ou moins fiables et des rapports faits par l'administration coloniale. La découverte des organes respiratoires des poissons respirant l'air illustre la difficulté d'examiner ces données d'une qualité douteuse. Paradoxalement, ce fut la méfiance concernant les rapports venus de l'étranger qui mena à la découverte du comportement respiratoire de ces animaux. Les descriptions de la perche grimpeuse (*Anabas testudineus*), poisson qui selon les témoins était capable de grimper aux arbres pour boire le vin de palme, demandaient des explications devant des prétentions aussi incroyables et ont inspiré des recherches ultérieures sur la question. Pour résoudre cette question, les zoologistes eurent besoin non seulement d'études comparatives sur d'autres espèces mais aussi de formes précises de critique des sources. Comme le montre le cas de figure, les rumeurs et les bruits colportés pouvaient jouer un rôle de catalyseur dans une discipline qui se basait traditionnellement sur des méthodes empiriques et sur l'observation.

In an essay on the respiratory behaviour of air breathing fishes from South and Southeast Asia, published in 1891, Carl Semper, professor of zoology and comparative anatomy at the University of Würzburg, reflected on the exceptional character of zoology and the epistemological peculiarities of this discipline. As he put it, subjectivity and objectivity were closely linked to each other, and sometimes unscientific assumptions and claims laid the foundation for established and reflected knowledge. Zoological research often departed from assumptions that circulated as questionable ‘Phrasen’ and rumours. As Semper put it, it was the task of the naturalist to examine, and eventually refute, such ‘phrases’ but in the case of the air breathing behaviour of Asian fishes, it was the very circulation of such rumours that laid the base for sound scientific inquiry:

Es ist merkwürdig, welche Macht die Phrase sich zu erringen versteht, nicht bloss im Gemütsleben, sondern auch im Verstandesleben der Völker. Man sollte meinen, dass die wissenschaftliche Arbeit frei sein würde von diesem bedenklichen Einfluss unbestimmter Gefühle des Menschen, die ihn etwas glauben, wiederholen und verfechten lassen, was er nicht annimmt, weil er der inneren Logik solcher Sätze sich beugt, sondern die er für richtig hält, bloss weil die häufige Wiederholung solcher Sätze ihm diese durch sein Ohr schliesslich auch in den Verstand eintrichtert.¹

As he continued, the present knowledge of the ‘so-called labyrinth fishes’ was not based on ‘strictly scientific investigation’ but on a diffuse mixture of claims and assumptions whose very questionability paved the way for sound inquiry.

The specific ‘phrase’ in case was the claim that labyrinth fishes, a fish order from Asia and Africa with the ability to breath air from the water surface, were able to leave their aquatic habitats for longer periods and live on dry land. Quoting Wilhelm Hess, a lecturer of zoology in Göttingen and author of a popular aquarium handbook, Semper referred to the long-held assumption that *Anabas scandens* (now *testudineus*), the climbing perch, even ‘climbed into high palm trees to drink palm wine’, an assertion that dated back to medieval

1 Semper, Carl, “Beobachtungen aus den Aquarien des neuen zoologischen Instituts”, *Arbeiten aus dem zoologischen-zootomischen Instituts in Würzburg* 10 (1891) 14–36, there 19: ‘It is remarkable, how much power the phrase can establish, not only in the emotional but also in the intellectual life of peoples. One might assume that scientific work would be free from the dubious influence of undefined human emotions that lead one to believe, repeat and defend things that one would not assume because of the inner logic of their proposition. Rather, one does only accept such propositions because of their frequent repetition into the ear by which they are drummed into the mind.’

