BRITISH MUSEUM (NATURAL HISTORY).

BRITISH ANTARCTIC ("TERRA NOVA") EXPEDITION, 1910.

NATURAL HISTORY REPORT.

ZOOLOGY. VOL. III, No. 4. Pp. 127–136.

CRUSTACEA.

PART III.—CIRRIPEDIA.

BY

L. A. BORRADAILE, M.A.

(*Fellow, Dean and Lecturer of Selwyn College, Cambridge; Lecturer in Zoology in the University*).

WITH SEVEN FIGURES IN THE TEXT.

LONDON:

PRINTED BY ORDER OF THE TRUSTEES OF THE BRITISH MUSEUM.

Sold by LONGMANS, GREEN & Co., 39, Paternoster Row, E.C.; B. QUARITCH, 11, Grafton Street, New Bond Street, W.; DULAU & Co., LTD., 37, Soho Square, W.;

AND AT THE

BRITISH MUSEUM (NATURAL HISTORY), Cromwell Road, London, S.W.

1916.

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THE "Terra Nova" brought back specimens of fourteen species of barnacles.* Five of them appear to be new, though, as is explained below, there is room for doubt in the case of four of these, on account of our lack of knowledge of the range of variation and of the life-history of forms to which they are related. Seven species were taken at or near New Zealand, four in the Antarctic, two at South Trinidad Island, and one from the bottom of the "Terra Nova" herself, the locality in which the ship acquired it being, of course, impossible to determine. None of the species was taken in more than one of these places, and there is nothing of interest in the occurrence of any of them where the Expedition found it, except in the remarkable case of *Hexelasma antarcticum*, and perhaps also in the appearance of *Conchoderma auritum* in New Zealand waters.

The following is a list of the species found, arranged according to localities:

Antarctic:

Scalpellum (*Arcoscalpellum*) *discoveryi*, Gruvel, 1907.
Scalpellum (*Arcoscalpellum*) *nymphonis*, n. sp. (?).
Scalpellum (*Arcoscalpellum*) *compactum*, n. sp. (?).
Hexelasma antarcticum, n. sp.

* By an unfortunate oversight the Report on the Cirripedia collected by the "Discovery" Expedition (Nat. Antarct. Exp. 1901–1904, Nat. Hist., Vol. III, 1907) contains no record of the localities where the specimens were obtained. They were as follows:—
Balanus psittacus (Molina). Port Ross, Auckland Islands.
Elminius rugosus, Hutton. Enderby Island, Auckland Islands.
Scalpellum discoveryi, Gruvel. "Discovery's" Winter Quarters, 5 fathoms.
Scalpellum bouvieri, Gruvel. "Discovery's" Winter Quarters, 10–20 fathoms. —S. F. H. (ED.).

New Zealand:

Smilium spinosum, Ann., 1911.
Lepas pectinata, Spengler, 1793.
Lepas testudinata, Aur., 1894.
Conchoderma auritum (L.), 1767.
Balanus amphitrite, Darwin, 1854.
Chthamalus stellatus (Poli), 1795.
Coronula diadema (L.), 1767.

South Trinidad Island:

Lithotrya atlantica, n. sp.
Balanus improvisus, Darwin, 1854.

On the hull of the "Terra Nova":

Lepas affinis, n. sp.

The following is a systematic description of the collection.

SUB-ORDER PEDUNCULATA.

FAMILY POLLICIPEDIDÆ.

1. *Smilium spinosum*, Ann., 1911.

Scalpellum (Smilium) spinosum, Annandale, Tr. N. Zealand Inst., XLIII, p. 164 (1911).

I have opened several individuals of this species without finding a dwarf male. One specimen harboured in its mantle numerous nauplius larvae, somewhat clumsy in shape and with rather short limbs. Very young barnacles are often to be found scattered over the stalk and mantle of what was presumably their parent. Probably the larvae have little power of swimming. The case resembles that of *S. stearnsi*, described by Hoek (Siboga Exped. Rep., Cirrip. Ped., p. 73, 1907).

Station 96 (7 miles E. of North Cape, New Zealand. 70 fathoms).

