

Muscidæ Acalypteræ.*MICROPEZINÆ.*11. *Calycopteryx Moseleyi*.

Calycopteryx Moseleyi, Eaton, Ent. Month. Mag. xii. p. 59 (1875);
Verrall, Phil. Trans. clxviii. p. 239, pl. xiv. figs. 1 *a-e* (1879).

Royal Sound, Graves Island, Kerguelen, Jan. 19, 1874;
Heard Island, Feb. 6, 1874.

*EPHYDRINÆ.*12. *Amalopteryx maritima*.

Amalopteryx maritima, Eaton, Ent. Month. Mag. xii. p. 58 (1875);
Verrall, Phil. Trans. clxviii. p. 241, pl. xiv. fig. 2 (1879).

Heard Island, Feb. 6, 1874.

*BORBORINÆ.*13. *Anatalanta aptera*.

Anatalanta aptera, Eaton, Ent. Month. Mag. xii. p. 59 (1875); Verrall,
Phil. Trans. clxviii. p. 244, pl. xiv. fig. 4 (1879).

Heard Island, Feb. 6, 1874; Betsy Cove, Kerguelen Land,
Jan. 10, 1874.

Bibionidæ.14. *Bibio Marci*, var.

Tipula Marci, Linn. Syst. Nat. ed. x. vol. i. p. 588 (1758).

Eucosca Dock, Japan, May 1875.

The wings appear to be darker and the thorax duller than
in European specimens; but I will not venture to separate
the Japanese form as a distinct species.

15. *Plecia fulvicollis*.

Penthetria fulvicollis, Wied. Dipt. Exot. p. 31 (1821).

Aru.

LII.—Coral-soundings in the Solomon Islands.

By H. B. GUPPY, M.B., Surgeon H.M.S. 'Lark.'

THE following observations were made in different localities
of the Solomon group during 1882 and 1883.

1. *Selwyn Bay, on the west side of Ugi Island.*—The

shore-reefs which fringe this island attain their greatest width on the weather or east side, where they receive the brunt of the trade-swell. On the lee side, however, around the shores of Selwyn Bay, corals thrive in considerable profusion; and here my soundings were taken. Out of fourteen casts in depths less than 25 fathoms and more than 5 fathoms, sand was only brought up on the arming on two occasions; whilst out of fifteen casts in depths beyond 25 fathoms and extending to 50 fathoms, there was only one instance, viz. a cast of 26 fathoms, in which sand or gravel was not found on the arming. On examining the results of the four lines of soundings which I took, I am inclined to place the limit of depth at which coral thrives in this bay at between 20 and 25 fathoms. The branching Madreporæ and corals of the genus *Seriatopora* appeared from the broken fragments brought up in the arming to have a vertical range extending through the whole zone of coral-growth; the Madreporæ, however, apparently lived under more favourable conditions in the shallower water; whilst the *Seriatopora** seemed to prefer the lower limits of the zone. This accords with Mr. Darwin's experience on the leeward coast of Mauritius ('Coral Reefs,' 1842, p. 81).

2. *Port Mary, on the west side of Santa-Anna Island.*—This small island, which lies off the eastern extremity of St. Christoval, is an upraised coral-atoll, about 450 feet in height, and completely girt by shore-reefs which on the west side of the island almost enclose a large circular lagoon known as Port Mary. My soundings were taken off the outer edge of the reef enclosing this harbour. They extended to depths of between 70 and 80 fathoms, and included sixty-three casts. The conclusions to be deduced from the indications given by the arming of the lead may be briefly stated. The most favourable conditions for the growth of coral existed in depths less than 12 fathoms. Down to 20 fathoms living coral flourished, but in less profusion. Beyond that depth sand and gravel were more frequently brought up on the arming, and a depth varying between 20 and 30 fathoms represented the lower limit of the coral-zone. From the absence of *branching* corals, no fragment of living coral was brought up during the soundings. In only one cast was I able to recognize the nature of the coral from the form of the impression, when, from a depth of 17 fathoms, the arming preserved the prints of the large cells of one of the *Astræidæ*. From experimental observation I have found that in the majority of soundings the unavoidable swaying of the lead renders the

