

margine anfractuum elevatiusculo, lineari, intus lubrico, umbone centrali exiguo munito.

From specimens which reached London alive, from the Concan, near Bombay.

Cyclostoma marginatum, Chemn.

Under this name Pfeiffer cites *Turbo marginatus*, Ch., from Coromandel, in his list of doubtful species. Mon. p. 313, with the observation that it may rather be a *Bithinia*. The latter supposition is correct. I have this shell, clearly indicated by Chemnitz, sent by Dr. Jerdon from the Carnatic, and by Mr. Edgar Layard from Jaffna in Northern Ceylon. It is the shell which Souleyet (Voy. de la Bonite, vol. ii. p. 547. t. 31. f. 19-21) has described and figured as *Valvata sulcata*, from a pond near Pondichery, although he has omitted to describe the delicate striæ by which the spiral ridges are decussated. Souleyet has erred in ascribing the shell to *Valvata*. The testaceous operculum confirms its place in *Bithinia*. Souleyet says it is "vix spiraliter striatum;" his engraver exhibits an operculum with concentric striæ. The truth evidently lies between, and, as in other *Bithinia*, there must be a central spiral nucleus, followed by concentric laminæ. Unfortunately my specimens are destitute of opercula. The shell will henceforth stand as *Bithinia* (*Turbo*) *marginata*, Ch.

Spa, 24th November 1854.

IV.—On *Artificial Sea Water*. By PHILIP H. GOSSE, A.L.S.

To the Editors of the Annals of Natural History.

GENTLEMEN,

IF Mr. Warington supposes that I obtained from him one atom of information previously unknown to me, on the subject of making sea-water from its constituent salts, he is most thoroughly mistaken. He is no less wrong in saying that I "consulted" him; since I merely mentioned what was on my mind in familiar conversation.

With this, however, the public are of course not concerned, and I shall say no more on that head.

Such of your readers as have felt interested in the matter may be assured that I have not deceived them, in the statement that the simple formula given in the 'Annals' for July 1854 will make sea-water, in every respect fit for an aquarium, and capable of supporting animal and vegetable life.

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A glance at my paper will show that I gave Dr. Schweitzer's analysis exactly as now given by Mr. Warington ; but, as I wrote for practical people, to whom minute accuracy is impossible, and to whom a chemical formula expressed in quantities of four or five decimals would certainly act as a prohibition, I reduced it to a simpler form ; having first made the experiment, whether such a departure from exact accuracy would vitiate the composition.

Now surely here is the point. If I had merely theorized ;— if I had given it *as my opinion* and nothing more, that the simplified formula would answer, I should be justly blameable ; but *I proved my hypothesis before I published it*.

That Mr. Warington's calculations are correct I do not at all deny ; but that they convict mine of "error" I by no means admit ; as my facts will presently show. The "error" (which is of that kind technically called "*nidus equæ*") lies altogether on the other side.

The half-gallon of artificial sea-water which was the result of my first experiment, and formed the subject of my communication to your pages, still exists. From the 21st of April to the present date it has never been even shifted from the vessel into which it was first put, nor have its constituents been changed in any respect.

Now mark the result. A large number of little healthy plants of *Ulva* and of *Conferva* have sprung up and grown in it, which on every sunny day give forth a copious supply of oxygen. Some of the original animals yet remain, in a healthful condition, as *Actinæ* and *Serpulæ* ; though others have died off in the course of the summer, and have been replaced by more. A whole generation of *Bowerbankiæ* appeared in August, quite unexpectedly, spreading in ramose shrubs about the glass sides, and after a while died away. At present there are in the vessel, besides those above-mentioned, a Prawn, and several Periwinkles. The water has always maintained, up to this day, a perfect clearness. Is not this case conclusive ?

But I have further evidence. On the 23rd of August last I manufactured nine gallons of sea-water, using the very same proportions of salts as before ;—with which I half-filled a square glass tank. I stocked it immediately with plants, and in about a week with animals. This experiment also has been perfectly successful. The animals remain in high health to the present time, as do also many more which were added to the stock in the early part of November. Here too the water continues perfectly transparent and colourless.

The stock of this tank includes at present the following animals :—

Crustacea.

- | | |
|-----------------------------------|-----------------------------|
| 1 <i>Carcinus mœnas</i> . | 1 <i>Palæmon serratus</i> . |
| 1 <i>Porcellana platycheles</i> . | 1 <i>Crangon vulgaris</i> . |

Mollusca.

- | | |
|---------------------------------|-----------------------------------|
| 4 <i>Littorina littoralis</i> . | 1 <i>Doris tuberculata</i> . |
| 1 <i>Purpura lapillus</i> . | 1 <i>Pleurobranchus plumula</i> . |
| 1 <i>Murex erinaceus</i> . | 1 <i>Mytilus edulis</i> . |
| 1 <i>Chiton (lævis?)</i> . | 1 <i>Ascidia</i> — ? |

Annelida.

- 1 *Borlasia* ?

Zoophyta.

- | | |
|-------------------------------------|--------------------------------|
| 5 <i>Actinia mesembryanthemum</i> . | 1 <i>Actinia nivea</i> . |
| 4 — <i>bellis</i> . | 3 — <i>rosea</i> . |
| 1 — <i>gemmaea</i> . | 1 — <i>venusta</i> . |
| 3 — <i>troglodytes</i> . | 1 <i>Anthea cereus</i> . |
| 2 — <i>clavata</i> . | 1 <i>Balanophyllia regia</i> . |

I leave these facts to speak for themselves. They are better than a thousand theories. Here is one vessel of water made from my formula eight months ago; here is another made four months ago. Neither has at any time been changed, nor even shifted; the waste of evaporation has been merely supplied from time to time with fresh (*i. e.* river) water. Both of them have always maintained marine animals and vegetables in health, from the first until now; and both contain animals that have survived for the whole period. Finally, both have preserved their purity and transparency.

I shall be but too happy to show any scientific persons the vessels in question, and to give any information in my power.

I am, Gentlemen, your obedient servant,

P. H. GOSSE.

58, Huntingdon Street, Barnsbury Park,
December 20th, 1854.

P.S. Some letters which have been lately published by Mr. W. A. Lloyd in the 'Athenæum' confirm my experience. Perhaps I may be excused for citing a few words contained in a private letter from the same gentleman to myself:—

"In reference to what has recently been published on an improvement (or a *supposed* improvement) on your receipt for the manufacture of sea water, a friend of mine took me by the button and said, 'My dear Sir, Mr. Gosse is altogether wrong; he has not salt enough; he has no —.' To which I replied, pointing to two fine *Actinia dianthus* in full blow in one of my vessels,— 'But if Mr. Gosse is altogether wrong, why do these *Actiniæ* flourish?' This was unanswerable."



Gosse, Philip Henry. 1855. "IV.—On artificial sea water." *The Annals and magazine of natural history; zoology, botany, and geology* 15, 17–19.

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