A FURTHER NOTE ON THE FRESH-WATER MEDUSA

IN SCIENCE of December 8, 1922, Professor H. Garman reports some later observations on the medusæ of Benton Creek, Kentucky, where they were found in large numbers in the late summer of 1917 as they had been the previous summer. In the present note he reports that careful search for the hydroid stage at several times had been without success, but mentions finding in September, 1922, colonies of *Cordylophora lacustris,* a well-known hydroid of fresh and brackish waters, and remarks upon its occurrence in " a new locality in which it is associated in a way with Craspedacusta," though adding in a foot note that "a medusa stage is believed not to be produced by this hydroid."

It seems to the writer that it may be well to briefly summarize present knowledge of this very interesting problem in order that subsequent findings may be properly correlated with what has already been established.

Cordylophora lacustris: This hydroid was first described by Allman in 1844 (*Annals of Nat. Hist.,* vol. xiii, p. 330, and later in his "Monograph of Gymnoblastic Hydroids," 1871, p. 252). Hincks described its life history (*Ann. Nat. Hist.,* 1853, and still later in his History of Brit. Hydroid Zooph., 1868). Details of its habitat have been given from time to time by scores of zoologists, but the fullest account of its development is that of F. E. Schulze in 1871 in a memoir of some 52 pages with six lithograph plates. Its life history is therefore as clearly established as that of any known hydroid. Of course, one of its very interesting peculiarities is its adaptability to both salt and fresh waters, and it has quite a wide and varied distribution, records of its occurrence in inland waters having been made by many observers. Hence there is no special significance in its occurrence in the Kentucky creek and in the same locality as that of Craspedacusta several years prior.

Microhydra Ryderi Potts: This very remarkable hydroid was discovered by Mr. Edward Potts in 1885, and was described by Dr. J. A. Ryder (*Amer. Naturalist,* vol. 19, p. 1232) at the request of Mr. Potts, who supplied the material and data as to its localities. The untimely death of Dr. Ryder soon after this delayed further accounts for several years. In 1897 Potts was fortunate in having actually observed the development and liberation of its medusa stage, and this he repeatedly confirmed by studies in subsequent years.

A later and final account of this hydroid by Potts appeared in *The Quar. Jour. Micro. Science,* vol. 50, 1906, including notes by Lankester, and drawings from several authors, making a comparatively complete account of the entire life history of the hydroid. As will be found in the description given, the size of the hydroid stage is extremely minute as suggested by the generic name given to it. Its size as given is only about 0.5 mm. in height, by less than one half that in diameter. Search for it would therefore be like that for the proverbial needle in a haystack.

It is doubtless due to this feature of minuteness that this hydroid has been so rarely seen. Added to this feature is also that of its anomalous characters of structure, for example, absence of tentacles, hydrorhiza, etc., which add to its disguise. Unless one were familiar with these facts, or had seen descriptions and drawings, it would be quite easy to overlook organisms such as these even when knowing something of the objects of search. One other feature also further obscures the hydroid, its very quiescent or sluggish habit, often being motionless for some time, and its motion unlike that of Hydra or other hydroid forms as commonly known. Further accounts along this line will appear under the following section.

Craspedacusta sowerbii Lankester (*Limnocodium sowerbii* Allman). Under these names are designated the fresh water medusa first made known by Lankester, and at the same time by Allman, in 1880; but that given by Lankester having been first published takes precedence. Its discovery was first made by Mr. Sowerby, secretary of the botanical garden of Regents Park, London, who supplied specimens to Professor Lankester. The fact that the specimens were found in large numbers in the tank where the giant water-lily, Victoria regia, was grown, having been brought from South America, led to the inference that the medusæ had been brought also from the same region of the tropics. As is now well known,

this inference is probably erroneous, since the wide distribution in other localities, most particularly in the United States, where they have been found in natural waters, lakes and creeks, accounts of which the present writer has given, first in SCIENCE, November 8, 1907, and later in the *Biological Bulletin,* vol. xiv, 1908, p. 304. Its next occurrence is that reported by Professor Garman in SCIENCE, December 15, 1916, and finally that described by the present writer in SCIENCE of October 31, 1919, and the note by Garman referred to in the opening paragraph of this paper. The following letter from Dr. R. E. Coker, of the Bureau of Fisheries, Washington, D. C., establishes still an additional locality for Craspedacusta in the United States:

Your somewhat recent paper in SCIENCE concerning fresh-water medusæ recalled to my mind the fact that I had not acquainted you with the examples which I collected on September 16, 1918 in Augusta, Georgia.

During a very brief stay in Augusta, my attention was called to the medusæ by Mr. Schultze, of the Public Health Service at that time, formerly with the Berkman nurseries of Augusta, Georgia, who during the previous few days had observed them abundantly in a concrete pool in the corner of the yard of the Catholic church. He was, of course, interested in knowing what they were, and properly suspected them to be jelly-fish.

