

Locality and Horizon. Regan's allotment, Northern railway, 31 miles from Townsville, North Queensland. Devonian.

Collection. Geological Survey of North Queensland, Townsville, N. Q.

EXPLANATION OF PLATE VI.

- Fig. 1.* *Alveolites alveolaris*, de Kon., sp. Portion of a specimen, showing the elevations upon the surface. Enlarged twice.
Fig. 1 a. Portion of another specimen, showing the mural pores. Enlarged about 25 times.
Fig. 1 b. Transverse section of this specimen. Enlarged about 25 times.
Fig. 1 c. Longitudinal section. Enlarged about 25 times.
Fig. 1 d. Copied from pl. ii. fig. 4, 'Foss. Pal. Nouv. Galles du Sud,' by L. G. de Koninck.
Fig. 2. *Aleolites alveolaris*, var. *queenslandensis*, Eth. & Foord. Transverse section. Enlarged about 25 times.
Fig. 2 a. Longitudinal section of the same species, showing pores. Enlarged about 25 times.
Fig. 2 b. Another longitudinal section, showing the tabulæ. Enlarged about 25 times.
Fig. 3. *Amplexopora Konincki*, Eth. & Foord. Portion of the surface, enlarged about 50 times.
Fig. 3 a. Transverse section. Enlarged about 50 times.
Fig. 3 b. Transverse section. Enlarged about 25 times.
Fig. 3 c. Longitudinal section. Similarly enlarged.
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XXIII.—Crustacea of the 'Albatross' Dredgings in 1883.

By SIDNEY I. SMITH*.

VERY little has yet been published in regard to the zoological results of the deep-sea explorations carried on during the summer of 1883, by the United States Fish Commission, although the dredgings were among the most important yet made. Some of the remarkable forms of fishes discovered have been described by Drs. Gill and Ryder, but the writer's report on the Decapod Crustacea (eighty pages of text with ten plates), recently put in type for the Fish Commission Report for 1882, is the first detailed report on the zoological collection made by the 'Albatross,' and affords an opportunity for a brief review of the results of the study of the higher Crustacea, which is here published by permission of the Commissioner of Fish and Fisheries.

The dredgings of the 'Albatross' extended from off Cape Hatteras to the region of George's Banks. The number of dredging-stations was 116, of which 30 were in less than 100 fathoms, 35 between 100 and 500 fathoms, 19 between 500

* From the 'American Journal of Science,' July 1884, pp. 53-56.

and 1000 fathoms, 27 between 1000 and 2000 fathoms, and 5 below 2000 fathoms. The whole number of species of Decapoda determined from these stations is 72, but of these at least 15 are true shallow-water species. Of the remaining 57 species, 40 were taken below 500 fathoms, 29 below 1000 fathoms, 13 below 2000 fathoms, and 6 at a single haul in 2949 fathoms. Of the 29 species taken below 1000 fathoms, 21 are Caridea or true shrimps, and the eight higher species are distributed as follows:—2 Eryontidæ, 3 Galatheidæ, 1 Paguroid, 1 *Lithodes*, and 1 Brachyuran belonging to the Dorippidæ. It is interesting to compare these results with the lists of the fauna of the North Atlantic below 1000 fathoms, given by the Rev. Dr. Norman in the presidential address to the Tyneside Naturalists' Field-Club, published last year. In Dr. Norman's lists only 12 species of Decapoda are recorded, none of them from as great a depth as 2000 fathoms, and of these 12 species 7 were known only from the 'Blake' dredgings of 1880.

The following are some of the more interesting new forms:—a new genus of Brachyura allied to *Ethusa*, 1496 to 1735 fathoms; an Anomuran belonging to A. Milne-Edwards's new genus *Galacantha*, 1479 fathoms; two species of *Pentacheles* (a genus of Eryontidæ, allied to *Willemoesia*), between 843 and 1917 fathoms; a stout Palæmonid (*Notostomus*), 6 inches long and intense dark crimson in colour, 1309 to 1555 fathoms; a gigantic *Pasiphaë*, 8½ inches long, 1342 fathoms; three species of a remarkable new genus allied to *Pasiphaë*, and also to *Hymenodora* and some other genera of Palæmonidæ, which shows that *Pasiphaë* is closely allied to the Palæmonidæ; a large Penæid, 1 foot in length, referred to the little-known genus *Aristeus*; and a large *Sergestes* 3 inches in length.

