

THE LORICATES OF THE NEOZELANIC REGION.

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I. (Continued.)

ISCHNOCHITON CIRCUMVALLATUS.

Plate ix., fig. 1.

1929. *Ischnochiton circumvallatus* Iredale and Hull, Austr. Zool., v., 316, pl. xxxiv., figs. 7-9.

At the place cited the history of this species was related and an immature specimen was figured. The adult is now pictured from a co-type of *Ischnochiton campbelli* Filhol = *Lepidopleurus melanterus* Rochebrune from Campbell Island (presented to one of us by Mr. Edwin Ashby ex Dupuis collection). This is a little larger than the majority of "*fulvus*" shells, but otherwise no distinction has been recognised.

II. Family LEPIDOPLEURIDAE.

This family is used to include Loricates which have lost the slitting of the insertion plates of the valves, or even the plates themselves. It is at present a heterogeneous assemblage, as proved by the radular characters, an item of some importance in this group. The mere fact that so-called Lepidopleurids provide distinctive styles of odontophore indicates the polyphyletic nature of the so-called family. Study of the members of the family further confirm this obvious conclusion, as they are found associated with such conditions that would allow the degeneration of the insertion plates through disuse. A comparison of such a Loricata as *Lepidopleurus cajetanus* Poli with (say) *Parachiton puppis* Hull would satisfy any student on this point. We have already recorded the intermediate stages in more than one family and will give full details of another (*Hemiarthrum*) in this work.

Shells of varying sizes, mostly small, of delicate texture (through their habitat) and scaly or spiculate girdle. Sculpture usually obsolete, pustulation rarely developing into strong radiation. Girdle covered with small scales or glassy spicules. Insertion plates generally missing in all valves; sutural laminae present, but reduced to small size.

It may be observed that the type of the genus *Lepidopleurus* is a rather heavy crass shell, very unlike any of the southern shells.

The Neozelanic forms can be separated into two genera as:—

Shell small with posterior valve normal; girdle scaly. . . . *Terenochiton*.
Shell larger with posterior valve generally disproportionately large; girdle clothed with glassy spicules. *Parachiton*.

Recently it has been suggested that as there is a minute spiculate edge to a scaly girdle these cannot be easily distinguished, but the youngest student should find no difficulty in this case.

ii. Genus TERENOCHITON.

1914. *Terenochiton* Iredale, Proc. Mal. Soc., xi. (March), 28. Type by original designation *Lepidopleurus subtropicalis* Iredale.

Shells of small size for the family (the smallest Neozelanic Loricates)

mostly unicolour, more or less elevated, elliptic ovals; sculpture consisting of minute distinct pustules, sometimes forming bead-like strings on central areas, commonly massed into rays on end valves. Girdle scales small, oval, striate.

Insertion plates absent throughout, but small distinct triangular sutural laminae present.

The curious station of the Kermadec type, under deeply buried stones between tide marks, has been confirmed by the collecting of the Sydney species (*badius*) at Long Reef, near Manly, N.S.W., of sixty to eighty specimens in one afternoon, under similar conditions.

7. TERENOCHITON INQUINATUS.

Plate ix., figs. 3-6.

1847. *Chiton inquinatus* Reeve, Conch. Icon., iv., pl. xxiii., sp. and fig. 154, (May). "Van Dieman's Land, Dr. Sinclair" error = New Zealand, we designate Auckland Harbour, North Island. Type in British Museum.
1892. *Ischnochiton inquinatus* Pilsbry, Man. Conch., xiv., 90, pl. xviii., figs. 49-50. Reeve's figures copied.
1896. *Lepidopleurus inquinatus* Pilsbry, Nautilus, ix., 108, January.
1897. *Lepidopleurus inquinatus* Suter, Proc. Mal. Soc., ii., 184, July.
1904. *Lepidopleurus inquinatus* (sic) Hutton, Index Faunae New Zeal., 87.
1905. *Lepidopleurus inquinatus* Hamilton, Col. Mus. Bulletin, No. 1, 36.
1913. *Lepidopleurus inquinatus* Suter, Man. N.Z. Moll, 7. Atlas: pl. 2, fig. 1; pl. 3, fig. 1.
1915. *Lepidopleurus inquinatus* Iredale, Trans. N.Z. Inst., xlvii., 1914, 423.
1921. *Lepidopleurus iredalei* Ashby, Proc. Roy. Soc. Vict., xxxiii., n.s., 155-7, pl. viii., fig. 3 a-b., May. Doubtless Bay, North Island, N.Z.
1923. *Lepidopleurus iredalei* Oliver, Trans. N.Z. Inst., liv., 1922, 529. Auckland Harbour.
1923. *Lepidopleurus iredalei* Finlay, Rep. Austr. Ass. Adv. Sci., xvi., 342.
1923. *Lepidopleurus inquinatus* Ashby, Trans. Roy. Soc., S.A., xlvii., 217 (corrects his error).
1924. *Lepidopleurus inquinatus* Odhner, Vidensk. Medd. Dansk. Nat. Foren. Bd. 77 (N.Z. Moll.), 5, fig. 1.
1926. *Lepidopleurus inquinatus* Finlay, Trans. N.Z. Inst., lvii., 331.

Reeve's description reads as follows: "Shell oblong-ovate, terminal valves and lateral areas of the rest concentrically somewhat obscurely ribbed, faintly radiately grooved, central areas longitudinally finely ridged, ligament horny, arenaceous; whitish, stained with a light brown spot along the summit of each valve.

"Habitat: Van Dieman's Land (Dr. Sinclair).

"The shell is sometimes partially stained throughout with the faint brown colour, which appears on the umbonal summit."

The re-discovery of the group of Loricates of which the present species is the commonest representative took place simultaneously in New Zealand and Australia nearly fifty years after the above description by Reeve. The species inhabiting the two localities were not differentiated at the time, but when Iredale compared the type series in the British Museum with Neozelanic specimens, they were found to agree exactly, while no Tasmanian shells could be found corresponding; it thus became obvious that the shells had been collected in New Zealand by Dr. Sinclair, as he collected more material there than in Tasmania, while the other Loricates he found in New Zealand were also localised incorrectly.

Ignoring this conclusion, based upon irrefutable data, Ashby described the New Zealand species as *Lepidopleurus iredalei* as follows: "*L. iredalei* differs from *L. inquinatus* Reeve, in that the girdle is clothed with comparatively large, flattened, irregular scales, quite different from the Tasmanian shell, in which species the scales are like minute, irregular grains of sand. In common with the other species, the girdle is furnished with a spiculate fringe, but in some of the specimens before me the girdle is almost otherwise bare of spicules. The latter (N.Z.) is more rounded than the Tasmanian, and the polished appearance is more persistent. The dark specimens vary from liver brown to hazel, and the lighter colour in the paler forms is cinnamon. Largest: 14 x 7 mm.; type, 8 x 4½; from Doubtless Bay, New Zealand."

Later, examining the type series in the British Museum, Ashby recognised his error and confirmed Iredale's conclusion. There are many species lumped at present under the name *inquinatus*, as Suter has recorded it from "25 fathoms, Hauraki Gulf," an impossible station for this littoral form. Odhner has remarked: "There is some variation in the sculpture in this species, the grains being somewhat larger than usual, by which their lateral arrangement at the later areas may be less distinct on account of their crowded disposition; this is obvious in the specimen from Campbell Island (fig. 1)."

Iredale observed years ago that probably more than one species was confused under the name "*inquinatus*," and one he had under observation is here described, but there may be many more.

8. *TERENOCHITON OTAGOENSIS* sp. nov.

Plate ix., fig. 11.

Shell very small, elongate oval, elevated, semi-keeled, side slopes curved, girdle scaly.

Colour reddish-buff, darker medially.

