

AUSTRALIAN MUSEUM SCIENTIFIC PUBLICATIONS

Whitelegge, T., 1891. On the organism discolouring the waters of Port Jackson. *Records of the Australian Museum* 1(7): 144–147. [30 June 1891].

doi:10.3853/j.0067-1975.1.1891.1247

ISSN 0067-1975

Published by the Australian Museum, Sydney

nature culture **discover**

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Shell elliptical, subcylindrical, perforate ; colour, the two latter whorls pale yellow, the former purple ; whorls $4\frac{1}{2}$, flattened, angled below the suture, the last exceeding the rest in length ; sculpture, last whorl encircled by five, the penultimate by three, wide flat-topped lyræ, crossed longitudinally by fine striæ ; suture impressed ; umbilical chink oblique, narrow ; spire obtuse ; peristome free, entire, ovate, expanded. Length $2\frac{1}{2}$, breadth 1 mill.

Hab. The creek to the north of the Old Settlement.

23. B. RAMSAY, *Brazier*, 1889.

Illustration. *Brazier*, Aust. Mus. Mem. 2, pl. 4, figs. 15, 16, (reversed).

Type. Australian Museum.

Shell narrowly ovate, perforate ; colour corneous ; whorls $4\frac{1}{2}$, convex, the last two-thirds of the total length ; sculpture faint oblique striæ ; suture impressed ; spire obtuse ; umbilical chink narrow oblique ; aperture obliquely ovate, effuse below, angled above, peristome entire, slightly expanded and reflected. Length 4, breadth 2 mill.

Hab. Running streams on the eastern flanks of Mt. Ledgbird.

ON THE ORGANISM DISCOLOURING THE WATERS OF PORT JACKSON.

BY THOS. WHITELEGGE.

[THE following report on the discolouration of the waters of the harbour has been prepared by authority of the Trustees of the Australian Museum, at the request of the Commissioners of Fisheries for New South Wales.

It is a preliminary report, and has already appeared in some of the Sydney daily papers. Mr. Whitelegge is still engaged in the investigation, and in the preparation of a paper on the subject.—ED.]

Australian Museum, 13th April, 1891.

To Dr. E. P. Ramsay, F.R.S., E., Curator.

Sir,—I have the honour to report that, in accordance with your instructions, I have visited various parts of the harbour, with the view of ascertaining the probable effects of the *Peridinium*

—which is the cause of the discolouration of the water—on fish and other organisms. The effect on the shore fauna has been very destructive; I find that the oysters, mussels, and other bivalves have been nearly all destroyed. At all the places I have visited, from Hunter's Hill, on the Parramatta River, down to Watson's Bay, the bivalves are killed, and at Little Sirius Cove the limpets and periwinkles are lying about with the animals still in the shells, mostly in a state of putrefaction; the stench from the bed of mussels is almost unbearable. During my examination of the shore I searched carefully for fish, but failed to find any dead ones, nor could I gain any information of any having been seen floating about in a dead or dying condition. The effect on the other kinds of life besides the mollusca has been very destructive, and there seems to be almost a total absence of the usual forms which live under stones, such as worms, ascidians, starfish, polyzoa and zoophytes—all seem to have suffered more or less.

The question as to how this vast destruction of shore life has been brought about is a rather difficult one to decide, and could only be satisfactorily determined by direct experiment in a well-appointed biological laboratory. I, however, submit the following as the result of my investigations in the matter, and in doing so I wish it to be distinctly understood that the conclusions are put forward tentatively, as a reasonable explanation of the phenomena.

In the first place, there cannot be the least doubt but that the *Peridinium* appears regularly each year in larger or smaller quantities; and I have been assured by various people that this discolouration of the water has been noticed on many occasions from 1856 down to the present time. But why has it appeared in such vast numbers during the last few weeks? It is highly probable that all the conditions favourable to its development have been nearly perfect, and the influences which might act injuriously have been reduced to a minimum. The very large rainfall may have affected the salinity of the water favourably, and the lengthened period of calm weather which has prevailed since its appearance might also contribute to its development. From what is known of the chemical composition of the *Peridinia* there is no reason why they should be regarded as injurious food for fish or any other organisms. The following account from the "Encyclopædia Britannica," 9th edition, Vol. xix., p. 859, is given to show that the composition of these organisms is very similar to that of diatoms, desmids, &c., which are known to constitute a highly nutritious food for fish, oysters, and other forms of animal life:—"The Dinoflagellata are either enclosed in a cuticular shell (*Ceratium*, *Peridinium*, *Dinophysis*, *Diplopsalis*, *Glenodinium*, *Prorocentrum*, &c.) or naked (*Gymnodinium* and *Polykrikos*). The cuticular membrane (or shell) consists of cellulose, or of a similar substance (cf. *Labyrinthulidea*), and not, as has been supposed, of silica, nor of chiton-like substance. . . .