The great size of some of these new species of shrimps is remarkable, but is far exceeded by two of the previously described crabs. *Geryon quinquedens*, from 105 to 588 fathoms, is one of the largest Brachyurans known, the carapax in some specimens being 5 inches long and 6 broad; while one specimen of the great spiny *Lithodes Agassizii* measures 7 inches in length and 6 in breadth of carapax, and the outstretched legs are over 3 feet in extent.

Among the Schizopoda there are two large species of *Gnathophausia*, one over 4 inches in length, and a *Lophogaster*, all from below 2000 fathoms. One of the most interesting Schizopods is a small *Thysanoessa* (a genus of Euphausidæ) from 398 to 1067 fathoms, of which one female was found carrying eggs. The eggs are carried in an elongated and

flattened mass beneath the cephalothorax, are apparently held together by some glutinous secretion, and are attached principally to the third pair of pereopods (antepenultimate cephalothoracic appendages). This apparently confirms Bell's statement in regard to the egg-carrying of *Thysanopoda Couchii*, which is, as far as I know, the only published observation of egg-carrying in any of the Euphausiæ.

The Amphipoda from deep water are comparatively few in number and have not yet been carefully examined; but among them is one specimen of the gigantic *Eurysthenes gryllus*, Boeck (*Lysianassa Magellanica*, Milne-Edwards), probably the largest of all known Amphipoda. This specimen, which is over $4\frac{1}{2}$ inches long, and very stout in proportion, was taken in 1917 fathoms, north lat. $37^{\circ} 56' 20''$, west long. $70^{\circ} 57' 30''$. The few previously known specimens came from Cape Horn, Greenland, and Finmark, and have apparently all been taken from the stomachs of fishes. This species and its occurrence in the extreme arctic and antarctic seas have been much discussed and form the subject of a long memoir by Lilljeborg; but the apparently anomalous distribution is explained by its discovery in deep water off our middle Atlantic coast.

The great differences in depth through which some of the species range is worthy of notice, several species ranging more than 2000 fathoms, as shown in the list, given further on, of species taken below 2000 fathoms. I have not yet noticed distinct varietal differences due to depth in any species, though there is often a very marked change in the associating species. A very remarkable case is that of *Parapagurus pilosimanus*, which was taken at fifteen stations, and in 250 to 640 fathoms, by the 'Fish Hawk' and 'Blake,' in 1880-81-82, and in great abundance at one station in 319 fathoms, where nearly 400 large specimens were taken at once. All these earlier specimens were inhabiting carcinoëcia of *Epizoanthus paguriphilus*. In the dredgings last summer the *Parapagurus* was taken at seven stations ranging in depth from 1731 to 2221 fathoms; but none of the specimens were associated with the same species of *Epizoanthus*, some being in a very different species of *Epizoanthus*, others in naked gastropod shells, and still others in an actinian polyp.

A striking characteristic of the deep-sea Crustacea is their red or reddish colour. A few species are apparently nearly colourless, but the great majority are of some shade of red or orange, and I have seen no evidence of any other bright colour. A few species from between 100 and 300 fathoms are conspicuously marked with scarlet or vermilion, but such bright markings were not noticed in any species from below

1000 fathoms. Below this depth orange-red of varying intensity is apparently the most common colour, although in several species, very notably in the *Notostomus* already referred to, the colour was an exceedingly intense dark crimson.