Sculpture consists of minute pustules, rayed on end valves, and lateral areas of median valves, and forming strings longitudinally on the pleural areas. On the anterior valve fifty closely packed radials may be counted and about forty on the post-mucronal area of the posterior valve; twelve radials are visible on the lateral areas, while about fifteen longitudinal chains of pustules are easily seen on each side of the jugum, closer packed jugally and widely raying laterally.

The mucro is at the anterior third, the post-mucronal slope a little concave.

Girdle scales minute, oval, striate.

Dimensions: Length, 7 mm.; breadth, 3.5 mm. (type).

Habitat: Otago, New Zealand. Type collected near Cape Saunders, shell also procured at Shag Point.

Station: Under stones just below high water mark.

Easily separated by its smaller size and bolder sculpture, the shells being worn and senile at the size given above.

9. *TERENOCHITON NORFOLCENSIS*.

Plate ix., figs. 7-10.

1912. *Lepidopleurus norfolcensis* Hedley and Hull, Proc. Linn. Soc. N.S.W., xxxvii., 273, pl. xi., figs. 1a-c. Norfolk Island. Type in Australian Museum.

The original description reads: "Shell small, elongated, low. Colour buff.

"Anterior valve ornamented by radial and concentric rows of small, close pustules, increasing in size and spacing toward the margin.

"Posterior valve: Mucro prominent, central; posterior slope even; clothed with close concentric rows of pustules.

"Median valves: Lateral areas slightly raised, not distinctly differentiated. The pustules on the central areas are inclined to longitudinal arrangement; those on the lateral areas are more transverse.

"Girdle broad, beset with small scales and spicules, the latter developing a marginal fringe. Length: 6 mm.; breadth, 3.5 mm.

"Station: Under loose stones at low tide.

"Habitat: Norfolk Island.

"Remarks: This shell is not common. It differs from the Australian species *L. badius* Hedley and Hull, in the more regular arrangement and larger size of the pustules."

10. TERENOCHITON CATENATUS.

Plate ix., figs. 12-15.

1912. *Lepidopleurus catenatus* Hedley and Hull, Proc. Linn. Soc. N.S.W., xxxvii., 273, pl. xi., figs. 2a-c. Lord Howe Island. Type in Australian Museum.

Originally described thus: "Shell small, elongated, low. Colour cream.

"Anterior valve with numerous rows of pustules, arranged radially and connected by short links, giving the appearance of concentric rings. The posterior margins raised, and more densely and irregularly pustulose.

"Posterior valve: Mucro prominent, slightly behind the middle, the anterior half sculptured, with longitudinal rows of pustules; the posterior half with radial rows.

"Median valves: Lateral areas raised posteriorly; latero-pleural areas sculptured, with 12-14 longitudinal rows of rounded pustules connected each to its fellow in the neighbouring row by low, slight, transverse links. On the central areas the rows are straight and set closer together, becoming increasingly concave to the axis as they recede.

"Girdle narrow, beset with minute scales.

"Length: 4.5 mm.; breadth, 2.5 mm.

"Station: On the under side of smooth stones.

"Habitat: Lord Howe Island.

"Remarks: This shell is rare and local, only one colony of five or six specimens being taken on a piece of basalt shingle in an open channel in the rocks at Ned's Beach, on the eastern side of the island. It is unlike any of the Australian or New Zealand species of the genus, and is remarkable for its prominent sculpture, and the curious differentiation in the arrangement of pustules on the posterior valve."

11. TERENOCHITON SUBTROPICALIS.

Plate ix., figs. 16-17.

1914. *Lepidopleurus* (*Terenochiton* n.) *subtropicalis* Iredale, Proc. Mal. Soc., xi., 28, pl. ii., figs. 10-17, March. Sunday Island, Kermadec Group. Type in Canterbury Museum, Christchurch, New Zealand.

1915. *Lepidopleurus subtropicalis* Oliver, Trans. N.Z. Inst., xlvii., 1914, 557, July 12, 1915.

Completely described at its introduction as follows: "Shell small, elongate oval, highly keeled, side slopes straight and steep, girdle scaly. General coloration uniform, pale reddish-yellow to brick; two specimens blackish-brown. Anterior valve flattened, with the apex elevated and slightly re-

curved, the anterior slope being faintly concave; the sculpture consists of minute pustules, arranged in very close radial rows. Median valves have their lateral edges almost straight, but somewhat raised; the sculpture of the lateral areas, which are differentiated by a slight fold, is simply pustulose, with no defined arrangement; the pleural areas are sculptured with slanting longitudinal rows of separated tubercles; from the edge of the valve ten rows can be counted before they become ill-defined and merging on the dorsal area. Posterior valve small, with the mucro anterior and elevated, the lateral slope concave. Sculpture as in the median valves. Inside coloration white. Insertion-plates absent. Sutural laminae low and broad, higher towards the outer edges of the valves, sinus broad. Girdle densely covered with minute striated scales.

"The preceding description is drawn up from a medium-sized specimen, selected as type. Minute juvenile specimens show the anterior valve, lateral areas of median valves, and posterior area of posterior valve to be simply pustulose, without any defined arrangement of the pustules, whilst the pleural areas of the median valves are sculptured with few well-defined longitudinal rows of tubercles, and the dorsal area is almost smooth. In an old crassate individual the pustules have developed into raised tubercles upon the anterior and posterior valves, and the dorsal area is strongly irregularly tuberculate, the longitudinal rows of the pleural areas showing indistinctly through the strong tubercles massing and somewhat merging.

"Length of type: 6.5, breadth, 4; size of largest specimen, 8 x 4.5 mm.

"Habitat: Sunday Island, Kermadec Group.

"Station: Living on the underside of embedded dirty stones below low water mark.

"Remarks: This little species recalls *Lorica* in miniature, and cannot well be confused with any other Australasian chiton. Its nearest relations are *Lepidopleurus norfolcensis* Hedley and Hull, from Norfolk Island, and *L. catenatus* Hedley and Hull, from Lord Howe Island. The authors note the relationship of the latter, but do not compare the former, which they contrast with the New South Wales *L. badius* Hedley and Hull. With the type of *Lepidopleurus* these small species have nothing in common save the absence of insertion plates. I am, therefore, introducing the new sub-generic name *Terenoichiton*, with *L. subtropicalis* Iredale, as type, and would for the present include all the small Australasian '*Lepidopleurus*' under this heading, though I can see little direct affinity between the present species and the Neozelanic *L. inquinatus* Reeve."

12. *TERENOCHITON FAIRCHILDI* sp. nov.

Plate ix., figs. 18-19.

1916. *Lepidopleurus kerguelenensis* Hedley, Austr. Antarc. Exped., 1911-14; Sci. Rep. Ser. C. Zool., iv., 34, November 6. Macquarie Island.

Not *L. kerguelenensis* Haddon, Rep. Chall. Zool., xv., 1886, pt. xliii., p. 12, pl. i., fig. 3; pl. ii., figs. 3a-e.

1926. *Lepidopleurus kerguelenensis* Finlay, Trans. N.Z. Inst., lvii., 332. Hedley's determination queried.

Shell small, narrowly elongate oval, elevated, rather keeled, girdle scaly.

Colour pink.

Sculpture obsolete, surface matt, practically smooth save for fine growth lines; many black specks (? eyes) occur all over; lateral areas little raised; anterior valve with half a dozen concentric growth lines, faint punctulation being noted with a strong lens towards the edge; mucro of pos-

terior valve ante-median, post-mucronal slope a little concave and here again a slight punctulation is preserved.

Girdle scales small.

Dimensions: Length, 8 mm.; breadth, 4 mm. (type).

Habitat: Macquarie Island.

Station: Under stones.

Type in the Australian Museum.