The pool was about 14 feet in diameter and 2½ feet deep; the intake was in the center, arising, I am told, from the city water system. The normal over-flow pipe was stopped up and the water was running over slowly on one side. There were no large plants, but the side walls were covered by a coating of sediment about half an inch thick and greenish in color. The medusæ were very active in a bottle of water, making as many as 114 strong pulsations to the minute. Five specimens were kept in a small bottle with some of the sediment from September 16 to 23, inclusive, when they died in my office in Washington. About a dozen examples were preserved in alcohol, the only thing available for the purpose at that time, and subesquently deposited in the United States National Museum under its accession number 62,830. They were presumably *Craspedacusta sowerbii.*

For a long time the medusa stage was the only aspect of the organism known. But in 1884 Bourne described a hydroid stage (*Proc. Royal Soc.,* London) and still later an extended account by Fowler was given (*Quar. Jour. Mic. Sci.,* vol. 30, 1890, p. 507, plate 32, nine figures) which includes an account of the liberation of the medusa and some details of its structure. Fowler's polyps were larger than those of Microhydra described above, but otherwise very similar. These accounts, with those of Lankester (*Quar. Jour. Mic. Sci.,* vol. xx, p. 351) will afford an excellent résumé of the life history up to that time. But it yet remains for further investigations to complete full and unquestioned life history of these most interesting organisms.

Another very interesting feature associated with the appearance and distribution of these medusæ is the anomalous and erratic aspects of their occurrence and, to a less degree, their more or less sudden disappearance. This point was very marked of their presence in the tanks of the Regents Park as reported by Bourne, Fowler and others. This was equally marked in the history of the medusæ in the Washington aquaria as I have shown. It was likewise noted in those of Benton creek, Kentucky, at the close of the first summer, *i. e.,* 1916, to which the present writer referred, and which Professor Garman, in his recent note in SCIENCE, December 8, 1922, deems an error. But this referred only to the particular feature here cited and was based on a letter from Professor Garman of December 21, 1916, in which he states: "You may be interested in knowing that on September 30, after I secured the medusæ, another trip was made to the creek with a view to learning something further of the organisms. I examined the banks from above backwater down to the mouth of the creek, but found neither medusæ nor colonial forms. A rain had followed my first visit, so that the stream was much above its former level and was muddy. This condition may account for the failure in the second trip to secure specimens." This last report of Garman establishes the recurrence of the medusæ in Benton Creek in 1917, though not since then. Advices indicate that at the Elkhart locality these medusæ have thrived without interruption since their first discovery some five years ago.

In his earlier account of the medusæ, the

writer showed those of Europe and the United States to be identical. Not having studied the hydroid stages he had only the descriptions of Bourne and Fowler of the hydroid they regarded as that of Craspedacusta, and those of Ryder and Potts of this stage of Microhydra, upon which to base an opinion. The accounts supply fairly strong evidence that these stages also show close affinities if not actual specific identity, though there yet remain points of ontogeny to be cleared up before a final pronouncement can be made.

Mayer ("Medusæ of the World," vol. ii, p. 366) states that Potts had declared their identity. Of this I find no evidence whatever, either in his papers or in personal correspondence with the writer. On the contrary, he specifically holds otherwise. "In concluding, it is hardly necessary to invite the attention of scientists to the fact that we have, in these three fresh-water forms, an equal number of species, no one of which has been conclusively studied; that their appearance in three of the five grand divisions of the earth points very plainly to the probability that closer methods of research may very soon discover others in familiar but unsuspected places; that, whatever we may believe as to the origin of *Limnocodium sowerbii,* it is hardly possible to doubt that *Limnocnida tanganyicæ* and *M. ryderi* are native to the districts in which they have been found, and that, unless or until the polyps of Bourne and Parsons have been seen to produce the Limnocodium, it is quite within the limit of possibility to suppose that they have had their origin in the Thames, or from any other source from which the tanks in which they were found may have been filled."

Browne (*Quar. Jour. Mic. Sci.,* vol. 50, p. 638) has expressed rather strong dissent on this point, especially based upon the features of the hydroid stages. Like the present writer, he had only the accounts already cited. While appreciating the points of objection raised, yet I am not convinced of their validity. It should not be overlooked that the material of Bourne and Fowler was that taken from the artificial habitat of the tanks in Regents Park, while that of Potts was from the natural outdoor habitat of rapidly flowing waters. With these points of contrast in mind, allowance must be made for habitudinal variations which, in these organisms, may often be quite marked. But, as stated above, it is not till full and convincing ontogenies are clearly established that a final verdict can be declared.

CHARLES W. HARGITT
SYRACUSE UNIVERSITY
JANUARY 30, 1923

PACIFIC DIVISION OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Financial Report of the Secretary-Treasurer for the calendar year ending December 31, 1922

Cash balance from preceding year		$1,526.54
Receipts for 1922		
From permanent secretary's office	$1,144.00	
From affiliated societies	125.00	
From dues and fees	368.00	
		1,637.00
		$3,163.54
Expenditures		
Dues remitted to permanent secretary's office	$ 195.00	
Supplies	20.13	
Salary, 1922	825.00	
Salary, 1921	75.00	
Office assistance	300.00	
Postage	20.00	
Telephone and telegraph	52.49	
Expense, general	5.00	
Expense, travel	99.27	
Membership campaign	113.00	
Conservation of marine life committee (stationery)	22.00	
		1,726.89
Cash balance, January 1, 1923		$1,436.65

Comparative Statement of Receipts and Disbursements and of Membership for the years 1921 and 1922

	1921	1922
Received from the permanent secretary's office:		
Account 1921-1922 dues	$1,639.00	
Account 1920 dues		$ 8.00
Account 1921 dues		22.00
Account 1922 dues		462.00
Account 1923 dues		652.00
	$1,639.00	$1,144.00
Received from societies and members:		
From affiliated societies	125.00	125.00
From new members, dues	290.00	195.00
From new members, initiation fees	230.00	173.00
Annual disbursements	$1,404.63	$1,531.89
Membership:		
New members enrolled	55	39
Total enrollment at end of year	990	1094