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Snakey Waters, or: How Marine Biology Structured Global Environmental Sciences

In the year 1902 an encounter of the monstrous kind aroused the attention of the German Kaiser. The *Daily Chronicle* announced the sighting of a giant "Sea Serpent off the Australian Coast." In the article, the steamboat captain who had discovered the creature provided a detailed eyewitness account:

> On the passage from Port Pirie to Sydney, when off Ram Head, a monster serpent was seen by several members of the crew. . . . Closer inspection proved it to be an immense serpent of, as far as could be judged, from 30ft. to 35 ft., with four dorsal fins about 6 ft. apart, standing about 4ft. or 5ft. high. The head resembled that of a seal, only it was much larger, being about 2ft. in diameter. . . . It was seen by myself, the second officer, and several others. All agree that it resembled the serpent seen by those on board the Princess, illustrated in the *Strand Magazine*, the only visible difference being the fins, which seemed more angular than those in the Magazine. The body of the serpent did not appear above the water, but it must have been of immense size.[1]

Reichskanzler Bernhard von Bülow had ensured that the director of the zoological collection of the Royal Museum for Natural History, Karl Möbius, received the article for appraisal. His initial response was noncommittal. In the news article there was, he thought, "not much to be learned about the 'great sea serpent' other than that from time to time they had seen monstrously long, unknown creatures on the surface of the sea." In course of the subsequent attempt to find a plausible explanation for the monstrous occurrence, however, Möbius warmed increasingly to the subject: "The perception of 'large sea serpents' was probably summoned up by the snake-like movement of the bodies of unusually long deep sea fish and giant squid which only come to the surface from the depths under particularly rare circumstances." Examples followed: "Similar giant creatures have also become stranded on the north Atlantic coast and gave rise to

This essay was originally written in German and has been translated for the *Perspectives* by Brenda Black. Unless otherwise noted, all translations of German sources are also the translator's.

1 Daily Chronicle, 19 August 1902, R 901/37635, Das Bundesarchiv [BArch; German Federal Archive], Berlin.

the kraken of Norwegian legend. A life-size model of a squid captured in the Japanese sea is displayed in the local Royal Zoological Museum."[2] The letter closed with a reference to further literature on the subject—a reference in fact to *The Great Sea Serpent*, written by the director of the zoological and botanical garden of The Hague, Dr. Antoon Oudemans, which contained reports of more than 162 sightings of sea serpents between the years 1522 and 1890.

The appearance of this anecdote in the newspaper is not, perhaps, particularly remarkable for the time. In the popular media sea serpents were considered a newsworthy event and magazines had already introduced a number of prominent "fellow creatures." It would be easy to dismiss the report as trivial, the stuff of gossip and legends. However, a couple of details make this incident worthy of closer analysis. It captured the interest of prominent scientific and political figures: Karl Möbius was not only a scientific expert in the German empire, but also the originator of the concept of "biocoenosis," a key term in the creation of an ecological conception of the world. Both von Bülow, the head of government, and Wilhelm II, the head of state of the German empire, were involved in the investigation. Moreover, this was not an event of local relevance, but one that had occurred in the ocean on the other side of the world.

Why did this minor sighting turn into a matter worthy of so much attention? What narratives, networks of meaning, and interpretations does this episode offer, and how are they to be located in historical context? We are not concerned here with the question of what exactly the crew of the steamboat *really* saw, but rather with the expectations of the time and the explanatory model of life in the ocean.

It is clear that two very different world views are colliding here: a belief in sea monsters versus a scientific view. The commotion that the giant sea serpent stirred up in 1902 was merely a symptom of a new perspective that had become prevalent in the last third of the nineteenth century in Central and Western Europe and in the United States. People were "discovering" the ocean as a three-dimensional space, which—contrary to traditional beliefs—was filled with living organisms far into the depths. Thus the sea acquired a new value as an inhabited environment in addition to its previous attributes as a space for conducting travel and asserting power.

2 All quotes: Karl Möbius, Letter to the Foreign Office, Berlin 29 September 1902, R 901737635, BArch, Berlin.

The investigation of life in the oceans caused the world to be reevaluated in a multitude of ways. Research in marine biology brought together economic, political, and cultural interests. Furthermore, marine expeditions transmitted both specific impressions of the world and the respective opinions of participating scientists.