This delightful little species is named after Captain Fairchild, of the New Zealand Government steamer, who made large collections of natural history objects, and who probably secured some of the rare species of Loricates about fifty years ago. As this species was recorded as *L. kerguelenensis* Haddon, the description of that species is here added to emphasise the distinction: "*Shell*: Minute, smooth, or with scattered minute tubercles; the sides meet at an angle of about 100 deg., sutural laminae small, triangular. *Anterior valve*: Small, smooth, with scattered aborted tubercles. *Intermediate valves*: Central area smooth, with very faint longitudinal striae; lateral areas scarcely discernible, with faint radial striae and minute concentric interrupted ridges towards the apex, which pass into inconspicuous small scattered tubercles. *Posterior valve*: With full rounded umbo, behind which is a shallow depression. *Anterior area*: Similar to the central areas of the intermediate valves. *Posterior area*: Similar to the anterior valve. *Girdle*: Narrow, with delicate scales. *Colour*: Uniform whitish. *Size*: Length, 3 mm.; breadth, 1.5 mm. *Gills*: Posterior, eight or nine in number."

The size, 3 mm., and the tuberculose nature of the valves at that size indicate a very different mature species from that we have described, and Haddon's figures show no close likeness to our species.

iii. GENUS PARACHITON.

1909. *Parachiton* Thiele, Revision Chitonen (Chun's Zoologica, heft 56), pt. i., 1909, 14. Type by monotypy *Lepidopleurus* (*Parachiton*) *acuminatus* Thiele.

Shell elongately ovate, round-backed, of delicate texture, usually unicolour; median valves deep, posterior valve very large, generally abnormally long with the mucro subterminal; the surface sculpture consists of pustules like that of the preceding genus, but much less pronounced. Girdle covered with fine elongated glassy spicules. Interior of the valves shows no insertion plates and small sutural laminae. Thiele, when he introduced *Parachiton*, showed that the radula distinctly separated his group from that of *Lepidopleurus*, and the obvious conclusion was that the likeness was due to convergence through loss of insertion plates. The genus is widely spread in Austral-Neozelanic waters, a species as yet undescribed being dredged in the north of New Zealand by Scott's Antarctic Expedition years ago.

13. PARACHITON MESTAYERAE.

Plate ix., fig. 20.

1914. *Parachiton mestayerae* Iredale, Proc. Mal. Soc., ix., 27, pl. i., fig. 1 (March). Sunday Island, Kermadec Group. Type in Canterbury Museum, Christchurch, New Zealand.
1915. *Parachiton mestayerae* Oliver, Trans. N.Z. Inst., xlvii., 1914, 557, July 12, 1915.

Again the original description is sufficiently elaborated: "Shell elongate, faintly keeled, elevated, side slopes slightly convex, *last valve disproportionately large*, girdle spiculose. General coloration pink, slashed

with longitudinal white streaks. Anterior valve regularly quincuncially punctate. Median valves narrow, not beaked, first very slightly larger than the others; lateral areas little raised, the sculpture regular, quincuncial punctation, the pleural areas are closely longitudinally striate, the striation becoming finer as it approaches the dorsal ridge, where, however, it still persists. Posterior valve much larger than the anterior valve; the mucro elevated at about the posterior fourth, the posterior area being concave. The anterior portion is triangular, its length twice as long as the preceding valve; it is similarly sculptured to the pleural areas of the median valves, whilst the posterior area is regularly quincuncially punctate, the punctation showing clearly on account of the protection afforded by the concavity of this area. Inside coloration pinkish-white. Insertion plates absent. The sutural laminae small, irregularly quadrangular, and very far apart. The girdle, owing to the difficulty of preserving, appears somewhat imperfectly covered with very slender elongate needles, with a fringe of much longer silvery spicules. A minute curled juvenile specimen shows the same sculpture as the adult; the quincuncial punctation appears more prominently, and the longitudinal striae more pronounced.

"Length of type: 11 mm.; breadth, 6 mm. A much larger specimen curled up before it could be preserved.

"Habitat: Sunday Island, Kermadec Group.

"Station: Dredged off the north coast on gravelly bottom in 15 fathoms; also in Denham Bay in 25 fathoms.*

"Remarks: This is undoubtedly most nearly allied to *Lepidopleurus acuminatus* Thiele, but otherwise no other shell is comparable. *L. acuminatus* Thiele has the apex of the posterior valve more posterior, and consequently the posterior area more diminished. I have associated with this beautiful chiton the name of my friend, Miss M. K. Mestayer, as a mark of her interest in this group."

* Oliver has added: "Also living on underside of stones near low water mark, Coral Bay."

III. Family LEPIDOKITONIDAE.

This family of world-wide distribution is a prominent feature of the Neozelanic Region, as besides the huge Eudoxochitons (the largest members of the family) some half a dozen smaller species of Callochitonid facies have already been described. Moreover, these show close relationship with Australian species on the one hand, and South American species on the other.

Shells varying in size from small to very large, generally of dark, more or less uniform, coloration, which, however, in some cases in life is very brilliant, but the brilliance is fugitive; sculpture a somewhat uniform coarse granulation with secondary ditches or ridges evolved on pleural areas only; girdle characters distinctive; closely packed glassy-like elongate spiculate scales laterally arranged with sometimes scattered corneous processes; insertion plates long, thick, more or less coarsely denticulate, generally brittle, many slit in end valves, usually more than one slit in median valves; sutural laminae generally continuous. Eyes present.

iv. Genus ICOPLAX.

1892. *Icoplax* Thiele, Das Gebiss der Schnecken (Troschel), ii., 392. Type by monotypy *Chiton puniceus* Couthouy.

Shells of medium size, sometimes small, elevated, ovate; colour more or less uniform, generally in preserved specimens dull; sculpture of end valves and lateral areas of median valves coarsely granulose as the rest of the

shell, but pleural areas bearing ditches or ridges and distinctly separated. (Note:—In our Monograph of the Australian Loricates we wrote: "Central areas longitudinally grooved," but this does not exactly apply to the type species, the ridges being elevated above the general level). The girdle is comparatively wide and covered with long slender spicules, placed latitudinally.

The internal features of the type show only one slit on each side in the median valves, whereas nearly all the rest of the species of the family are characterised by multi-slitting in this place. Moreover, while the insertion plates are generally grooved and brittle, some are scarcely pectinate and solid. Hence probably more genera will be needed, rather than less, and for the group typified by *empleura* we propose the new sub-generic name *Scrobicoplax*.

14. ICOPLAX PUNICEA.

- 1846. *Chiton puniceus* Gould, Proc. Bost. Soc. Nat. Hist., ii., 143. Orange Harbour, South America. Type lost.
- 1847. *Chiton illuminatus* Reeve, Conch. Icon., iv., pl. xxii., sp. and fig. 147. Straits of Magellan. Type in British Museum.
- 1882. *Chiton puniceus* Gould, U.S. Expl. Exped., Moll., 324, pl. 27, fig. 412.
- 1892. *Callochiton illuminatus* Pilsbry, Man. Conch., xiv., 51, pl. 9, figs. 92-4.
- 1892. *Ischnochiton puniceus* Pilsbry, Man. Conch., xiv., 81, pl. 8, figs. 76-77.
- 1897. *Callochiton illuminatus* Suter, Proc. Mal. Soc., ii., 185, July. Off Kapiti Island, N.Z.
- 1904. *Callochiton illuminatus* Hutton, Index Faunae N.Z., 87.
- 1907. *Callochiton illuminatus* Suter, Proc. Mal. Soc., vii., 294.
- 1908. *Callochiton (Icoplax) puniceus* Thiele, Deutsche Sudpol. Exped. (Antark. Chitonen), 14 (refers to N.Z. record).
- 1909. *Callochiton puniceus* Suter, Subant. Islands, N.Z., i., 2. Snares Island, 50 fathoms.
- 1913. *Callochiton puniceus* Suter, Man. N.Z. Moll., 2. Atlas, pl. 3, fig. 8a-c.
- 1915. *Callochiton puniceus* Iredale, Trans. N.Z. Inst., xlvii., 1914, 424.