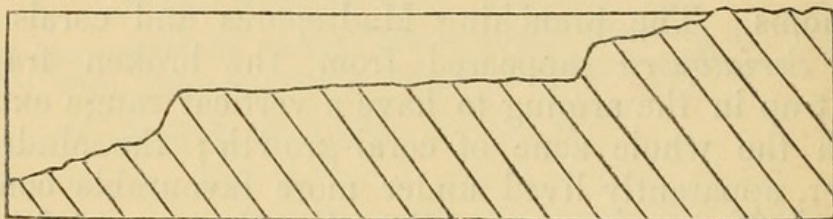
* Probably a new species.

impression difficult to recognize. In section 1, I have shown, drawn on the true scale, the seaward slope of that part of the reef at which the soundings were taken. For the first 100 to 150 yards from the edge of the reef the submarine slope was somewhat gradual until a depth of about 16 fathoms was reached, when, within a distance of two boats' length, the

Sections showing the Seaward Slopes of Reefs in the Solomon group.
(Drawn on a true scale to the 100-fathom line, $\frac{1}{10}$ inch = 100 feet.)

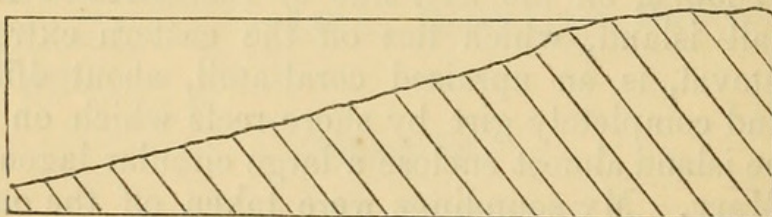
Section 1.—Port-Mary Reef, Santa Anna.

Sea-level.



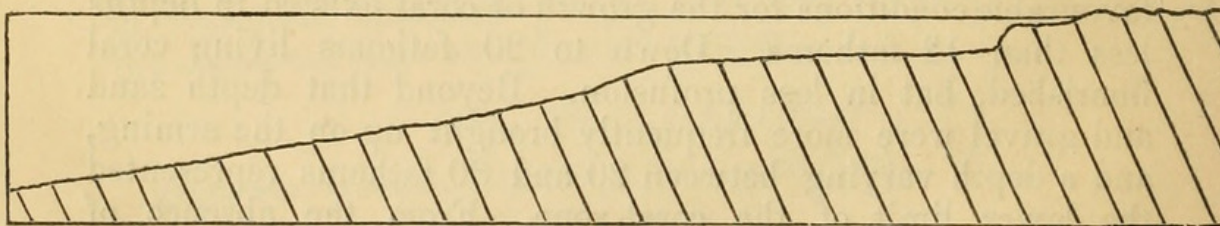
Section 2.—Reef of Onua Islet, Shortland Islands.

Sea-level.



Section 3.—Barrier-reef of Choiseul Bay.

Sea-level.



soundings suddenly increased in depth by about 100 feet, or another 16 fathoms. From the foot of this declivity there was an easy descent for about 450 yards, with a fall of some 50 or 60 feet, terminating in a precipitous slope where there was a drop of about 25 fathoms or 150 feet. The submarine slope beyond descended at a moderate angle to considerable depths. I have, however, terminated this section

at the 100-fathom line, having no reliable information of the greater depths. Santa Anna, I should add, rises out of deep water, where 200 fathoms of line have failed to reach the bottom.

3. *The Reef of Onua Islet*.—This islet is one of a group of islets and small islands situated on a broken line of barrier-reef which skirts the weather or south-east border of the Shortland Islands. My soundings were taken off the weather edge of this reef in a 'Rob Roy' canoe, and considerable caution had to be exercised in the shallower depths on account of the uncertain behaviour of the rollers. From a series of soundings between the depths of 6 and 33 fathoms, it would appear that the lower limit at which coral thrives on the seaward slope of this reef is about 20 fathoms. Beyond that depth the arming was thickly coated with sand and gravel. Section 2 shows on a true scale the submarine contour of this reef where the soundings were taken. For the first 100 yards from the edge of the reef-flat there was a gradual descent until a depth of 5 or 6 fathoms was reached, when there was a rapid fall of from 10 to 15 fathoms, followed by a moderate slope to the 100-fathom line.