travel accounts and was frequently repeated since then.² Ridiculing Hess's 'Kneipe für Fische' ('fish pub') served as a rhetorical occasion for discussing his own observations on the ability of fishes to live on dry land and to compare such rumours to a number of other observational accounts from India.³ Semper's approach that combined source criticism of travel reports and older zoological descriptions with his own experimental observations in his home aquarium and the collections of Würzburg's Zoological Institute, illustrates the problematic status of European knowledge on species from far abroad and the problem of credibility that emerged in the transfer of information over long distances. As the case of the debate on air breathing fishes shows, European zoologists often had no choice but to rely on questionable sources of information in which it is difficult to distinguish between reliable observations, rumour and lore. The transfer of colonial knowledge revolved around vivid cultures of collecting but dead specimen were of little value to questions about the behaviour and living conditions of plants and animals, which forced zoologists to explore other, and more hybrid, methods of inquiry.⁴

This article examines the attempts of nineteenth-century ichthyologists to treat colonial reports with hermeneutical scrutiny and test dubious claims in experimental setups – often under simple and improvised conditions. The discovery of the respiratory organs of labyrinth fishes serves as a remarkable example for such forms of knowledge production since rumours, colonial hearsay and sensationalist tales were the most important catalyst for research on this topic. While luck, accident and serendipity have long been acknowledged as important factors in the history of science and knowledge, rumour and hearsay have received less scholarly attention.⁵ In the case of air-breathing fishes, it was the very sensationalism of the rumours that circulated

2 Semper, "Beobachtungen" 20; Hess, Wilhelm, *Das Süßwasseraquarium und seine Bewohner. Ein Leitfaden für die Anlage und Pflege von Süßwasseraquarien* (Stuttgart: Enke, 1886) 150.

3 Semper, "Beobachtungen" 24.

4 On the role of collecting and collections in colonial science in Southeast Asia, see e.g. Weber, Andreas, "Collecting Colonial Nature. European Naturalists and the Netherlands Indies in the Early Nineteenth Century", *BMGN – Low Countries Historical Review* 134/3 (2019), 72–95. On the problem of circulation and transfer of knowledge within colonial networks, see Boomgaard, Peter, "Introduction", in Boomgaard, Peter (ed.), *Empire and Science in the Making: Dutch Colonial Scholarship in Comparative Global Perspective* (New York: Palgrave Macmillan, 2013) 1–37.

5 See e.g., Barber, Elinor –Merton, Robert King, *The Travels and Adventures of Serendipity: A Study in Sociological Semantics and the Sociology of Science* (Princeton: Princeton University Press, 2004); Anel, Pek van, "Anatomy of the Unsought Finding. Serendipity: Origin, History, Domains, Traditions, Appearances, Patterns and Programmability", *The British Journal for the Philosophy of Science*, 45/2 (1994) 631–648.



FIGURE 7.1 *Anabas testudineus*, the “climbing perch”

PHOTO BY RAHUL KUMAR

within colonial networks that inspired new and experimental studies of the respiratory organs of these animals. Most researchers did not actually believe stories about tree-climbing fish but the persistent dissemination of such stories was the very occasion for inquiry. After a short overview on the order of Anabantiformes (labyrinth fishes), their role in South Asian cultures and culinary traditions and the early colonial reports on these animals, I will discuss how colonial correspondence networks between South Asia and Europe informed forms of knowledge production that required both hermeneutic and experimental methods and skills.

While most fishes mainly rely on their gills for oxygen uptake, a wide number of species is also able to breathe air from the water surface or even to leave their underwater habitats temporarily, for example the mudskippers, a subfamily of gobies that inhabits brackish coastal areas and mangrove woods of the Indian and Pacific Oceans. Other fishes with the ability to breathe air are the six lungfish species, some loaches and catfish and the species-rich order of Anabantiformes with labyrinth fishes (Anabantoidei), snakeheads (Channoidei) and nandids (Nandidae) as sub-orders.⁶ The respiratory behaviour of these animals allows for their adaptation to stagnant aquatic habitats with very low oxygen levels.⁷ Their ability to survive in mired and oxygen-poor water or even on dry land – given their body surfaces remain wet – made them

6 Betancur, Ricardo, – Wiley, Edward O. – Arratia Gloria, et al., “Phylogenetic Classification of Bony Fishes”, *BMC Evolutionary Biology* 17/162 (2017) 1–40, there 24.

