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## EDITORIAL

### Pioneers of Plankton Research: Marie Lebour (1876-1971)

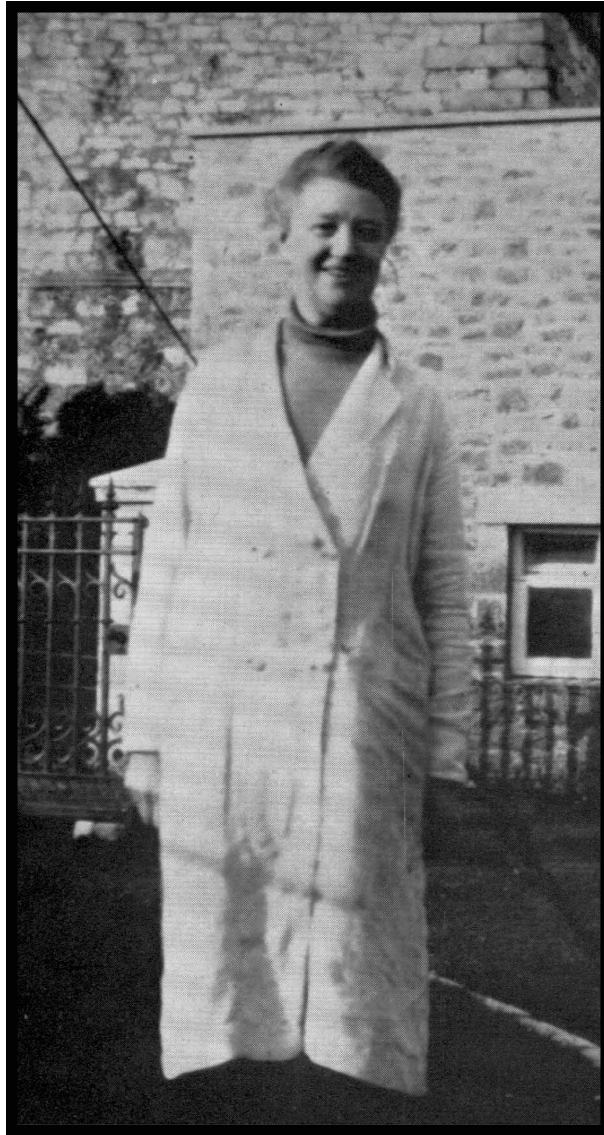
Marie Lebour made major contributions to plankton research. Her books on dinoflagellates and diatoms were the first in the English language and remain today valuable reference works. Her studies of larval fish of the plankton, both as predators in the plankton and the prey of other planktonic organisms, have been cited hundreds of times (e.g. Lebour 1922, "The Food of Plankton Organisms"). However, Marie Lebour is today perhaps best known from her pioneering work on the identity and developmental sequences of many of the striking larval forms of crustaceans and mollusks we find in the plankton. The following brief resumé of Marie Lebour's long and remarkably productive career is based largely on the account of her life given in Russell (1972), which includes a complete bibliography of Lebour, and the account given in Rice (1989).

Marie Lebour appears to have come to plankton studies via a very unusual route. As a young naturalist, her first published study was on land and freshwater mollusks (Lebour 1900). She published 3 other studies on marine mollusks before finishing her undergraduate studies in 1904 at the University of Durham. By 1906 she was employed as a 'junior demonstrator' in the Department of Zoology at the University of Leeds. She remained at the University of Leeds for several years, publishing on near-shore mollusks and their parasitic trematodes. While she concentrated mostly on trematodes of mollusks, she also worked on the trematodes of ostracod crustaceans, fish, and even a snake. In this period, her work on trematodes, and their development in their hosts, appear to be her first studies in developmental biology. Decades later, she would become known as an expert in the development of a very wide variety of marine planktonic larvae.