2. *Scalpellum (Arcoscalpellum) discoveryi*, Gruvel, 1907. Fig. 1.

Scalpellum discoveryi, Gruvel, Nat. Antarct. Exped. 1901–1904 ["Discovery"], Nat. Hist., III, Crust. VI, p. 2, pl. figs. 4–6 (1907).

A specimen of this species was taken on the pycnogonid *Ammothea glacialis* in the Antarctic. It is intermediate in characters between the two individuals figured by Gruvel, and, like them, shows the features of the section *Mesoscalpellum*,* though there may well be a later stage of the species which has those of a *Neoscalpellum*.

* See Pilsbry, Proc. Ac. Philadelphia, LX, p. 110, 1908. *Mesoscalpellum* and *Neoscalpellum* are treated by Pilsbry as sections of the subgenus *Arcoscalpellum*, s. lat.

It was accompanied by a smaller specimen (Fig. 1), probably a young example of the same species. This, like the young stages of *S. larvale* and *S. japonicum*,* is indistinguishable in general features from the members of the section *Arcoscalpellum*, s.s. It may be recognized among the other forms assigned to that section by the following combination of characters: the carina is continuously curved: the lower border of the tergum is very oblique, and very slightly sinuous; the carinal border of the same plate is almost straight, very slightly convex in its lower part, about half of it projecting beyond the carina: the lateral border of the scutum is convex and notched distally for the reception of a projection of the adjacent angle of the upper lateral plate; this projection alone prevents the upper latus from having a pentagonal shape: the carino-lateral is deep, and notched where it meets the shoulder of the carina: the umbo of the carino-lateral does not project beyond the outline of the capitulum; the inframedian plate is tall and narrow, with slightly concave sides, and only a little broader at the base than at the distal end; the rostro-lateral is transversely oblong, its umbo not projecting beyond the outline of the capitulum. The scales of the peduncle are sub-triangular, and broad, but not imbricating. The length of the capitulum is 6 mm. These specimens are from Station 340 (7° 56′ S., 164° 12′ E., 160 fathoms). At Station 356 (off Granite Harbour, entrance to McMurdo Sound, 50 fathoms) there were taken three exactly resembling the smaller described above.

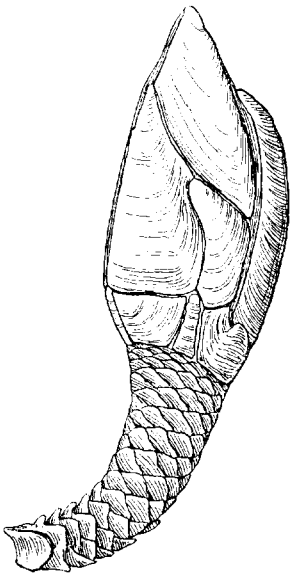

Fig. 1.—*Scalpellum* (*Arcoscalpellum*) *discoveryi*, juv. (?). × 8.

Scalpellum (*Arcoscalpellum*), spp. ? juv.

I am compelled to describe here as new species two small Scalpella related to, but, as it seems, quite distinct from, that which I have treated as the young of *S. discoveryi*. Very possibly they are the young of Mesoscalpella or Neoscalpella, and, it may be, of species already known to science. The same possibility exists in regard to other members of the section *Arcoscalpellum*, s. str., though it is necessary for purposes of reference that all such forms should receive, on their description, specific names of their own.

3. *S.* (*A.*) *nymphonis*, n. sp. (?). Fig. 2.

An *Arcoscalpellum* rather smaller than the early stage of *S. discoveryi* described above (length of capitulum 4·5 mm.), and differing from it as follows: the uncalcified strips between the plates are wider:

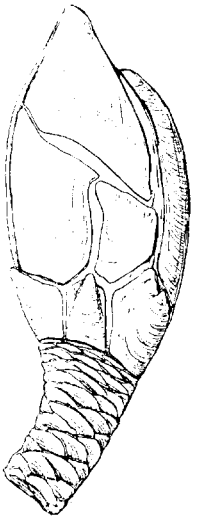

Fig. 2.—*Scalpellum* (*Arcoscalpellum*) *nymphonis*, n. sp. (?). × 10.