The Formation of a Global Environmental Science: Scientific Journeys, Expeditions, and Research Stations

The sea has held the attention of researchers for centuries. However, the term *Weltmeer* (world ocean), which can be found in oceanographic records and descriptions, first became commonplace around the turn of the twentieth century. Marine biology discovered various dimensions of the world: scientific expeditions measured the oceans, while marine biological stations traversed the extended surfaces of the coasts. Supplementing this horizontal scope of investigation, marine research also sounded the depths of the seas. Through scientific measurements and experiments, and the communication of these through narrative, the underwater world became visible, tangible, perceptible, and communicable as a multidimensional living space.

By the beginning of the twentieth century the contact between German scientists and the sea had crystallized into three main forms: First, there were the traditional journeys by scientists, primarily collecting sea creatures around islands or off coasts. Second, marine research and marine biology experienced an upswing due to the establishment of specialized expeditions. Third, researchers and the government attempted to establish a long-term presence on the sea by creating marine biology stations.

Travels of Individual Scientists

Specimen collectors conducted research mainly along the coastlines. While the German colonies in the South Seas and Africa were one of the target areas, the scope also reached beyond the sphere of direct influence: German marine biologists had been working since the beginning of the nineteenth century in the Red Sea, the Black Sea, South America (Bahia, Rio de Janeiro, Chile), on the Guinea Islands, in Morocco, in Madeira, on Sumatra, and on Mauritius and the Seychelles. They were particularly interested in the subtropic and tropic environments and sought a scientific—and perhaps also emotional—"place in the sun." One could argue, perhaps provocatively, that through

marine biology—and thus through gentler methods, namely those of science—the Germans managed to accomplish what they had failed to do through power politics: they established a global presence.[3]

Expeditions

While the scope of individual researchers was limited to a particular region, oceanographic expeditions circled the entire globe. Just as the routes of the ships encompassed the whole world, the areas of marine research activity were also polycentric. This era of oceanography began with the investigation of the deep sea and the open waters.[4] Not only did the traditional naval powers England and France organized expeditions: Between 1875 and 1880 the American Alexander Agassiz fathomed the Atlantic and Pacific Ocean to depths of approximately nine kilometers, the deepest measurement at that time. In 1889 the Kiel-based Plankton Expedition covered close to 16,000 nautical miles in the ship the *National* on a route between Greenland, Newfoundland, the Bermudas, Cape Verde Islands, and Brazil. Between 1898 and 1899 Carl Chun undertook an oceanographic journey around the world on the German ship *Valdivia,* which traveled through the Atlantic and Pacific Oceans. These oceanographic expeditions were projects of national prestige, highly subsidized by the state—the journey of the German *Valdivia*, for example, received funds from the state amounting to 300,000 Reichsmark.

Marine biological work was an important component of these expeditions, and the "discovery of life" in the sea was one result of these journeys. Thus, for example, the writer and science journalist Carus Sterne issued the opinion in the *Täglichen Rundschau* (14 March 1891) that the Kiel Plankton Expedition had set as its goal the "census of the ocean provinces." Indeed, the Kiel scientists had taken countless water samples along the route and quantified the number and concentration of the microorganisms and particulate matter that form the basis of the marine food chain and the oceanic ecosystem. With the counting of the living organisms in the sea, a "new epoch in the study of marine life"[5] had begun! Even though this method of recording

3 A. A. Aleem, "German Contributions to Marine Biology in the Red Sea during the 19th Century," in *Ocean Sciences: Their History and Relation to Man*, ed. by Walter Lenz and Margaret Deacon (Hamburg: Bundesamt für Seeschiffahrt und Hydrographie, 1990), 109–13.

4 Helen Rozwadowski, *Fathoming the Ocean: The Discovery and Exploration of the Deep Sea* (Cambridge, MA: Belknap Press, 2005).