Her studies of plankton began only in 1915, at age 39, when she went to Plymouth Marine Laboratory (PML). Oddly enough, the move to the PML was not one she sought. Marie Lebour was 'loaned' by the University of Leeds to PML supposedly for only a year, where at the time of WW1, a large part of the staff had been called to military service. However, PML apparently suited her quite well. In 1917 she was offered a permanent position at the University of Leeds but chose to stay at the PML. She would remain at the PML for the rest of her career, working in the laboratory until 1964, well past her official retirement in 1946. In fact, post-retirement she published 17 papers. Her last, and 156th paper appeared in 1959 (Lebour 1959), when she was 83 years old!

One can roughly parse the career of Marie Lebour as a plankton specialist at PML into three more or less distinct periods, which is to say with some temporal overlaps. In the first period were her studies of microplankton, chiefly dinoflagellates and diatoms of the phytoplankton. In the second period, her major works were investigations into the biology of larval and young post-larval

fish, both as predators, (studying what they ate from fish gut contents), and as prey of other planktonic organisms in laboratory studies with invertebrate predators. During the third and last period the studies of Marie Lebour largely concerned documentation of the development stages of a wide variety of the meroplanktic larvae of both molluscan and crustacean taxa.

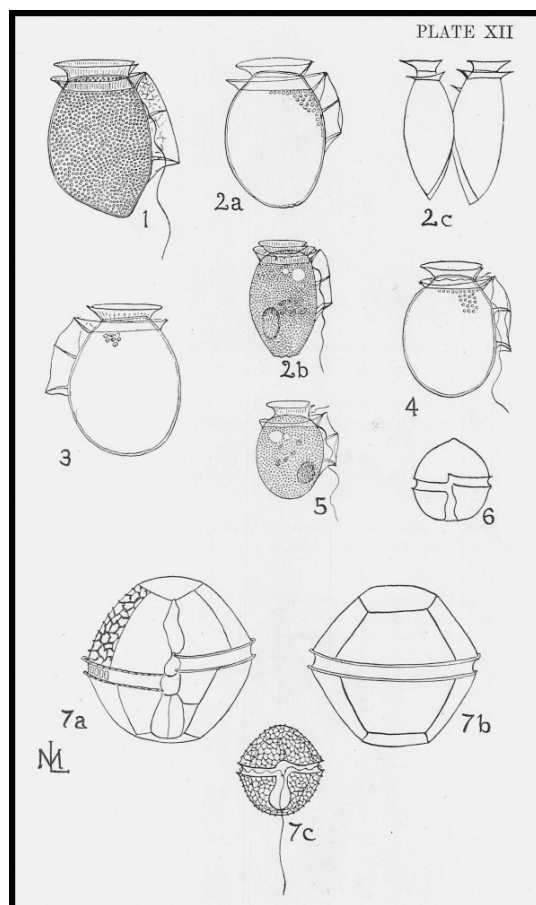


**Fig. 1.** Marie Lebour *ca.* 1916, at about age 40. Image from Russell's 1972 obituary notice published in the *Journal of the Marine Biological Association*.

Marie Lebour's first published work on marine plankton was her now classic study documenting the developmental stages of the copepod *Calanus finmarchicus* (Lebour 1916). The copepod had been brought into culture by L.R. Crawshay. He had painfully worked out culture methods over several years at PML. When Crawshay was called to military service, he gave his cultures to E.J. Allen, the director of PML at the time, and they supplied the material used by Lebour for her first publication from PML, signed as "Assistant Lecturer in Zoology, Leeds University. Temporary Naturalist in the Plymouth Laboratory." in 1916 she also began her work based on organisms collected in plankton net tows, working out developmental stages of a crab parasitic in medusa. However, she