* Pilsbry, *loc. cit.* and Bull. Bur. Fish., XXVI, pl. VI, fig. 4, 1907.

the free part of the tergum is shorter: the lower border of the same plate is concave: the lateral border of the scutum is much less convex; the inframedian plate is pentagonal, with a thickened triangular area which leaves at the side structures like the radii of a *Balanus*; the umbo of the rostro-lateral projects beyond the outline of the capitulum: the scales of the peduncle are narrower.

One specimen was taken at Station 349 (off Butter Point, western shore of McMurdo Sound, 80 fathoms), growing on a pycnogonid of the genus *Nymphon*.

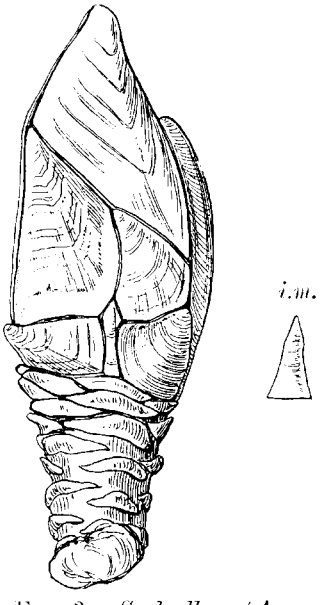

FIG. 3.—*Scalpellum* (*Arcoscalpellum*) *compactum*, n. sp. (?). × 9. *i.m.*, inframedian plate of opposite side.

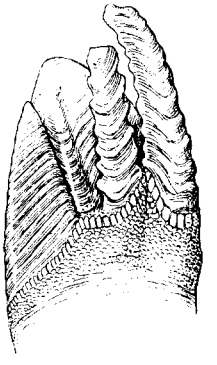

FIG. 4.—*Lithotrya atlantica*, n. sp. Capitulum. ×6.

FIG. 5.—Jaws of *Lithotrya*. *a*, mandible of *L. atlantica*: *a'*, mandible of *L. pacifica*; *b*, maxilla of *L. atlantica*: *b'*, maxilla of *L. pacifica*.

4. *S.* (*A.*) *compactum*, n. sp. (?). Fig. 3.

An *Arcoscalpellum* of about the same size as the supposed young stage of *S. discoveryi* (length of capitulum 5·5 mm.), but differing from it as follows: the lateral border of the scutum is not notched: the produced angle of the upper lateral plate is much sharper: the carino-lateral is not notched where it meets the shoulder of the carina: the umbo of the rostro-lateral projects beyond the outline of the capitulum, but transversely, not with an upward trend, as in *S. nymphonis*; the inframedian plate is triangular with the apex distal (except on one side of one specimen, where it is very narrow, with a spear-head at the distal end): the plates of the peduncle are narrower and more widely separated.

One specimen was taken at Station 356 (off Granite Harbour, western entrance to McMurdo Sound, 50 fathoms).

5. *Lithotrya atlantica*, n. sp. Fig. 4, Fig. 5, *a*, *b*.

Three specimens of a *Lithotrya*, taken in calcareous rock on the shore at South Trinidad Island, closely resemble *L. pacifica*, Borr., 1900, but differ from that species in having the distal row of scales of the peduncle much smaller and more numerous, and also in the mouth-parts (Fig. 5). The distance between the first and second teeth of the mandible is much greater than, instead of being nearly the same as, that between the second and third; and the lobes of the maxilla are not so distinct. The palps and maxillules, though not identical in the only two specimens I have been able to compare, are less unlike. The above-mentioned differences are probably specific.

Station 36.

Family LEPADIDAE.

Sub-Family LEPADINAE.

6. *Lepas pectinata*, Spengler, 1793.

Lepas pectinata, Spengler, Darwin, Lepadidae, p. 85, pl. I, fig. 3, Ray. Soc. (1851); Pilsbry, Bull. U.S. Nat. Mus. 60, p. 81, pl. VIII, figs. 4–8 (1907).