7 Graham, Jeffrey B., *Air-Breathing Fishes. Evolution, Diversity, and Adaptation* (San Diego: Academic Press, 1997) 256.

an important ingredient of South Asian cuisines and food cultures. Unlike other fish, they can be transported over long distances and sold on food markets while still alive. Even smaller labyrinth fishes, such as the various *Trichogaster* (formerly *Colisa*) species, which remain under 2–3 inches, are a valuable source of fresh and protein-rich food in many areas around the Indo-Gangetic Plain. Bigger species, for example *Osphromenus goramy* or *Helostoma temmickii*, are aquacultured for consumption in many parts of South and Southeast Asia.

Some labyrinth fishes also play an important role in the national and popular culture of some Southeast Asian countries and since the late nineteenth century also in the international ornamental fish trade. In Thailand, the so-called Siamese fighting fish (*Betta splendens*), became a national emblem during the reign of King Rama III (1788–1851), who kept and bred these animals himself, even though his grandfather, Rama I, had banished all animal fights in the late eighteenth century.⁸ Accounts of Thailand's fish fight tradition became known in Europe and in 1892, the first *Betta splendens* were imported to Paris and the 'Siamese fighter' soon became a popular ornamental fish in Europe.

Despite the significance of labyrinth fishes in Asian cultures, cuisines and local economies and their presence in many aspects of everyday human life, European observations and reports were often shaped by exoticist discourses that presented these animals as marvellous and otherworldly creatures. According to Carl Semper and others, much of the damage was done by an often misread and misquoted source by a colonial army servant of the Danish East India Company, Karl Daldorff.⁹ In 1795, Daldorff sent a short description of *Anabas testudineus*, the climbing perch, to the famous English naturalist Joseph Banks, naming the species *Perca scandens*. In his report, that was published in the *Transactions of the Linnean Society of London* in 1797, he mentioned that he found a climbing perch in a tree but did not offer much additional information about his observation.¹⁰ The ambiguity of Daldorff's account led others to believe that the tree in which the fish was found was in fact an overhanging branch that grew horizontally above the water surface. As

8 Sermwatanakul, Amonrat, "Capacitating the Local Farmers to Enhance Global Marketing of Thailand's National Aquatic Animal, the Siamese Fighting Fish", *Fish for the People* 17/2 (2019), 42–48. An orientalist account of this Thai tradition is presented in Young, Ernest, *The Kingdom of the Yellow Robe – Being Sketches of the Domestic and Religious Rites and Ceremonies of the Siamese* (London: A. Constable, 1898) 151.

9 Semper, "Beobachtungen" 23.

10 Daldorff, Karl, "Natural History of *Perca Scandens*. By Lieutenant Daldorff of Tranquebar. Communicated by Sir Joseph Banks", *Transactions of the Linnean Society of London* 3 (1797) 62–63. On Banks as an agent in the exchange of knowledge in the British Empire, see Gascoigne, John, *Science in the Service of Empire. Joseph Banks, the British State and the Uses of Science in the Age of Revolution* (Cambridge: Cambridge University Press, 1998).

the Scottish zoologist Francis Hamilton speculated in his *Account of the Fishes Found in the River Ganges* (1822), the fish might also have been caught by a bird and then left on a branch where it survived for some while.¹¹ Despite such attempts to find other explanations for Daldorff's observation, sensational accounts had already spread widely and informed exoticist images of India, not only in popular but also in academic literature. Without citing any sources, popular magazines, schoolbooks and even zoological handbooks repeated the statement that the climbing perch could live without water for no less than six days, due to a water storage that kept its gills humid.¹² Academic publications did not fall short in depicting the *Anabas* as an exotic Asian creature. In 1858, Austrian entomologist Vincenz Kollar accounted that the fish was 'commonly displayed in dry pots by Indian jugglers' who brought it to markets and fairs as a curiosity.¹³ While climbing perches, snakeheads and other air breathing fishes were indeed sold alive at local markets where they could survive in a humid environment for some time, such accounts mistook merchants and fishermen for jugglers, which fit in with Orientalist images of fakirs and dervishes as iconic representations of Indian culture.¹⁴