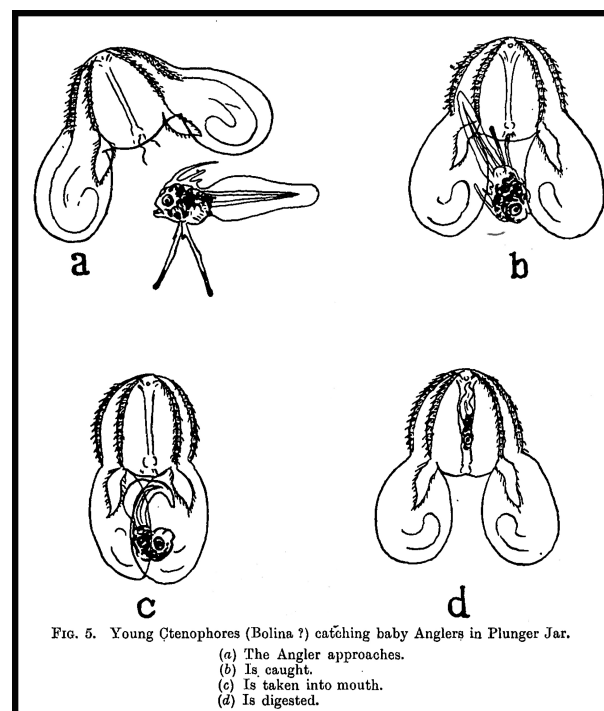
did not abandon her work on trematodes as she also described trematodes she found as larvae in medusa.

In just the first few years at PML, Marie Lebour attained a considerable expertise in the study of plankton. By 1917 Marie Lebour had become the British expert on the dinoflagellates of the marine plankton, describing several new species in her first work on dinoflagellates (Lebour 1917). A few years later she published "The Dinoflagellates of the Northern Seas" (Lebour 1925a), her first book on phytoplankton and the first book in English on dinoflagellates (Rice 1989). It was illustrated with her detailed drawings of cells from life (e.g., Fig. 2) and was very favorably reviewed both in the United Kingdom (Anon 1926a) and in the United States of America (Anon 1926b). Marie Lebour's contributions to our knowledge of dinoflagellates is evidenced by the fact that several genera and species of dinoflagellates have been named for her. Among those currently recognized as valid are the genera *Lebouraia* and *Lebouridium* and the species *Cochlodinium lebourae* and *Polykrikos lebourae*. The fact that phagotrophic species of dinoflagellates (*Cochlodinium* and *Polykrikos*) are named for her is especially apt. She was fond of insisting that dinoflagellates are not typical plant-like phytoplankton but rather at borderland separating plants and animals with some forms feeding and other relying on photosynthesis (e.g., Lebour 1928). Marie Lebour was an early advocate of the fact that within a taxon of marine plankton, a variety of trophic modes can be found.