Half-a-dozen specimens with well-marked ribs and moderate pectination were taken on floating weed at Station 89 (off Three Kings Islands, surface).

7. *Lepas testudinata*, Aur., 1894 (?).

Lepas testudinata, Aurivillius, K. Svenska Vet. Ak. Handl. XXVI, no. 7, p. 7, pl. I, figs. 1–3; pl. VIII, fig. 4 (1894).

The "Terra Nova" example appears to belong to this species by every character except the absence of the second filamentary appendage. As, however, the specimen is somewhat damaged in the region of that structure, it is possible that the appendage was really present.

Station 143 (34° 58′ S., 170° 12′ E., surface).

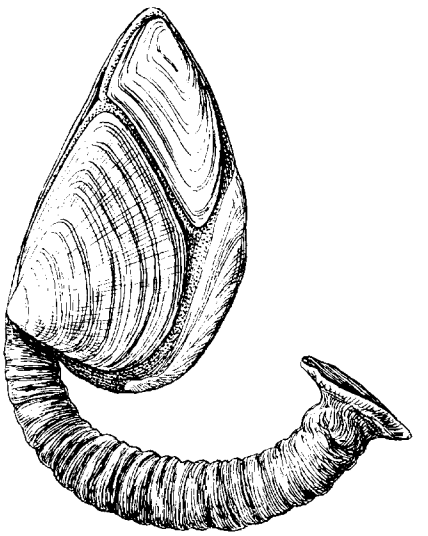

Fig. 6. —*Lepas affinis*, n. sp. × 1½.

8. *Lepas affinis*, n. sp. Fig. 6.

Numerous specimens of a *Lepas*, removed from the bottom of the "Terra Nova" while she was in Lyttelton Harbour, in October, 1911, are nearly related to *L. hilli*, but differ from that species in the following respects:—

1. The occludent edge of the scutum is either straight, or slightly concave, or slightly convex, not markedly convex, as in *L. hilli*.
2. There is less space than in *L. hilli* between the carina and scutum, and the branches of the forked end of the former extend further beneath the latter. This appears to be due to a greater width of the scutum.

3. There are only two pairs of filamentary appendages.
4. The peduncle is longer and narrower than that of *L. hilli*.
5. The skin is black. In *L. hilli* it is generally yellowish.

It is possible that this is merely a variety of *L. hilli*, but on the whole the differences between the two forms appear sufficiently pronounced to necessitate the recognition of a new species.

The plates of the shell are strong, white, and polished, with well-marked lines of growth, but very faint radial striae. The fork of the carina is at about the same angle as that of *L. anatifera*, but between its prongs is a small median prominence. The scuta have no umbonal teeth.

It is of course impossible to say in what quarter of the globe the "Terra Nova" received the larvae of this species.

9. *Conchoderma auritum* (L.), 1767.

Conchoderma aurita (L.), Darwin, Lepadidae, p. 141, pl. III, fig. 4 (1851).

Numerous specimens from *Megaptera nodosa* in the Bay of Islands and off Cape Brett, New Zealand.

Sub-order OPERCULATA.

Tribe SYMMETRICA.

Family BALANIDAE.

10. *Balanus amphitrite*, Darwin, 1854.

Balanus amphitrite, Darwin, Balanidae, p. 240, pl. V, fig. 2 (1854).

Several specimens of var. *communis*, on whelk-shells, associated with small anemones, were taken at Station 134 (11–20 fathoms, near N. Cape, New Zealand).

11. *Balanus improvisus*, Darwin, 1854.

Balanus improvisus, Darwin, Balanidae, p. 250, pl. VI, fig. 1 (1854).

Several small specimens from rock-pools in South Trinidad Island.

12. *Hexelasma antarcticum*, n. sp. Fig. 7.