Early European research on the respiratory system of air breathing fishes was not only influenced by such exotic images, it also responded to circulating assumptions about the nature of these animals. Paradoxically, it was the very sensationalism of accounts on labyrinth fish that fuelled further inquiry. While many of the exaggerations that surrounded the 'palm-climbing' *Anabas* can be traced back to European colonial accounts, zoologists who were sceptical about the validity of existing reports ascribed their shortcomings to Indian folklore. Christoph Giebel, professor of zoology in Halle, discussed the

11 Hamilton, Francis, *An Account of the Fishes Found in the River Ganges and Its Branches* (Edinburgh: A. Constable, 1822) 99.

12 See e.g. Leunis, Johannes, *Schul-Naturgeschichte. Eine analytische Darstellung der drei Naturreiche*, vol. 1 (Hannover: Hahn, 1877) 136; Brockhaus, Friedrich Arnold (ed.) *Conversation-Lexikon. Allgemeine Deutsche Real-Encyclopädie*, vol. 9 (Leipzig: Brockhaus, 1878) 114.

13 Kollar, Vincenz, *Bildliche Naturgeschichte aller drei Reiche: mit vorzüglicher Berücksichtigung der für das allgemeine Leben wichtigeren Naturproducte* (Pest: Hartleben, 1858) 119: 'Die indischen Gaukler zeigen ihn gewöhnlich in trockenen Töpfen vor.' Kollar's reference to 'jugglers' was probably a distortion of Francis Hamilton's account of fishermen selling climbing perches 'in an earthen pot without water' where the fishes could survive for five or six days. (See Hamilton, *Fishes Found in the River Ganges* 99).

14 Goto-Jones, Christopher, "Magic, Modernity, and Orientalism. Conjuring representations of Asia", *Modern Asian Studies* 48/6 (2014) 1451–1476, there 1458. On the emergence of European images of India and the role of colonial agents, see Subrahmanyam, Sanjay, *Europe's India* (Cambridge/Massachusetts: Harvard University Press, 2017) 286–311.

respiratory behaviour of the climbing perch but discredited most of the available accounts as ‘fables of the Indians’ that should not be repeated as they were already ‘refuted by trustworthy observers’.¹⁵ Pioneering work on the respiratory organ of labyrinth fishes was done by Georges Cuvier and Achille Valenciennes and published in their co-authored *Histoire naturelle des poissons* between 1828 and 1849.¹⁶ Cuvier and Valenciennes were professionally trained zoologists and used a systematic and comparative approach to describe the air breathing organs of a wide number of fish genera. Much of the research that followed, however, was the work of semi-professional scholars, among whom colonial army surgeons with an interest in natural history, such as Francis Day and George Edward Dobson, or clergymen like Barcroft Boake. The work of these researchers took place at an intersection between established science and less professional forms of inquiry. The interferences between such colonial agents in Asia, their correspondence with zoological societies in Europe and the dissemination of fragmentary information among professional and lay audiences would shape the debate about the difference between ‘Indian fables’ and established fact.