5 "Unterhaltungsbeilage," *Tägliche Rundschau,* quoted in: Viktor Hensen, *Die Planktonexpedition und Haeckel's Darwinismus* (Kiel: Verlag Lipsius & Tischer, 1891), 80–1.

organisms in the sea by means of statistics was subject to harsh criticism, the journey marks a shift in perspective. By expanding the focus of biological research from the coasts and surface of the water to encompass the high seas as well, the ocean was "discovered" as an inhabited, animal-filled, and biologically dynamic environment. While Charles Darwin had taken for granted that oceans were relatively poor in life-forms, by the turn of the twentieth century they were understood to be teeming with life. Sea cucumbers and polyps populate Carus Sterne's article. Terms such as *Tierstaaten* (animal nations) and *Tierstrassen* (animal roads) had found their way into the scientific terminology of marine biology.[6]

While the Kiel expedition was based on rational-quantifying research methods, the "sea monster" continued to live for the German *Valdivia* expedition. Neither the leader of the expedition, Carl Chun, nor the scientific experts could escape the fascination inherent in the deep-sea fauna. Carl Chun raved, "for the first time we encountered the magic of the pelagian deep-sea fauna, a profusion of new life forms notable for their organization."[7] Although deep-sea fauna was understood as a component of the oceanic ecosystem and metabolism, it was described as something strange and wonderful, as the spawn of a fantastic world. The semantics of the biologically impossible was extended from monsters and prodigies to those "living sensations" that were fished out of the depths: For example, black squid, which "have always aroused the interest of researchers to a particular degree with their equipment of phosphorescent organs and their bizarre habits."[8] Blood-red crustaceans, medusas, winged snails, worms, thaliacea, and deep-sea fish overwhelmed the researchers with anatomical curiosities, such as oversized heads, jaws, and eyes on stalks as well as phosphorescent lights on their bodies. The ability of these creatures to live at great depths and under inconceivable water pressure also made them organisms whose existence seemed inexplicable.

The diverse fascinations of contemporaries with these expeditions had three main causes. First, global expeditions were instruments of German "cultural propaganda" and offered a good opportunity to demonstrate the nation's international standing without involving political and military rituals. Second, the globe was being discovered as a multidimensional, inhabited, and dynamic space—both in its horizontal expanse and in the vertical depths of the oceans. Third, the sociocultural and emotional implications

6 Hensen, *Planktonexpedition*, 30–40.
7 Carl Chun, *Aus den Tiefen des Weltmeeres* (Jena: Verlag Gustav Fischer, 1903), 226.
8 Ibid., 86–7.

of the so-called discovery of the world under the sea were not merely scientific. Its manifestation was that of something hidden and fantastic; that is, it was based on an inherently romantic narrative that projected notions of the exotic and the strange onto the underwater world.

Marine Biology Stations

Simultaneous with the multifaceted "acts of discovery" by the large expeditions, the turn of the twentieth century was at the time already thought of as being accompanied by a shift from extensive to intensive research. The discovery of new species was no longer considered the paradigm of this emerging scientific field, but rather precise examination of already existing species; depending on their regional situation, institutes of marine biology were often able to do both.

The first stations were established on and near the European seas. This was motivated by the idea of providing researchers with "living material" for their work. In 1870 the German zoologist Felix Anton Dohrn set up the zoological station in Naples; a wave of new stations followed throughout Europe as well as in North America. Plans to spread out over the coasts outside of Europe and North America were also abundant. Among the marine biology research institutions, the South Pacific was an object of particular interest for the Germans. Dohrn had justified his decision to establish a station there in 1894 with arguments based on cultural ideas of the tropics: "If there are places that have a particular draw for the researcher and that would offer rich rewards for his efforts, then the tropical coral reefs are among them."[9] When the station was closed in 1897, the long-term presence that German marine biologists had aimed for also disappeared.

Renewed attempts in 1905 to rebuild the aquarium of Dar es Salaam—which was under the charge of a German ship doctor—into a laboratory for marine biology show clearly that the scope of plans was constantly expanding away from the local and nearby waters, and ultimately becoming a global aspiration. Arguments of national prestige and the need to fulfill this cultural responsibility, as the investigation of the tropical seas was understood to be, were combined with scientific arguments: for German marine biologists the "tropical seas, the setting for the richest development of organic life,"[10] exerted such a lasting attraction that having a national presence was felt to be a

9 Felix Anton Dohrn, Letter, 15 January 1896, Neapel R 1001/6212, BArch, Berlin.
10 Carl Chun, Letter, 29 August 1906, Leipzig, R 1001/6208, BArch, Berlin.

downright necessity. At the same time economic motivations should not be forgotten: the investigation of the sea had the potential to help find foodstuffs from the sea and thereby contribute to feeding the colonial population. Such arguments demonstrate the view of marine research as an environmental science with many practical implications for politics and economics.