A number of valves, some badly broken, others almost complete, belonging to several specimens of a large balanid barnacle were obtained under unusual circumstances. The original label reads, "Evans Cove, Terra Nova Bay, Victoria Land. In glacier, 30 feet above sea level. Collected by R. E. Priestley." The individuals to which they belonged were members of a species closely related to *H. aucklandicum*

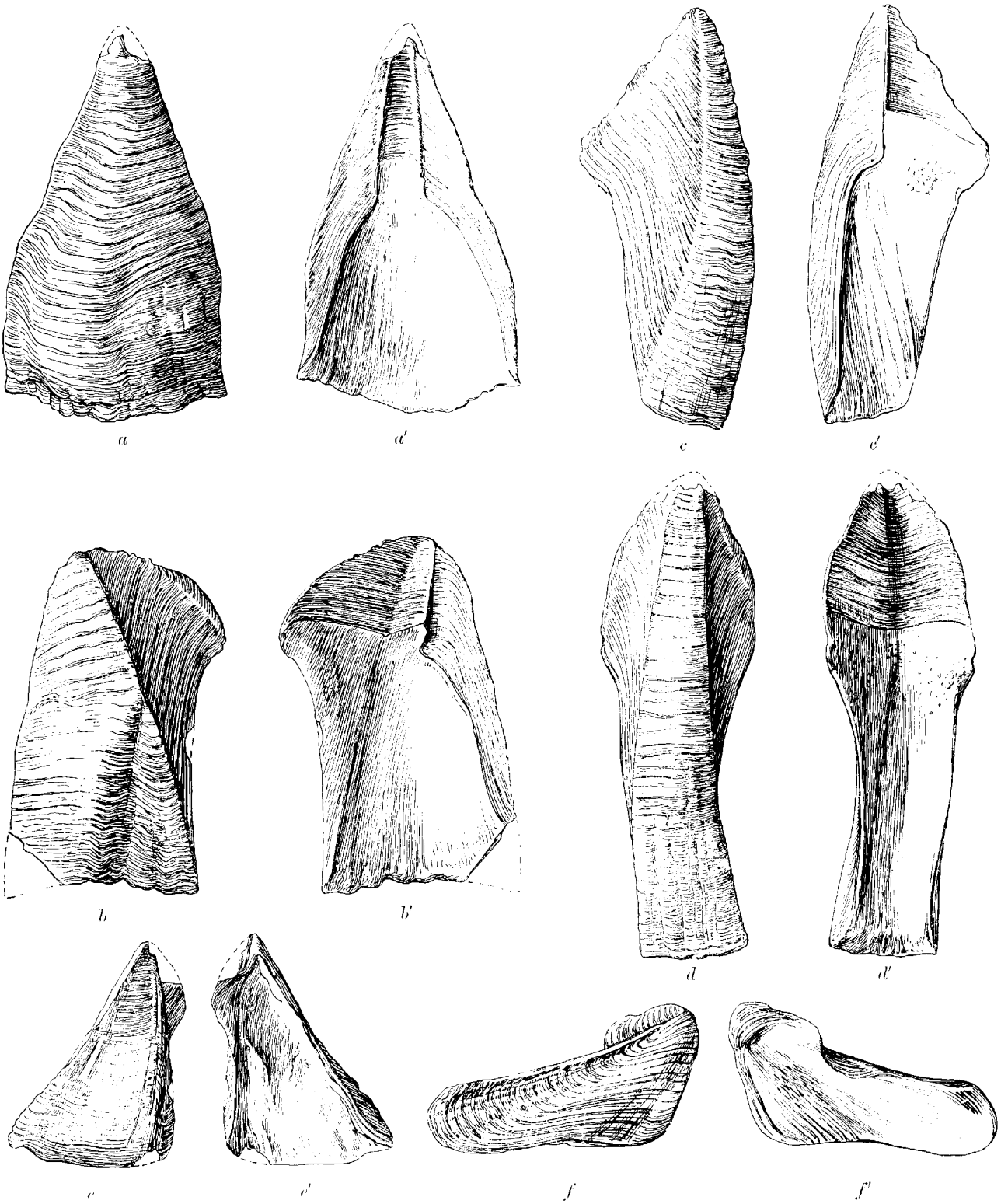

FIG. 7.—*Hexelasma antarcticum*, n. sp., nat. size. *a*, *a'*, external and internal views of rostrum; *b*, *b'*, the same of lateral; *c*, *c'*, the same of carino-lateral; *d*, *d'*, the same of carina; *e*, *e'*, the same of tergum; *f*, *f'*, the same of scutum. The valves figured are the most perfect specimens collected; they do not belong to the same individual.