4. *The Harbour of Treasury Island*.—In this harbour, which has a maximum depth reaching down to 46 fathoms, I found the living coral restricted, on account of the rapid descent of the submarine slope, to a narrow zone limited by a depth of from 12 to 15 fathoms. In the more open part of the harbour a calcareous mud, often foraminiferous and occasionally loamy, and derived from the material brought down by the streams, formed the bottom beyond the coral zone; but among the islets in the more sheltered south side of the harbour I found that calcareous gravel derived from the *débris* of corals and shells occurred in the deeper water.

5. *North-west Coast of Balālai Island, Bougainville Straits*.—This low island is of raised coral formation and fringed by shore-reefs. My soundings (over sixty in number) were taken off the north-west coast, which is the lee side of the island during the greater portion of the year. A depth of 15 fathoms apparently represented the lowest limit of the zone of corals. Beyond that depth the arming, in the great majority of the casts, came up thickly coated with calcareous sand and gravel. My soundings showed that extensive thickets of a branching *Porites* (*Porites lævis*, Dana) occurred in the shallower depths of from 2 to 8 fathoms, living fragments frequently breaking off in the arming. This species of coral apparently occupied the region that is usually usurped

on the protected sides of islands by the arborescent Madrepores. The branching coral most frequent in the greater depths was a slender Madre pore, fragments of which, bearing the living polyps, came up in the arming from depths of $9\frac{1}{2}$, 10, and 13 fathoms. I should add that a portion of an Alcyonarian (*Anthelia*), was brought up from $13\frac{1}{2}$ fathoms.

6. *The Barrier-reef of Choiseul Bay.*—This bay lies within a broken line of barrier-reef which skirts the western extremity of the large island of Choiseul, at a distance of from one half to three quarters of a mile from the shore. Basing his observation on Bougainville's chart of this bay, Mr. Darwin inferred ('Coral Reefs,' p. 167, edit. 1842) that part of the shores is fringed by coral-reefs. In reality the reefs have the characters of the barrier class, although associated with shore-reefs to the northward and southward of the bay; and the capacious anchorage with a depth of from 13 to 18 fathoms, which Choiseul Bay affords, owes its existence to the fact of its lying within a line of barrier-reef. The intention of the French navigator to anchor in this harbour was frustrated by an attack made by the natives on his boats whilst employed in searching for an anchorage. For this reason his plan of the harbour was imperfect, and may be viewed as merely a preliminary sketch. My soundings off this barrier-reef gave results somewhat at variance with my previous experiences. I was surprised to find that in fifteen casts between the depths of 3 and 20 fathoms sand or gravel was brought up on the arming on seven occasions, and that six out of fourteen casts in depths between 20 and 40 fathoms gave a similar indication of the bottom. A living fragment of Madre pore was brought up from 13 fathoms. In a cast of 23 fathoms the arming preserved the impression of the cells of one of the *Astræidæ*, and in another of 31 fathoms there was a rounded impression of the size of a billiard-ball, the inner surface of which retained the prints of small cells as if of a *Porites*. The conclusion at which I arrived after extending my soundings to 40 fathoms, at a distance of about 600 yards from the shore, was that I had not reached the lower limit of the coral-zone. An examination of the configuration of the bottom, as shown in section 3, may throw some light on this unusual experience. With the eye assisted by the lead I could observe that the submarine portion of the reef at first sloped gradually to a depth of 4 or 5 fathoms. There was then a sudden drop of another 9 or 10 fathoms, forming a steep declivity, at the foot of which began a broad platform with a gentle slope down to 25 fathoms, and terminating in another somewhat gradual slope. An inspection of this diagram would lead one to expect that an

accumulation of detritus would be found in depths of from 15 to 20 fathoms at the foot of the declivity, and that in the more level region beyond, from the absence of such accumulations, there would be more favourable conditions for the growth of coral. My soundings afford evidence that such is the disposition of the detritus on the outer slope of this reef. Eight out of twelve casts in depths between 15 and 20 fathoms brought up sand or gravel on the arming; whilst out of eleven casts in depths between 23 and 40 fathoms, seven showed a perfectly clean indentation, in two of which the nature of the coral was shown. There would thus appear in this reef to be a belt of sand and gravel separating the zone of coral into two parts, and situated in those depths in which corals are stated to cease to flourish. I was on the point of concluding that I had found in this band of sand and gravel the lower limit of the corals; but a subsequent extension of my line of soundings seaward prevented my falling into this error.