Gould described his species, using Couthouy's M.S. name as "Shell small, thin, elongated, elliptical, elevated and sharply carinated along the back, of a dull rose, or bright brick-red colour, and everywhere minutely punctured. The lateral areas are very abruptly and distinctly elevated, regularly ridged by the obtusely rounded stages of growth and bearing a few scattered granules. Central areas with the lines of increase well marked, and remarkably barred with about six elevated, longitudinal, parallel ridges, which are generally dislocated about the middle by some of the lines of increase. The posterior valve has a very minute, and acute, nearly central umbo, with an abrupt depression passing transversely through it; the margin is very minutely imbricated by prismatic scales, coloured like the shell, and with yellowish bands crossing it, opposite to the juncture of the valves.

"Length: $12\frac{1}{2}$ mm.; breadth, $7\frac{1}{2}$ mm.

Simultaneously Reeve introduced *C. illuminatus* thus: "Shell ovate, terminal valves and lateral areas of the rest minutely granosely rough, central areas very finely ridged, ridges slightly granulated, interstices hollow and very minutely reticulated; ligament horny, arenaceous; red throughout, ligament marked with white spots.

"Habitat: Straits of Magalhaens.

"The shell and ligament are all of an uniform red colour, the latter being marked with a white light exactly in the places occupied, in the fasciculate species, by the tufts of spiculae."

Carpenter's fuller description of Reeve's shells was printed by Pilsbry and reads: "Shell oval, red, rather elevated, the jugum acute; umbo a little in front of the middle, slightly elevated. Entire surface very minutely wrinkle-striate and granulose under a lens, the central areas longitudinally, the rest radially. Central areas with slender elevated separated threads, parallel to the jugum, 6 to 14 on each side. Lateral areas rather elevated. Interior roseate. Anterior valve with 15-16, posterior with 11-14 slits, median valves with 1 slit. Teeth acute, quite distant, scarcely propped. Eaves spongy, sinus small, the sutural plates connected across it. Girdle normal, the scales rather large, solid; sometimes spotted with paler at the sutures.

"Length: 16 mm.; breadth, 10 mm.; the divergence, 120 deg."

As a synonym Suter included *Chiton dimorphus* Rochebrune (Miss. Sci. Cap. Horn., vi., 1889, Moll., 142, pl. 9, fig. 10; Orange Harbour, Patagonia) whose description translated by Pilsbry reads: "Shell ovate-rounded, umbonate, bright-red. Anterior valve wide, concentrically lineate. Posterior valve and central and lateral areas of the intermediate valves concentrically sulcate and most minutely punctulate. The central and lateral areas have quadrangular pits at their intersections. Marginal ligament rufous, regularly striated with white lines.

"Length: 14 mm.; breadth, 10 mm."

This description does not agree and suggests another species, but all the above have been reproduced as the identity of the Neozelanic shells with the South American species is doubtful. When Suter introduced it into the fauna, he wrote: "A small specimen is in the Canterbury Museum, and was kindly submitted to me for examination by Captain Hutton. Since there is only one specimen I was not allowed to separate the valves; but, so far as examination was possible, I found it to agree perfectly with the description and figures of *Callochiton illuminatus* in Pilsbry's Man. Conch. The colour is not red, but greenish-grey; however, the same variability in colour is met with in *Chiton canaliculatus* and others. Central areas with eight separate threads on each side; end valves and lateral areas minutely granulose; median valves with one slit. Girdle scales, those characteristic of the genus, rather large. Interior greyish-white; sinus shallow.

"Length: About 10 mm.; breadth, 7 mm.; divergence, 120 deg.

"Habitat: Dredged off Kapiti Island, Cook Strait."

Later Suter added: "A young specimen, only 5 mm. long, kindly given me by Captain J. Bollons, was found amongst dredgings in 50 fathoms, near the Snares Islands. The specimen is semi-transparent, dirty-white, the characteristic girdle scales of the genus, and the sculpture of the species; there are only five elevated threads on each side of the central areas."

If it had not been for this record, which may represent a species very like *punicea*, we would have relegated all the references to the succeeding species. We have, however, thought it best to leave the two species in the list at present, rather than transfer the second species here.

15. *ICOPLAX KAPITIENSIS*.

Plate x., figs. 6-7.

- 1926. *Callochiton kapitiensis* Mestayer, Trans. N.Z. Inst., lvi., 1925, 583, pl. 100, figs. 2-4, May 5. Kapiti Island, Cook Strait. Type in the Dominion Museum, Wellington, New Zealand.
- 1873. *Chiton sulcatus* Hutton, Trans. N.Z. Inst., iv., 1872, 178. Kapiti Island. Not of Quoy and Gaimard.
- 1897. *Chiton limans* Suter, Proc. Mal. Soc., ii., 197. Kapiti Islands specimens.

1904. *Chiton limans* Hutton, Index Faunae N.Z., 86.
 1905. *Chiton limans* Hamilton, Col. Mus. Bull., No. 1, 36.
 1913. *Chiton limans* Suter, Man. N.Z. Moll., 39 (not description and Kapiti Island specimens only).
 1926. *Icoplax kapitiensis* Finlay, Trans. N.Z. Inst., lvii., 332.

After examination of the two specimens in the Dominion Museum from Kapiti Island, Cook Strait, which had been determined as *Chiton sulcatus* by Hutton and recorded by Suter as *Chiton limans*, Miss Mestayer described them as a new species of *Callochiton* under the name *kapitiensis*. It seems an obvious conclusion that the specimen recorded by Suter as *Callochiton illuminatus* from the same locality is referable to this species. It must be remembered that Suter's description of *Chiton limans* given in the Manual was based upon the Australian species and not upon the Kapiti Island specimens.

Miss Mestayer's description is here given: "Shell small, narrow-oval, side slopes very slightly convex, jugum acute, mucro median. Colour: Shell whitish-brown, mantle reddish-brown. Sculpture: The head valve, lateral areas, jugal area, and posterior two-thirds of tail valve closely covered with very minute granules, clearly defined only under a strong hand lens. Two concentric growth lines clearly marked on all valves. Posterior margins of valves 1-7 finely denticulate. Under lens two other growth lines can be seen on head valve. Median valves: Lateral areas strongly marked, pleural areas with eight very narrow raised longitudinal ridges, interstices about three or four times width of ridges. Posterior margins straight. Valves 6 and 7 of holotype, badly broken on right side. Tail valve: Pleural areas ridged, mucro small, nearly central, posterior portion slightly concave. Girdle narrow, densely covered with small pillar-like scales in mottlings of reddish-brown and white.

"Length: 9 mm.; breadth, 5 mm.

"Locality: Kapiti Island, Cook Strait.

"Remarks: The disarticulate remains of a paratype show that the insertion plates are narrow, head valve with 15 or 16 very shallow slits, median valves 1 slit, and the interior bluish-white. A living specimen. Colour: Shell light brown, the lower two-thirds of lateral areas of valves 3-5 dark brown; tail valve dark brown with a white stripe from mucro to margin. Girdle same colour as shell, faintly mottled with dark brown, with fine hair-like spicules scattered about it, and a very delicate fringe at the edge."

16. ICOPLAX EMPELURA.

Plate x., figs. 1-5.