(Hector), 1887 (Withers, P.Z.S., 1913, p. 840, pl. LXXXV), differing from it, however, in the following particulars:—

1. In the rostrum, the lateral strips marked with longitudinal lines extend to the base.

2. In the laterals, the ala is relatively wider, and the internal sculpture is a little different, the lines of the parietal margin lacking the downward bend where they meet the longitudinal ridge, and the transverse lines of the ala being stronger.

3. In the carino-laterals, the internal sculpture shows the same features as that of the laterals.

4. In the carina, the angles of the alae are nearer the apex of the valve, and the transverse sculpture of the inner side is stronger and more extensive.

The tergum and scutum are shown in Figs. 7*e*, *e'*, *f*, *f'*. The longest valve, a carina, would measure, if complete, nearly 90 mm. The rest are of the same order of magnitude.

The occurrence of this barnacle presents a very puzzling problem. It is not possible to judge from the appearance of the shells whether they are recent or fossil. The valves are all disarticulated, of a pure and brilliant whiteness, and without any trace of organic matter, but they are not imbedded in any matrix. They are covered with a very fine white dust, but this may be derived from the disintegration of their surface, though they are sharply sculptured, and retain *Spirorbis* shells that have grown upon them on both inner and outer surfaces. More probable traces of a matrix are minute sandy deposits which soil the surface here and there, but the meaning of these is doubtful. That the animals should be recent seems, however, hardly possible, for no trace of such a barnacle has been found in any dredging or collection either in the Ross Sea or elsewhere, nor—a stronger argument—can any satisfactory suggestion be made as to the way in which recent shells could have reached the position in which these were found. The nearest known relation of *H. antarcticum* is *H. aucklandicum* from the Miocene of New Zealand. The other described members of the genus are recent deep-sea species of small size. Withers thinks that the loose articulation and relative thinness of the shell of *H. aucklandicum* shows that it also lived below the littoral zone. The shell of *H. antarcticum* is similarly loosely articulated, though it is not particularly thin. If the new species be a fossil, it seems highly probable that it is, if not of Miocene age, at least Tertiary, for it is quite unlike any Cretaceous barnacle. Here, however, is the difficulty. No Tertiary rocks are known from the neighbourhood of the glacier in which the shells were found, nor, indeed, has anything later than the Carboniferous been reported in this region. It may be that somewhere in its course the glacier is in contact with Tertiary rocks. Decision upon this point must rest with the geologists. It is for them also to decide what bearing the facts here stated may have upon the history of the Antarctic Continent.*

* Hennig (Wiss. Ergebn. Schwed. Südpolar-Exped. III, X, p. 10, pl. XI, figs. 3–7, 1911) mentions the existence in the Pleistocene of Cockburn Island of a small *Balanus*, but this is quite unrelated to *Hexelasma antarcticum*.

13. *Chthamalus stellatus* (Poli), 1795.

Chthamalus stellatus (Poli), Darwin, Balanidae, p. 455, pl. XVIII, fig. 1 (1854).

With some doubt, I refer to this species six specimens, much eroded and with obliterated sutures, whose soft parts have not been preserved. They are from the Bay of Islands, New Zealand.

14. *Coronula diadema* (L.) 1767.

Coronula diadema (L.), Darwin, Balanidae, p. 417, pl. XV, fig. 3; pl. XVI, figs. 1, 2, 7 (1854).

The overlapping of the base of the shell of this species by the skin of the whale on which it stands might seem to be due to the growth of the epidermis of the host. A very interesting specimen in the British Museum shows that this is not the case. Some specimens of *Balanus crenatus* have settled upon a piece of oilcloth, and, no doubt by the growth of their shells, have scaled off the surface of the fabric and caused it to rise over their bases just as the skin of the whale is caused to rise.

Several specimens were taken on *Megaptera nodosa* off New Zealand, associated with *Conchoderma auritum*.

INDEX.

The more important references are indicated by black type.

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