The question then arises, whether in other reefs there may not be a belt of detritus dividing the coral-zone into two portions. In reefs of which the submarine slope is rapid, or which are exposed to the whole strength of the trade-swell on the weather side of the island, it would be a difficult matter to ascertain the existence of such a belt, as in the former case an accumulation of detritus of small horizontal extent would reach downwards to a great depth; whilst the violence of the surf in the second instance would distribute the sand and gravel over a considerable area. In the somewhat gradual slope of the reef of Choiseul Bay there are more suitable conditions for the formation of such a belt of detritus*.

My observations on the outer slopes of reefs in this group point to the conclusion that the corals grew in greatest profusion in depths under 10 fathoms. Beyond this depth the sloping surface of the reef usually presented the character of extensive tracts of bare coral-rock, studded here and there with bosses of living massive corals, and marked at intervals by small patches of calcareous sand and gravel. In some isolated reefs, sunken some 6 to 8 fathoms below the surface, and only indicated to the navigator by the "rips" produced by the powerful tidal currents of these regions, I was much surprised by their comparatively barren aspect. Lark Shoal, an isolated reef exposed to the full force of the trade-swell in the eastern portion of the Solomon group, is covered by from

* It is worthy of note that in the cases of the soundings off the reefs of Santa Anna and Onua Islet, the lower limit of the coral-zone corresponds with the base of the declivities shown in the sections.

7 to 9 fathoms of water, and offers an instance of this nature. Here I expected to find the corals in luxuriance; but the appearance of its surface from the ship's side and the character of the soundings showed that the greater portion of its area consisted of dead coral-rock dotted with bosses of massive corals here and there. Such was the condition of another shoal in Bougainville Straits, which was covered by from 5 to 6 fathoms of water. Here the eye could discern an occasional dark-coloured boss of coral in a field of a pale grey hue, which was shown by the nature of the crushed material adhering to a heavy lead to be dead coral-rock.

A word with reference to the general character of the reefs in the Solomon group may not be out of place in concluding this paper. From the works of Krusenstern, Surville, Bougainville, and Labillardière, Mr. Darwin presumed that these islands were fringed ('Coral Reefs,' p. 167, edit. 1842). There are, however, numerous reefs in this archipelago which belong to the class of barrier-reefs. A barrier-reef of extensive nature is situated on the west side of Bougainville Straits, where it follows the edge of a wide submarine platform, which may be viewed as the submerged continuation of Bougainville Island. A smaller barrier-reef, previously referred to in the instance of Choiseul Bay, skirts the western extremity of the island of Choiseul on the opposite side of these straits. Similar lines of dangerous reefs lie off portions of the coasts of Guadalcanar, Malayta, and other islands. I hope on some future occasion to enter more fully into this subject, this reference to which must for the present suffice.

LIII.—*On the Relation of the Pali of Corals to the Tentacles.*

By Prof. P. MARTIN DUNCAN, F.R.S. &c.

PROF. LINDSTRÖM has brought under my notice that my late friend M. de Pourtalès differed from me in reference to the relation of pali to the tentacles of Corals. In noticing a very interesting form from the Caribbean Sea which has a Miocene ancestry, M. de Pourtalès considered the question of pali. He wrote, "Prof. Duncan's supposition that the office of the pali is to support an extra circle of tentacles is not borne out in this species, nor in any other paliferous coral of which I have had the opportunity of examining the polyp." We had a conversation on this point, and M. de Pourtalès told me that he had not had opportunities of seeing many living forms with pali with the soft parts extended, but that



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