1872. *Chiton empleurus* Hutton, Trans. N.Z. Inst., iv., 1871, 178. Habitat ?
 Type in the Dominion Museum, Wellington, New Zealand.
 1873. *Chiton empleurus* Hutton, Cat. Marine Moll. N.Z., 48.
 1880. *Chiton empleurus* Hutton, Man. N.Z. Moll., 113.
 1897. *Callochiton empleurus* Suter, Proc. Mal. Soc., ii., 185, July.
 1904. *Callochiton empleurus* Hutton, Index Faunae N.Z., 87.
 1905. *Callochiton empleurus* Hamilton, Col. Mus. Bull., i., 36.
 1905. *Callochiton empleurus* Suter, Journ. Malac., xii., 65, pl. ix., figs. 1-4.
 (December 30). Stewart Island specimen.
 1913. *Callochiton empleurus* Suter, Man. N.Z. Moll., 13. Atlas, pl. 3, fig. 7a-d.
 1915. *Callochiton empleurus* Iredale, Trans. N.Z. Inst., xlvii., 1914, 424.
 1921. *Callochiton empleurus* Mestayer, Trans. N.Z. Inst., liii., 180.
 1924. *Callochiton empleurus* Odhner, Vidensk. Medd. Dansk. Nat. Foren. Bd., 77 (N.Z. Moll.), 6 (Campbell Island).

1926. *Callochiton empleurus* Mestayer, Trans. N.Z. Inst., lvi., 583.
 1926. *Icoplax empleurus* Finlay, Trans. N.Z. Inst., lvii., 332 (littoral). Dunedin, New Zealand.

Hutton did not know whence the specimens came when he introduced the species thus: "Oblong; margin with very minute scales; valves rather elevated and flattened on each side, subcarinate; posterior margins slightly concave, with a small central point; terminal and lateral areas raised above the rest minutely punctate; median areas minutely punctate, sometimes with a row of deep longitudinal pits along the anterior edges of the raised lateral areas.

"Length: .75 inch; breadth, .3 inch.

"Colour: Uniform yellowish-pink.

"Founded on two specimens in the Colonial Museum; locality not stated."

Pilsbry (Man. Conch., xv., 1893, 67) ranked the species as a synonym of *Callochiton crocinus* Reeve, "fide Hutton in litt."

This conclusion was negated by Suter, who explained: "On the glass tablet labelled '*Chiton empleurus*,' there were not only two specimens, but also two species. One of them is Hutton's *C. empleurus*, but the larger specimen I found to correspond exactly with specimens of *C. platessa*, from Port Jackson. . . . The elongated form and the deep longitudinal pits along the anterior edge of the lateral areas distinguish this species at once from *C. platessa*, with which it has been supposed to be identical. In Hutton's diagnosis the word 'sometimes,' that precedes 'with a row of deep pits, etc,' must be struck out. There are 9-10 pits on each side. *C. empleurus* seems somewhat to approach *Ischnochiton* (or *Callochiton* ?) *puniceus*, Couth., which latter, however, I have not seen. I have nothing to add to Hutton's description, because the type specimen could not be taken to pieces, and the classification of the species rests only on the character of the girdle scales, which are very similar to those of *C. platessa*."

Later receiving specimens, Suter more fully described them: "Shell small, elongated oval, subcarinated, slopes very slightly convex, flesh-colour, with a squarish white patch on the posterior part of the jugal tract. Anterior valve almost smooth, but minutely punctate; anterior margin with square white spots at irregular distances, and faint traces of radiate riblets. Posterior margin with a median notch. Intermediate valves. Central area minutely punctate, the jugum mostly smooth, with a few transverse shallow furrows; the pleural tracts with 9-10 deep pits on each side in front of the anterior edge of the lateral areas; these short pits become shorter and shallower towards the median part of the valve. Lateral areas raised, distinct, with well pronounced concentric ridges. Posterior valve rather indistinctly minutely punctate, with a subcentral mucro, posterior slope slightly concave. Girdle with characteristic minute, elongated, and imbricating glossy scales. Colour of valves fleshy, lighter and with white streaks on the jugum. A white squarish spot on each intermediate valve on the posterior part of the jugum, and on the tail valve in front of the mucro. Interior pink, with the sutural laminae white. Sinus rather broad, shallow. Intermediate valves with 3 slits on each side.

"Length: 22 mm.; breadth, 9 mm.; divergence, 83 deg.

Habitat: Near Stewart Island in about 15 fathoms."

Odhner added: "Campbell Island, Perseverance Harbour, 20 fathoms, 6 specimens, length (of largest) 9. They are probably not full-grown, since there are 6-7 pits on the sides of the lateral areas. Suter has not stated the number of slits in the terminal valve, because of the scarceness of his

material. They amount to 14. In the anterior valve there were about 23 irregularly disposed ones."

Through the courtesy of the Director of the Dominion Museum, Wellington, New Zealand, to whom our sincere thanks are here tendered, we have been enabled to study the type of *Chiton empleurus* Hutton, a figure is given from the specimen and a new description is here offered: Shell narrowly elongate, oval, elevated, keeled, side slopes nearly straight, girdle, somewhat curled in, scaly. Colour pinkish, indistinctly mottled with brownish, more noticeable towards the apices, which are a little eroded. Sculpture consists of very fine punctulation throughout, lateral areas large, strongly elevated, growth lines obsolete; pleural areas with a series of ditches along the edge of the lateral areas, nine to twelve in number on each side, longest at the extreme edge, but still short and only extending across, getting shorter inwards and dying out before they reach the jugum. Mucro about the anterior third, elevated, post-mucronal slope very slightly concave. Median insertion plates at least three slit, those of end valves not examined. Girdle wide, surface of scales very small, placed latitudinally and showing narrow oval tips only. Length (a little curled) 17 mm.; breadth (girdle curled in) 7.5 mm. Three valves from another specimen (figured) show the insertion plates of terminal valves to be short, thick, not brittle, slightly grooved, fifteen slits, very irregular, in anterior valve, eleven also very irregular, in posterior valve, four in median valve; sutural laminae continuous.

17. *ICOPLAX SULCULATA*.

Plate x., figs. 8-11.

1907. *Callochiton sulculatus* Suter, Proc. Mal. Soc., vii., 294, fig. 5 in text (June 25). Dusky Sound, New Zealand. Type in Coll. Suter, now in Wanganui Museum, New Zealand.
 1913. *Callochiton sulculatus* Suter, Man. N.Z. Moll., 14. Atlas: pl. 3, fig. 9.
 1915. *Callochiton sulculatus* Iredale, Trans. N.Z. Inst., xlvii., 1914, 424.
 1924. *Callochiton sulculatus* Odhner, Vidensk. Medd. Dansk. Nat. Foren. Bd., 77 (N.Z. Moll.), 7. North Island.
 1926. *Icoplax sulculatus* Finlay, Trans. N.Z. Inst., lvii., 332.

Suter's description is all we know about this species: "Shell very small, angularly raised, side slopes straight, central areas laterally grooved, colour light fulvous. Anterior valve smooth, with a few fine growth lines, the whole surface dotted with small black eyes. Intermediate valves having the jugum sharply rounded, central areas microscopically longitudinally closely striate, on each side 4 to 5 deep grooves, twice as broad as the ribs, the innermost groove extending only over half the length; lateral areas distinctly raised, microscopically radially striate, with numerous eyes, flatly and broadly nodulous by a few concentric furrows, more pronounced near the margins; sutures crenate. Posterior valve smooth, with many eye-dots; mucro in front of the middle, low; posterior slope slightly concave. Girdle with elongated, pointed, and slightly keeled smooth scales. Colour light fulvous, darker on the end valves and lateral areas; girdle white, with fulvous patches. Interior pinkish-white; anterior valve with 14, median valves with 2, and posterior valve with 10 slits; teeth blunt, propped up on the outside; eaves spongy; the low and broadly rounded sutural laminae continuous across the shallow sinus. The approximate dimensions are:—Length, 9 mm.; width, 6 mm.; divergence, 105 deg.

"Habitat: One specimen amongst material dredged by Mr. R. Henry in 30 fathoms, Dusky Sound.

"With regard to sculpture of the lateral areas this species stands between *C. empleurus* and *C. illuminatus*; the former, however, has 4, the latter only 1 slit on the intermediate valves."