The medullary protoplasm contains often chlorophyll, and also diatomin and starch or other amyloid substance. . . . The constitution of the cell-wall or cuticle from cellulose, as well as the presence of chlorophyll and diatomin, and the holophytic nutrition of many forms recently demonstrated by Bergh, has led to the suggestion that the dinoflagellata are to be regarded as plants, and allied to the Diatomaceæ and Desmidiaceæ. Physiological grounds of this kind have, however, as has been pointed out above, little importance in determining the affinities of Protozoa."

Another reason why the organism in question should not be regarded as injurious is that it does not appear to die and undergo decay. Some of those which I collected on 2nd April have been in a small bottle for ten days without change of water; and although the water swarms with bacteria and infusoria, they show no traces of decomposition; they are, in fact, still alive, but motionless. After remaining in the bottle for about four days they settled down to the bottom, and ever since they have been undergoing certain changes; the nucleus acquired a bright red colour, and afterwards divided into two nuclei; after division they began to enlarge, and the rest of the contained protoplasm was gradually absorbed, and finally there were formed two large orange-coloured spores. This condition is evidently the well-known encysted state, which obtains in many of the lower plants and animals. When encystment takes place, spores in most cases are provided with a thick cell-wall, and are endowed with a great power of resisting all kinds of injurious influences, so much so that many of these resting spores may be boiled, or kept in a dry state for a lengthened period, without destroying their vitality. If, in spite of such unfavourable conditions as mentioned above, they are capable of attaining to the encysted state, there is no reason to suppose that they would do otherwise when in their natural habitat. No doubt many of them may die, through injury, and make the water foul; but still there is no trace of the dead bodies of the *Peridinia* on the surface of the mud, or in the water where they are abundant.

If the organism does not die in large numbers, and its composition is not likely to be injurious, how has it acted so injuriously on the littoral fanna? This is a difficult question to answer without direct experiment on the organisms affected. There are, however, several ways in which this may have been brought about, without supposing that the effects are the result of any poisonous qualities, or that they arise from the death and decomposition of the *Peridinia* themselves. The bivalve mollusca have evidently been the most affected, and their decomposition has had some influence in killing the limpets, periwinkles, and other animal life. The death of the bivalves may be attributed to several causes; the *Peridinia* may have been present in such

numbers as to literally clog the gills and prevent respiration, or the water may have been so deficient in oxygen as to be unfit to support the higher forms of life, or they may have been so overfed as to produce indigestion and sickness. No doubt any one of these causes acting for weeks in succession, or a combination of the whole, would be sufficient to render the entire littoral fauna unhealthy; and every death of the larger animals would tend to make the conditions worse for those that remained. I examined the stomachs of both oysters and mussels, and found them full of *Peridinia*, and in many cases the water enclosed in the shell contained great quantities in a living condition.

From what I have observed of the habits of the particular species of the *Peridinia* in question they appear to be extremely social, and seek each other, and swim in lines or clouds, always with a tendency towards the light; and, as it is probable they do not extend to a great depth, the bottom fauna will not be so much affected as the littoral. The sudden appearance of this organism, which has discoloured the whole of the waters of Port Jackson and destroyed a very considerable portion of its fauna, is another instance of our ignorance of the various conditions which affect our marine food supplies, and shows the importance and necessity of the immediate establishment of a thoroughly efficient biological station. If such an Institution had been in existence during the presence of this extraordinary visitation, the whole of the question as to its effects on our marine fauna could have been satisfactorily determined experimentally.

I have the honour to be, Sir, your obedient servant,

THOMAS WHITELEGGE.

P.S.—(7th May) The *Peridinium* mentioned in the above report is probably a new species, and will be dealt with in a further report. The organism in question made its appearance in vast numbers about the middle of March, and is now disappearing.—T.W.

NOTE ON THE NIDIFICATION OF *PLOTUS NOVÆ-HOLLANDIÆ*, Gould.

The New Holland Snake-bird or Darter.

BY A. J. NORTH, F.L.S.

THE Trustees of the Australian Museum have lately received the eggs of *Plotus novæ-hollandiæ*, taken by Mr. J. L. Ayres at Lake