**Fig. 2.** Plate 12 from Lebour's "The Dinoflagellates of the Northern Seas" (Lebour 1925a).

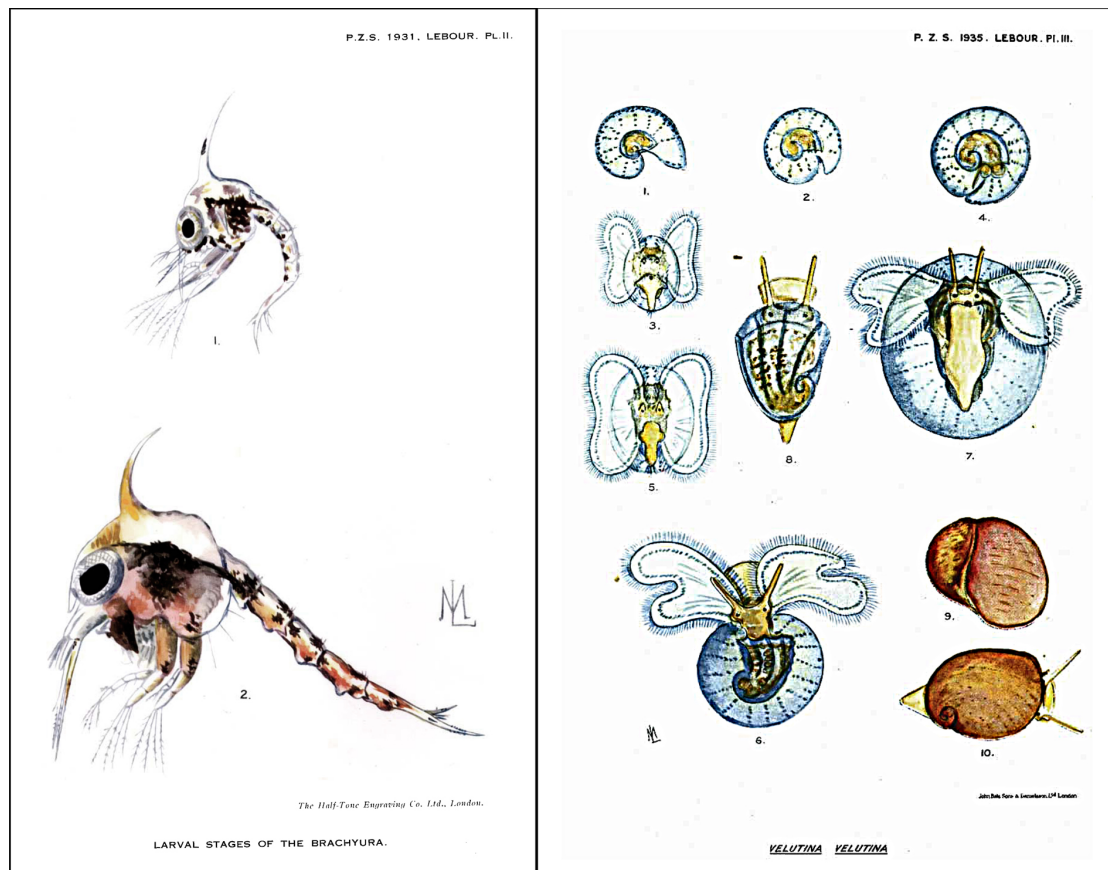
It was also during those early years at PML, following her work on dinoflagellates, when Marie Lebour began her studies of larval and young post-larval fish as both predators and prey of planktonic organisms. The first reports in 1918, signed as "Naturalist at the Plymouth Laboratory" (no longer "Temporary Naturalist"), were on the prey found in the alimentary canal of the in a large variety of species. She found that certain fish appeared to prefer certain prey (e.g., Lebour 1918). She continued her studies on the food of larval fish, based on field-caught material, over the next few years finishing with studies of the larvae of commercially important species such as Herring (Lebour 1921). Thereafter, she turned her attention to feeding of other organisms of the plankton, primarily coelenterates, on fish larvae. These studies relied on laboratory observations and were made on field-caught individuals maintained in the laboratory in vessels she developed, Plunger Jars, adapted from designs originally developed at PML to maintain medusae. The Plunger Jars kept the organisms in suspension. She documented predation on fish larvae by a surprisingly wide variety of invertebrates ranging from medusa, ctenophores (fig. 3) to arrow worms and annelids. Her last publication on holoplanktic organisms was her 1930 book on diatoms, "The Planktonic Diatoms of Northern Seas" (Lebour 1930). Subsequently her studies focused on the meroplankton, specifically the development of the planktonic larvae of benthic taxa.



**Fig. 3.** From Lebour's 1925b study "Young anglers in captivity and some of their enemies, a study in a plunger jar" in the *Journal of the Marine Biological Association (UK)*, reproduced by permission.

From the 1930's on, Marie Lebour 's work largely concerned documentation of the developmental stages of crustacean larvae. She produced a large number of studies such that crustacean biologists often consider her to be one of their own, ignoring her previous and other work (Rice 1989). However, during this third part of her career, she also worked on the planktonic forms and stages of