In these stations, the nature/culture divide that is problematized in the environmental humanities today was historically up for negotiation. It is characteristic of these research spaces that the separation between nature and culture dissolved within them. They merged with their environment, which allowed them to become nature-culture hybrids. What was true for European stations was even more the case in the colonial regions, as Friedrich Dahl, the field scientist of Ralum, explained in 1895: "The location is ideal for marine research. Next to the shore there is a narrow coral reef, not far beyond that there are depths of up to hundreds of meters. The house consists of three rooms. . . . The middle room will contain the aquarium, the library, the instruments—insofar as they would not be better housed on the veranda—and the chemicals and supplies of [specimen] glasses."[11] While the marine life-forms gained entrance to the cultural area of the station through the aquariums, the station merged architecturally into the maritime environment. As a living space for animals, as well as a living and working space for people, the spheres of marine environment and research were intimately intermingled.

Summary

Where, then, is the place for the "great sea serpent" cited at the beginning within this new marine biology? Antoon Oudemans's book about giant sea serpents, which Karl Möbius recommended to the Kaiser, demonstrates in highly compressed form the development of modern environmental science precisely on the boundary between nature and culture, between natural science and cultural imagination. On the specific matter of sea serpents, Kaiser Wilhelm would have found plenty of illustrative material in this book in 1902, for Antoon Oudemans was obsessed with this creature. As the director of the zoological museum in The Hague he really ought to have been—given his scientific profession—disinclined to hold such attitudes that today are generally dismissed as

11 Friedrich Dahl, Letter, 30 June 1896, Ralum, R 1001/6212, BArch, Berlin.

Figure 1: The „Great Sea Serpent" according to Hans Egede, 1734 (Reproduced in: Ellis, R. 1994. Monsters of the Sea. Robert Hale Ltd.)

fantasizing. Nevertheless, the foreword of the book shows indications of a fanciful conviction, the belief in being able to scientifically document the existence of giant sea serpents through eyewitness accounts, illustrations, and extensive data collection, worldwide in scope and spanning over 450 years. The author made use of the entire arsenal of the cultural techniques of science at his disposal in order to create an impression of authenticity. Exact photographs and measurements were, he believed, to be given preference over paintings and descriptions. Oudemans attempted to pin down the sea serpent with the zoological terminology that was standard for taxonomical, physiological, and psychological classification of animals, such as: appearance (the lengths of various limbs, texture and consistency of the skin, colors and variations, physiological characteristics); behavior; geographical distribution; and comparison with similar animals. The style of description, the taxonomical parameters, and the early observations of animal psychology might have been used to describe any other animal. The sea serpent as an object of scientific study had originated in the realm of "fabulous zoology," and lived on in the natural sciences. Within the physical, institutional, and epistemic framework of marine biology Oudemans's book is nothing less than an attempt to connect the worldwide sightings of an unknown sea creature—which in this case belonged to an even older discourse of monstrous creatures—with a concrete species and thus to make the unknown scientifically describable. In so doing an object of study is constructed that can

be described sociologically as a *boundary object*,[12] an abstract or concrete item which, while the epistemic core remains the same, acquires various interpretations depending on one's standpoint, functioning in a variety of historical contexts and crossing boundaries—in this case, the boundaries between scientific reporting, entertainment media, and popular imagination. The giant sea serpent shaped the basic outlines of one of the first global environmental life-sciences.

Further Reading

Aleem, A. A. "German Contributions to Marine Biology in the Red Sea during the 19th Century." In *Ocean Sciences: Their History and Relation to Man,* edited by Walter Lenz and Margaret Deacon. Hamburg: Bundesamt für Seeschiffahrt und Hydrographie, 1990.

Rozwadowski, Helen. *Fathoming the Ocean: The Discovery and Exploration of the Deep Sea.* Cambridge, MA.: Belknap Press, 2005.

12 Susan Leigh Star and James R. Griesemer, "Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907–39," in *Social Studies of Science* 4 (1989), 387–420.