Odhner has added: "North Island, North Channel, Kawau Island, 10 fathoms, 1 specimen, length, 10 mm. Colour coralline red, lateral areas white clouded; 6th and 7th valve of a whitish colour (except the red apices) which occupies also the adjacent part of the girdle. In its sculpture the present specimen shows the peculiarity of having the sulci of the lateral areas most distinct on plate 6 and 7, 2 and 1."

V. GENUS *PARICOPLAX* nov.

Shell small to medium for the family, more or less depressed, oval, roundbacked, rarely carinated, girdle scaly.

Colour, when dead, dullish, but when alive, bright, apparently agreeing with its environment, reddish, dark and light, often varied with shades of green and yellowish, but these bright shades vanish with death.

Sculpture entirely minutely granulose forming a matt surface; lateral areas scarcely raised and not specially distinguished.

Girdle scales characteristic; elongate slender, glassy spicules packed latitudinally so that the ends only show superficially.

This genus is founded on the well known shell hitherto known as *platessa*, but here determined as *crocinus* Reeve.

We introduced in the Monograph of the Australian Loricates the genus name *Levicoplax*, definitely designating as type *Chiton platessa* Gould. That species turns out to have been wrongly determined, and is the common New South Wales *Ischnochiton*, so that the genus name *Levicoplax* falls into the synonymy of *Ischnochiton*, and it is necessary to introduce a new name for this group.

18. *PARICOPLAX CROCINA*.

Plate x., figs. 12-13.

- 1847. *Chiton crocinus* Reeve, Conch. Icon., iv., pl. xxii., sp. and fig. 146.
Habitat unknown = New South Wales. Type in British Museum.
- 1852. *Chiton versicolor* A. Adams, Proc. Zool. Soc., 1852, 92, pl. xvi., fig. 5.
Sydney, New South Wales. Type in British Museum.
Not *Chiton versicolor* Sowerby, Mag. Nat. Hist., 1840.
- 1877. *Chiton platessa* Tenison Woods, Proc. Linn. Soc. N.S.W., ii., 252.
Gould's description reprinted.
- 1886. *Callochiton platessa* Haddon, Chall. Rep. Zool., xv. (pl. xliii.), 15.
N.Z. in British Museum.
- 1892. *Callochiton platessa* Pilsbry, Man. Conch., xiv., 49, pl. 10, figs. 1-5.
- 1893. *Callochiton crocinus* Pilsbry, Man. Conch., xv., 67, for xiv., pl. 10, fig. 7.
- 1897. *Callochiton platessa* Suter, Proc. Mal. Soc., ii., 184.
- 1904. *Callochiton platessa* Hutton, Index Faunae N.Z., 87.
- 1905. *Callochiton platessa* Hamilton, Col. Mus. Bull., i., 36.
- 1908. *Callochiton platessa* Iredale, Trans. N.Z. Inst., xl., 1907, 374.
- 1910. *Callochiton platessa* Iredale, Proc. Mal. Soc., ix., 157.
- 1913. *Callochiton platessa* Suter, Man. N.Z. Moll., 13, Atlas, pl. 3, fig. 7a-d.
- 1915. *Callochiton platessa* Iredale, Trans. N.Z. Inst., xlvii., 1914, 424.
- 1922. *Callochiton platessa* var. *fossa* Ashby, Trans. Roy. Soc. S.A., xlvii., 19, pl. iii., fig. 4. Port Jackson, New South Wales. Type in Coll. Ashby.
- 1923. *Callochiton platessa* May, Illus. Index Tas. Shells, pl. xiv., fig. 7.
- 1924. *Callochiton platessa* Finlay, Trans. N.Z. Inst., lv., 517.

1925. *Levicoplax platessa* Iredale and Hull, Aust. Zool., iii., 349, pl. xxxix., fig. 30.
1846. *Not Chiton platessa* Gould, Proc. Bost. Soc. Nat. Hist., ii., 143. New South Wales = Port Jackson. Type lost (?).
1852. *Not Chiton platessa* Gould, U.S. Expl. Exped., 320, atlas, figs. 434-434a.
1862. *Not Lepidopleura platessa* Gould, Otia Conch., 242.

This species has been known by the name of *platessa* Gould, through some blunder in the early history of the species, and this misidentification has persisted through many years until we began introducing the original descriptions in this essay. When we read the original Latin diagnosis, doubt was immediately raised, and, as Gould gave an English translation himself there is no doubt, especially since figures were given to illustrate the species.

These diagnoses are here given as the books including them are rare and difficult of access. The original Latin definition reads: Testa parva, tenuis, elongato-ovalis, transversim arcuata, citrino-olivacea, ubique minutissime punctata; areis lateralibus parvis, vix elevatis, lineis 2-3 inconspicuis striatis; areis centralibus lineis confertis acutis granulatis arcuatim decussatis; valvâ posticâ magnâ, obscurè radiatâ; margine virente, fusco tessellato, minutissime granulato; intus caeruleo-virescens. Long., 7/8; lat., 9/20 poll.

Habitat: New South Wales.

The English account is here added: "Shell rather small and thin, oval, much elongated, transversely arched, of a yellowish olive colour, minutely punctured in quincunx at every part. The valves are flattened, without beaks or keel, the tips denuded; lateral areas very small, striated with two or three radiating lines; central areas with very fine, sharp, granulated, longitudinally arcuated lines, like jeweller's engine work, posterior valve large, faintly radiated. Margin covered with granules so minute as scarcely to be distinguished by the naked eye, chequered green and dusky. Inside bluish-green.

"Length: Seven-eighths of an inch; breadth, nine-twentieths of an inch.

"Habitat: New South Wales.

"Similar in its general aspect to *C. fruticosus*, but smaller, smoother, and the sculpture of the lateral areas and terminal valves entirely different. It is almost exactly like fig. 67 of the "Conchological Illustrations," which is said to be a variety of *C. longicymba*. In form it resembles *C. catenulatus* Sowb."

The shape, tenuity and colour attract attention as being unlike the conventional "*platessa*," but the item "lateral areas striated" definitely precludes the association of the well known shell with the name, while the illustrations show this striated sculpture, as well as the central area sculpture, and also the girdle scales.

The error apparently originated in Carpenter's acceptance, without reference to the type, of some Australian shells as "*platessa*," and then this was reinforced by the description of characters peculiar to the present genus, and hence the error became established.

Simultaneously Reeve had described a species, *C. crocinus*, thus: "Shell ovate, terminal valves and lateral areas of the rest concentrically sculptured with waved wrinkles, the surface being most minutely punctured, central areas undulately decussated with minute ridges; saffron yellow, stained in the middle with light purple; ligament horny, tessellated.

"Habitat (?): A species most peculiar in colour, and not less in sculp-

ture; the surface of the central areas having the appearance of coarse cloth or canvas."

A few years later A. Adams correctly described the species from Sydney, New South Wales, but unfortunately selected a preoccupied name, so that it is unnecessary to transcribe his Latin description.

Haddon published the synonymy of *platessa*, *crocinus* and *versicolor*, ascribing it to Carpenter, apparently only on M.S. notes in the British Museum, written on the back of the tablets by Carpenter. Pilsbry published Carpenter's M.S. notes which never referred to the type of "*platessa*," and since then no doubt has been expressed, though it is obvious an error has been made. The Neozelanic form was for many years very rare, but recently intensive search has shown it to be much less uncommon than supposed. Criticism of such specimens with Australian ones show very little distinction, and, as we have pointed out, the latter is very variable in elevation and breadth, we cannot at present separate the Neozelanic shells. Ashby introduced a varietal name "*fossa*" for Australian shells, which have developed a few irregular sulci on valves vi.-viii., and this phase has not yet been seen from New Zealand.

19. PARICOPLAX MORTENSENI.

Plate x., figs. 14-15.

1924. *Callochiton mortenseni* Odhner, Vidensk. Medd. Dansk. Nat. Foren. Bd., 77 (N.Z. Moll.), 6, figs. in text. Campbell Island. Type in Stockholm Museum, Sweden.