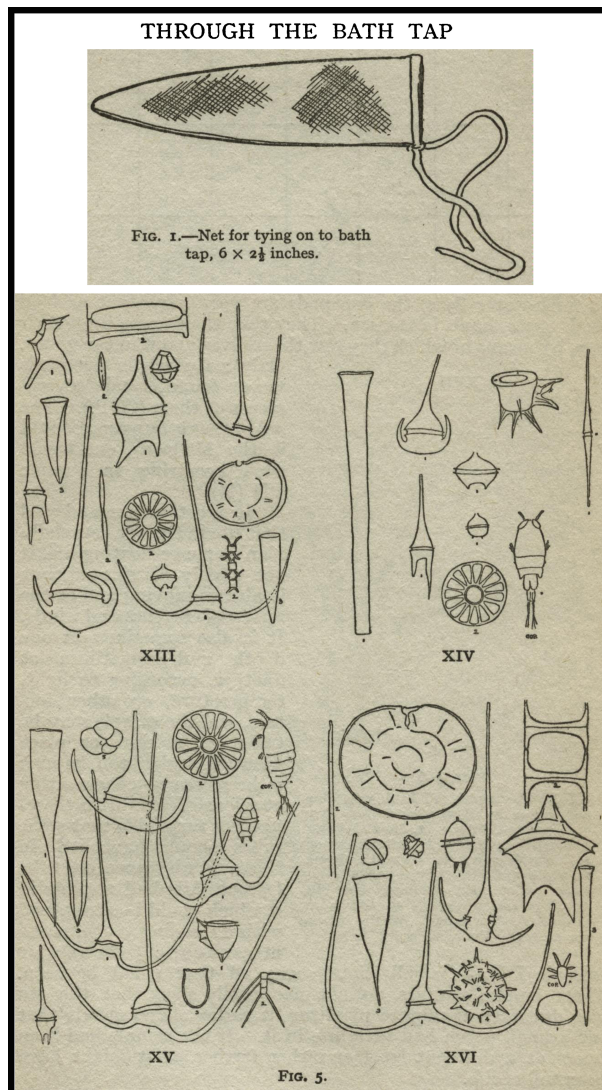
mollusks, the group of organisms with which she began from her days as a young naturalist. Her renown among crustacean biologists is due to the fact that she was one of the first to successfully rear crustacean larvae and her studies, unlike those of her predecessors which were largely morphological, examined questions of nutrition, ecology, as well as patterns of temporal and spatial distributions (Anger 2001). Many of her studies included illustrations in color, showing the natural colors of the larval forms, such as those shown in Figure 4. She apparently studied art as an undergraduate and her artistic talents were well recognized (Russell 1972)



**Fig 4.** Color plates of Marie Lebour from her 1931 article on larval Brachyura (left panel) and her 1935 article on Echinospira larvae (right panel). Both article appeared in the Proceedings of the Zoological Society (London), reproduced by permission.

In concluding our review of the work of Marie Lebour, it would be remiss to omit mention of her work in popularizing the world of plankton. She contributed several articles over the years to the popular science magazine *Science Progress*. One of her articles told of the story of her exploiting the fact that her brother-in-law was traveling to the then Ceylon (now Sri Lanka) on a cruise ship equipped with a running seawater bath. The article was titled "Through the Bath Tap (an account of samples of minute planktonic organisms collected on board a P & O liner during a voyage from England to Ceylon)". She supplied her brother-in-law with a bag of silk fashioned to fit over the bath faucet and tubes with a small amount of formalin in each. Periodically he tied the bag on the faucet and let it run for about an hour. He then noted the position of the ship, and emptied the

netting into a tube. From her article, the "bath tap plankton net" and some of the catch are shown in Figure 5. Thus, the readers of *Science Progress* were shown the variety of life-forms found in the plankton of tropical seas. Although not identified in her article, the illustrations were detailed enough to allow us today to easily identify many of the species shown. She also wrote several articles for a magazine for science teachers, *School Science Review*, for example "Plankton or the Floating Life of the Sea" (Lebour 1933). Marie Lebour was not only a pioneer of plankton research but also a public proponent of the importance and beauty of the plankton.



**Fig. 5.** Illustrations from Marie Lebour's 1932 article "Through the Bath Tap (an account of samples of minute planktonic organisms collected on board a P & O liner during a voyage from England to Ceylon)" which appeared in the magazine *Science Progress*.

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