The eyes of these abyssal species are even more remarkable than their colours, as the following list of the Decapoda and larger Schizopoda taken below 2000 fathoms by the 'Albatross,' with the notes which follow, will show:—

	fathoms.
1. <i>Parapagurus pilosimanus</i>	1731 to 2221
2. <i>Pontophilus abyssi</i>	1917 to 2221
3. <i>Nematocarcinus ensiferus</i>	588 to 2030
4. <i>Acanthephyra Agassizii</i>	105 to 2949
5. <i>Acanthephyra</i> , sp.	2929
6. Genus allied to <i>Acanthephyra</i>	1395 to 2929
7. <i>Hymenodora glacialis</i>	888 to 2030
8. <i>Parapasiphaë sulcatifrons</i>	516 to 2929
9. <i>Parapasiphaë compta</i>	2369
10. <i>Amalopenæus elegans</i>	640 to 2369
11. <i>Aristeus</i> ? <i>tridens</i>	843 to 2221
12. <i>Hepomadus tener</i>	2949
13. <i>Sergestes mollis</i>	373 to 2949
14. <i>Gnathophausia</i> , sp.	858 to 2033
15. <i>Gnathophausia</i> , sp.	959 to 2949
16. <i>Lophogaster</i> , sp.	1022 to 2949

In every one of these sixteen species the eyes are present, in the normal position, and distinctly faceted. In nos. 3, 4, 5, 6, 11, and 12 the eyes are well developed, black, and, while somewhat smaller than in the average *Palæmonidæ* and *Penæidæ*, not conspicuously smaller than in many allied shallow-water forms. In 1 the eyes are black, but conspicuously smaller than in the allied shallow-water species. In 13 the eyes are black and of moderate size. In 9 they are apparently black or nearly black and small. In 2 they are nearly colourless in alcoholic specimens and rather larger than usual in the genus, but considerably smaller than in *Pontophilus gracilis*, a very closely allied species found in 200 to 500 fathoms. In 7 and 8 they are small and light coloured. In 10 they are rather small and dark brown. In 14, 15, and 16 they are not conspicuously different in size from those of allied shallow-water species and are dark brown.

However strong may be the arguments of the physicists against the possibility of light penetrating the depths from which these animals come, the colour and the structure of their eyes, as compared with those of blind cave-dwelling species, show conclusively that the darkness beneath 2000 fathoms of

sea-water is very different from that of ordinary caverns. While it may be possible that this modification of the darkness of the ocean abysses is due to phosphorescence of the animals themselves, it does not seem probable that it is wholly due to this cause.

The large size of the eggs is a marked feature in many of the deep-water Decapoda. The eggs of *Eupagurus politus* from 50 to 500 fathoms are more than eight times the volume of those of the closely allied and larger *E. bernhardus* from shallow water; and in *Sabinea princeps*, from 400 to 900 fathoms, they are more than fifteen times as large as in *S. septemcarinata* from 25 to 150 fathoms. The most remarkable cases are among the deep-water genera. *Galacantha rostrata* and *G. Bairdii*, from between 1000 and 1500 fathoms, have eggs 3 millim. in diameter in alcoholic specimens, while in the vastly larger lobster they are less than 2 millim. The largest Crustacean eggs known to me are those of *Parapsiphaë sulcatifrons*, a slender shrimp less than 3 inches long, taken between 1000 and 3000 fathoms. Alcoholic specimens of these eggs are fully 4 by 5 millim. in shorter and longer diameter, fully ten times the volume of the eggs of *Pasiphaë tarda* from 100 to 200 fathoms, more than 350 times the volume of those of a much larger shallow-water *Palæmon*, and each one more than a hundredth of the volume of the largest individual of the species. From the peculiar environment of deep-water species it seems probable that many of them pass through an abbreviated metamorphosis within the egg, like many freshwater and terrestrial species, and these large eggs are apparently adapted to produce young of large size, in an advanced stage of development, and specially fitted to live under conditions similar to those environing the adults.

XXIV.—*Notes on Sponges, with Description of a new Species.*

By STUART O. RIDLEY, M.A., F.L.S., &c.

THE following remarks are either based on specimens recently added to the collection in the British Museum, or suggested by the study of the collection.

MONACTINELLIDA.

Chalinidæ.

Cladochalina diffusa, n. sp.

Cladochalina diffusa, Ridley, Report on the Zoological Collections made during the Voyage of H.M.S. 'Alert,' p. 672, pl. xli. fig. D, d, d'.

Suberect, branching subdichotomously in one or more parallel



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