1926. *Levicoplax mortenseni* Finlay, Trans. N.Z. Inst., lvii., 332.

Odhner's description (which is all we know of this species): "Shell ovate, dark brown, shining, smooth, bluntly keeled, dorsally, slightly convex at the lateral slopes. Anterior valve a little broader than the posterior one, with a few concentric growth lines (in the one specimen with 4 concentric regularly distant sulci), otherwise smooth and showing only microscopic radiating striae and impressed dots which are densest towards the margin. Intermediate valves beaked, with elevated lateral areas, totally smooth, except for lines of growth (and occasional impressed dots towards the margins, and furrows; 4 concentric ones in one specimen), microscopically striated longitudinally. Posterior valve with a premedian mucro; its central area separated, by means of straight lines, from the posterior elevated area, which has a straight or slightly concave slope. All valves porous, the pores appearing as microscopical regular dots all over the surface. Eyes in a small number, occupying a median ray on the lateral areas, most obvious in their upper parts. Girdle narrow, rusty brown, lighter at the margin, with close elongate scales and fringed with short acicular ones. Interior of the valves crimson; anterior valve with 16 slits; posterior one with 12, median valves with 4 or 5; teeth solid, propped outside, eaves porous, sutural plates united, sinus shallow, broad. Gill cordon extending from the anterior corners of the foot to near the foot end.

"Locality: Campbell Island, 45 (= Perseverance Harbour, 20 fathoms); 2 specimens; maximum length, 13 mm.; breadth, 8.5 mm.

Compared with *C. steinenii* from South Georgia, which has a similar colour, the present species shows much smaller and denser girdle scales, as well as completely smooth, not granulose, and distinctly microscopically striated valves; in the latter respect it differs also from *C. platessa*, in which a tendency to granulation of the lateral and central areas appears. The number of slits of the intermediate valves (in *C. steinenii* 2, in *C. platessa* 3) is another point of distinction."

20. *PARICOPLAX PERSCRUTANDA* sp. nov.

Plate x., figs. 25-26.

Shell very small, depressed, broadly oval, girdle wide.

Colour brownish green, variegated with paler green.

Sculpture obsoletely quincuncially papillate throughout; lateral areas a little raised, but not otherwise differentiated; valves three times as broad as deep, mucro very anterior.

Girdle scales typical, but larger than those of *crocina*.

Dimensions: 6 x 4.5 mm. (type in Australian Museum).

Station: On shell of *Haliotis iris* taken at extreme low tide at Taylor's Mistake, near Lyttelton, Canterbury, New Zealand.

Habitat: New Zealand.

Note.—This little species is described to attract attention to the probability of other small Loricates existing on the same station.

vi. Genus *QUAESTIPLAX* nov.21. Type *Quaestiplax wilsoni* nov.

Plate ix., fig. 2.

This genus is introduced for a minute shell from Lord Howe Island, which superficially recalled *Terenoichiton*, but upon dissection proved to show many features peculiar to *Icoplax*, and it appears to be a degenerate ally of that series.

Shell very small, elongate oval, uniformly dull-coloured, pale creamy buff, of median elevation; girdle wide, scaly.

Sculpture of pustules, arranged in quincunx, massing and obsoletely showing ray formation on lateral areas and end valves, less defined on jugal area, lateral areas small, well elevated.

Post-mucronal area of posterior valve, similarly small and a little concave; ante-mucronal area large, nearly twice the depth of the post-mucronal area, mucro at about the posterior third elevated.

Interior white. Insertion plates present, stout and short, one or more slit in median valves, many slit in end valves, fourteen in anterior valve, fifteen in posterior valve; the slitting is very irregular, faint grooving discernible on anterior plate, while posterior plate is shortened and tending to elimination; sutural laminae small, very widely separated.

Girdle scales very small, irregularly elongately oval, non-striate, a fine spiculose edge present; the girdle scales are obliquely placed, tending to lateral formation.

Dimensions: 4 x 2 mm. (type).

Station: Under stones associated with *Terenoichiton catenatus* Hedley and Hull.

Habitat: Lord Howe Island.

This interesting little Loricata was collected by Hull in 1907, and later many examples were sorted out of washings made by Mr. Roy Bell from the underside of dirty stones. It is associated with Mr. Herbert Wilson, who collected with Hull in 1907, and for him later. Type in Australian Museum.

The above description covers both specific and generic features, the most notable in connection with the latter being the association of widely separated sutural laminae, rather characteristic of *Terenoichiton*, etc., and the multi-slit insertion plates, the disappearing tendency of the latter in the posterior valve first, and the girdle scales, very like, but not so latitudinally placed as those of *Paricoplax*.

vii. Genus EUDOXOCHITON.

1853. *Eudoxochiton* Shuttleworth, Mittheil. naturf. Gesellsch. Berne, 191.

Type by monotypy *Acanthopleura nobilis* Gray.

Shells very large for the family, oval, elevated or depressed, girdle wide, leathery, beset with short scattered spinelets.

Coloration dark brown (generally uniform).

Sculpture uniformly minutely granulose. Eyes present. Interior with multislit median valve insertion plates, many slit end valves, sutural laminae continuous.

The species occur throughout New Zealand and to the Kermadec Islands, but are at present unknown from the Subantarctic Islands, while a closely allied genus, *Eudoxoplax*, is restricted to Tasmania.

The radula proves that the group belongs to the family *Lepidochitonidae*, as was easily recognised by the superficies and the internal characters, a very young *Eudoxochiton* recalling the commoner smaller shells.

Bucknill's account (T.N.Z.I., 59, 1928, 625) of the eyes and minute sculpture should be referred to.

22. EUDOXOCHITON NOBILIS.

Plate x. figs. 22-23.

1843. *Acanthopleura nobilis* Gray, Travels in New Zealand (Dieffenbach), ii., 245. New Zealand. Type in British Museum.

1847. *Chiton nobilis* Reeve, Conch. Icon., iv., pl. 21, fig. 139 (ex Gray M.S. in British Museum = Gray's type as above).

1853. *Chiton* (*Eudoxochiton*) *nobilis* Shuttleworth, Mittheil. naturf. Gesellsch. Berne, 191.

1872. *Chiton nobilis* Hutton, Trans. N.Z. Inst., iv., 1871, 181.

1873. *Chiton nobilis* Hutton, Cat. Marine Moll. N.Z., 49.

1874. *Chiton* (*Chaetopleura*) *nobilis* Smith, Voy. Erebus & Terror, Moll., 4, pl. 1, fig. 8 (type figured).

1880. *Chaetopleura nobilis* Hutton, Man. N.Z. Moll., 115.

1892. *Chaetopleura nobilis* Pilsbry, Man. Conch., xiv., 30 (Reeve's description and figure only).

1893. *Eudoxochiton nobilis* Pilsbry, Man. Conch., xiv., 193, pl. 46, figs. 88-95.

1897. *Eudoxochiton nobilis* Suter, Proc. Mal. Soc., ii., 197.

1904. *Eudoxochiton nobilis* Hutton, Index Faunae N.Z., 86.

1905. *Eudoxochiton nobilis* Hamilton, Col. Mus. Bull., i., 36.

1905. *Eudoxochiton nobilis* Nierstrasz, Notes Leyden Mus., xxv., 151.

1913. *Eudoxochiton nobilis* Suter, Man. N.Z. Moll., 41. Atlas: pl. 2, figs. 20-25; pl. 4, fig. 14.

1914. *Eudoxochiton nobilis* Iredale, Proc. Mal. Soc., xi., 126.

1915. *Eudoxochiton nobilis* Iredale, Trans. N.Z. Inst., xlvii., 1914, 424.