A controversy that was continued throughout the nineteenth century was the question if the labyrinth organs of climbing perches, gouramis and snakeheads were water reservoirs to keep the fishes’ gills wet or organs that allowed the animals to directly breathe air. A third hypothesis stated that the labyrinth organ was in fact a filter that extracted water from mired substances in which the fish were stuck, an idea that was based on observations of climbing perches that survived in humid earth or mud.¹⁷ Francis Day, a colonial surgeon who operated in the south of British India in the 1850s and 60s, was one of the first to hypothesise that the labyrinth organ was an independent breathing organ that had to be filled with air rather than with water. This hypothesis was based on his observation in live fish he had collected in Sri Lanka and kept in an aquarium at his home.¹⁸ The same approach had already been followed by Barcroft Boake a few years earlier, who had noted that several of the fish he kept in his home aquarium visited the water surface in frequent intervals and

15 Giebel, Christoph Gottfried Andreas, *Die Naturgeschichte des Thierreichs: Amphibien und Fische*, vol. 3 (Leipzig: Wigand, 1861) 229: ‘Wir wollen keinesfalls die Fabeleien der Indier von Neuem auftischen, da zuverlässige Beobachter sie längst widerlegt haben’. Giebel, however, does not refer to those ‘trustworthy observers’ or their accounts.

16 Cuvier, Georges – Valenciennes, Achille, *Histoire naturelle des poissons*, 22 vols. (Paris: Levrault, 1828–1849).

17 Graham, *Air-Breathing Fishes* 65.

18 Day, Francis, “Observations on some of the freshwater fishes of India”, *Proceedings of the Zoological Society of London* XVIII (1868) 274–288.

took in little amounts of air. Boake, however, lacked the time and the training to theorise his findings and he often used only local Singhalese names for the fishes rather than scientific ones. As he reflected on his lacking zoological background that limited his studies, which he started in the mid-1850s:

Had I been a practiced naturalist these circumstances would probably have led to my discovering at that time the fact that the fish, in which they were observed, are air breathers, and as incapable of supporting life by breathing water, and as liable to be drowned by being kept from access to atmospheric air, as the whale or the turtle; but, not being much accustomed to such investigations, I failed to perceive the conclusion to which these habits obviously pointed.¹⁹

Gaining more and more experience and talking to Singhalese natives, Boake continued the experimental observations in his aquarium and noted all the witnesses to his observations of air breathing behaviour in live fish, mostly fellow clergymen, whose names and ranks he added to his publications on this topic.

Largely unfamiliar with the zoological classification systems of his time, Boake attempted to divide the observed fishes in two groups: ‘water breathers’ and ‘air breathers’. As he noted, the fishes he classified as air breathers were largely unaffected by poor water quality and they could also be caught in marshes that were heavily polluted by animal dung. His observation that even these air breathers moved their gills while submerged in water led him to the question if they depended on air breathing for survival. A next step in his experiments involved a controlled setup, in which several fish species were denied access to the water surface. As Boake noted, the water breathers were unaffected by nets that blocked the access to the top of the aquarium but the air breathers all died after a while. He decided to conserve all the drowned fishes and send them to England. Addressing his British reader and mentioning the interest in this matter by scholars such as Thomas Huxley, Boake stated:

I think I have thus established, with regard to these eight species, inhabiting the marshes of Ceylon, what Professor Huxley states would be a great fact, if established, viz., that they habitually breathe air, and are incapable of surviving, for any length of time, if excluded from it; and I have the

¹⁹ Boake, Barcroft, “On the Air Breathing Fish of Ceylon”, *The Journal of the Ceylon Branch of the Royal Asiatic Society of Great Britain & Ireland* 4/13 (1865–66) 128–142, there 128–129.

pleasure of presenting you with specimens, for your Museum, of those species which have been actually drowned in the manner described.²⁰

Boake made no mention of the labyrinth organ and his publications did not attempt to theorise the air breathing behaviour of the observed fishes in any way. As an untrained observer he tried to document his findings as clear as possible so that his data could be interpreted by others.

Boake's experiments were continued and refined by Francis Day who studied more species in his home aquarium or on his expeditions to Sri Lanka. Like Boake, Day was not a trained zoologist but his medical background enabled him to interpret his findings more systematically. Familiar with the work of Cuvier and Valenciennes, Day knew about the labyrinth organ and realised that his and Boake's observations contradicted the theory that this organ served as a water storage that allowed the fish to keep their gills moist when they left the water. Like Boake, who was probably not aware of the water storage-hypothesis, he concluded that the labyrinth organ itself was filled with air. In order to establish this idea, he subjected a wider number of fish species to similar experiments and compared his observations to anatomical descriptions of these fishes breathing organs. Having theorised and explained the respiratory behaviour of labyrinth fishes, Day called on others to collect more data and encouraged fellow colonial servants to continue his experiments. One of them was George Edward Dobson, an Irish army surgeon in British India, who expanded the list of species with the capacity of air breathing. Dobson was developing an expertise on small Asian mammals and did not further continue his ichthyological studies but followed Day's request and sent the documentation of his fish experiments to the Zoological Society of London.²¹

Observations like Boake's and Dobson's, thus, lacked a larger theoretical framework and were further subjected to examination by zoologists in Europe. Research by ichthyologists who seldom travelled, such as Carl Semper in Würzburg, or Nikolay Zograf in Moscow, did not only involve empirical observation but also critical readings of sources from India and other colonial territories. Trying to make sense of travel reports and of 'raw' scientific data that were provided by contributors to zoological journals, Semper tried to subject these documents to stringent source criticism. Comparing Daldorff's account of the 'climbing fish' with botanical and geographical descriptions of its habitat, he concluded that the tree was probably not a coconut tree but a doub palm

20 Boake, "On the Air Breathing Fish of Ceylon" 138.

21 Dobson, George Edward, "Notes on the Respiration of some Species of Indian Freshwater Fishes", *Proceedings of the Zoological Society of London* XXI (1874) 312–321.

(*Borassus flabelliformis*, now *flabellifer*). As he remarked, these trees gained height only when they reached a considerable age – as young plants they stayed low and only grew in width. Their rough bark formed little pockets that were often filled with rainwater that created a habitat for ‘plethora of animals, worms, snails, land crabs, and amphibians’ and served as ideal feeding grounds for the climbing perch.²² In a similar manner, he tried to reconstruct the conditions under which experiments in India had been conducted. Concluding that Francis Day was correct in his assumption that the labyrinth organ was not a water storage but a breathing organ in itself, Semper tried to settle the dispute with a simple *in vivo* experiment that confirmed Day’s hypothesis. As a hobby aquarist, Semper kept and bred another species of labyrinth fish, *Macropodus opercularis* from China and Vietnam. Observing that these fishes took in air in the same way as described by Day, Semper caught one specimen while keeping it underwater and then cut open its skull with a scalpel which he then turned by 90 degrees. As the wound opened up, the air escaped directly from the labyrinth organ in the fish’s forehead, which proofed the correctness of Day’s hypothesis.

While remaining highly sceptical about exaggerated reports from India, Semper concluded that accounts about fishes surviving on dry land or drowning without access to the water surfaces were not impossible and likely had a factual basis. As the case of the discovery of the labyrinth organ illustrates, nineteenth-century zoological research often involved hybrid and diverse forms of knowledge production. In addition to serendipity, luck and chance, factors that have been widely addressed by historians of science, rumours and unfounded hearsay could inspire scientific discoveries as well. While scholars were often relentless in their criticism of unfounded sensational accounts about wondrous animals, and sometimes tried to falsely ascribe them to Indian folklore, it was these rumours and dubious claims that also sparked interest in the reality behind such stories. The discovery of the air breathing behaviour of labyrinth fishes was, thus, a direct result of this dialectical relationship between colonial rumour and scientific inquiry. Making sense of the colonial hearsay that emerged in the interaction between travellers, colonial agents with an interest in natural history and trained zoologists was a project that required critical readings of colonial sources as much as it involved empirical and experimental research.

²² Semper, “Beobachtungen” 23.

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