1924. *Eudoxochiton nobilis* Odhner, Vidensk. Medd. Dansk. Nat. Foren. Bd., 77. (N.Z. Moll.), 9. North Island and Stewart Island.

1928. *Eudoxochiton nobilis* Bucknill, Trans. N.Z. Inst., lix., 625-6, fig. in text (ocelli).

The original description is brief, but recognisable: "Mantle rugose, rough, with scattered long tapering brown bristles; valves brown, convex, evenly rounded, with very minute dots like shagreen, the lateral area slightly marked with 3 or 4 indistinct rays; inside white; length, 3 inches."

Reeve figured the specimen and then E. A. Smith gave another figure, some thirty years later.

The species may be described more fully as follows: Shell large, elongate oval, elevated, side slopes curved, girdle leathery, with scattered spine-

lets. Colour, red brown. Sculpture: The whole of shell is minutely punctulate, rarely tending to radiation, lateral areas little differentiated and elevated; mucro of the posterior valve antemedian, the post-mucronal slope not steep, the posterior edge slightly sinuate. Interior pure white, sutural laminae large, continuous, a shallow sinus medially; insertion plates short, stout, deeply grooved so that teeth are not easily counted. Teeth very irregular, 25-30 in anterior valve, 3-6 in median valves, 24-25 in posterior valve. Angle of divergence of valves, 100 deg. to 110 deg.

Dimensions: Length, 65 mm.; breadth, 41 mm.; up to 110 mm. in length.

Station: On rocks below median tide facing heavy sea.

Habitat: New Zealand.

23. EUDOXOCHITON HUTTONI.

Plate x., fig. 24.

1893. *Eudoxochiton huttoni* Pilsbry, Man. Conch., Ser. i., xiv., 194, pl. 46, figs. 96-100. New Zealand. Type in Acad. Nat. Sci. Philad. Coll.
 1897. *Eudoxochiton huttoni* Suter, Proc. Mal. Soc., ii., 198.
 1904. *Eudoxochiton huttoni* Hutton, Index Faunae N.Z., 86.
 1905. *Eudoxochiton huttoni* Hamilton, Col. Mus. Bull., i., 36.
 1913. *Eudoxochiton huttoni* Suter, Man. N.Z. Moll., 41. Atlas: pl. 4, fig. 15.
 1915. *Eudoxochiton huttoni* Iredale, Trans. N.Z. Inst., xlvii., 1914, 424.
 1928. *Eudoxochiton huttoni* Bucknill, Trans. N.Z. Inst., lix., 626, fig. —.

This species was introduced by Pilsbry, as follows: "Shell oval, depressed, with convex side slopes. Colour dark brown, the girdle greenish brown. Valves broadly V-shaped, not beaked, rounded at the ends; the lateral areas well raised. Entire surface smooth, except for a microscopic punctulation and slight growth lines. Posterior valve depressed, the mucro plane, central; posterior margin hardly marginate. Interior white, smooth. Sutural plates continuous across the sinus, which is indicated by a shallow wave or bay. Insertion plates blunt, deeply pectinated, the anterior valve having 17, central 3, posterior 19 short slits. Eaves very narrow and grooved along the teeth. Girdle leathery, bearing numerous short, rigid, dark brown spinelets.

"Length: 50 mm.; breadth, 34 mm.; divergence, 135 deg. to 140 deg.

"This species is closely allied to *E. nobilis*, from which it differs in the proportions of the valves, depressed form, fewer slits, etc."

This appears to be one of the rarest of Neozelanic Loricates, as all we have recently seen under this name have been depressed, immature specimens of the preceding species. It is apparently a deeper water form and may represent an ecological variation; the slitting in the type may be abnormal, but it is well to leave the name in view, and also those of the two succeeding forms. The latter were found under recognisable ecologic conditions, and were thus separated, and if they be lumped, then the present species must also be suppressed. We have found lumping ever to prove a dangerous policy, so here allow the whole four in order that inquiry may be stimulated. Superficially they resemble each other so much that we have only reproduced the two Kermadec pictures with sketches of the elevation of the valves; these, however, are somewhat misleading, and it is necessary to study specimens, the long account given some years ago by Iredale being here reproduced.

24. EUDOXOCHITON PERPLEXUS.

Plate x., figs. 16-18.

1914. *Eudoxochiton perplexus* Iredale, Proc. Mal. Soc., xi., 29, pl. i., figs. 4, 6, 8. Sunday Island, Kermadec Group. Type in Canterbury Museum, Christchurch, New Zealand.
1915. *Eudoxochiton perplexus* Oliver, Trans. N.Z. Inst., xlvii., 1914, 557. var. *typica*, id., ib.

"Shell large, oval, elevated; valves arched, side slopes almost straight; girdle leathery, with short spinelets. Colour uniform reddish-brown, girdle greenish-brown. The only sculpture is minute punctulation, though indistinct radiation may sometimes be observed on the anterior valve, whilst growth lines are commonly seen on the central areas. Anterior valve comparatively small. Median valves narrow, lateral areas well raised. Posterior valve with the mucro elevated at about the anterior third, the posterior slope slightly concave. Inside coloration pure white. Anterior valve has the insertion plate very short, and cut into about twenty-three teeth, which are irregularly deeply pectinated. Median valves with sutural plates continuous, the sinus only indicated by a shallow depression. Insertion plates short, with three or four teeth as in anterior valve. Posterior valve faintly emarginate on the posterior border, the insertion plate very short and not projecting beyond the tegmentum. About twenty-three slits can be counted, the teeth as in anterior valve. Girdle leathery, covered with short brown spinelets. Length of type, 59 mm.; breadth, 40 mm.

"Habitat: Sunday Island, Kermadec Group.

"Station: On rocks about low tide."

25. EUDOXOCHITON IMITATOR.

Plate x., figs. 19-21.

1914. *Eudoxochiton imitator*, Iredale, Proc. Mal. Soc., xi., 30, pl. 1, figs. 5, 7, 9. Sunday Island, Kermadec Group. Type in Canterbury Museum, Christchurch, New Zealand.
1915. *Eudoxochiton perplexus* var. *imitator* Oliver, Trans. N.Z. Inst., xlvii., 1914, 557.

"Shell large, oval, depressed; valves slightly keeled, side slopes straight, girdle leathery with short spinelets. General coloration uniform dark-brown, girdle pale greenish-brown. Sculpture as in preceding species. Contrasted with the foregoing species the valves are more depressed, posterior valve with mucro planate, almost central. Inside coloration pure white. Sutural laminae longer than in the above species, and the sinus even less pronounced. Insertion plates longer, and the anterior valve with more than twenty-five teeth, the posterior about twenty-two. Girdle leathery, with short brown spinelets. Length of type: 59 mm.; breadth, 40 mm.

"Habitat: Sunday Island, Kermadec Group.

"Station: On rocks below low tide.

" . . . The Eudoxochitons of Sunday Island are very puzzling, as the existence of two forms on such a small island I could scarcely credit myself. Yet the shells seem easily separable into two lots, which might be classed as varieties of *nobilis* Gray; they differ in general forms as much from each other as from that species, and are both less elevated. One form is even lower than *huttoni* Pils., though in the characters and number of the teeth it absolutely agrees with the other. . . .

"Remarks: I have here admitted the two forms above indicated as distinct species, and would fully note the differences observed. *E. perplexus* was first collected, and it was noted as being less elevated than *E. nobilis* Gray, though quite unlike *E. huttoni* Pils. Collectors of *Eudoxochiton* well know the rarity of the genus, and very few specimens were obtained. Valves were not uncommonly met with on the beach, and examination of these constantly gave the number of slits in the anterior and posterior valves as about twenty-two or twenty-three. . . .

"In the winter the sand moved along the north coast and forced a large number of *Eudoxochiton* to come up to low water mark. This unexpected opportunity was greedily seized to collect every specimen, and it was then found that the majority of these differed in their depressed form and darker coloration, which was noticeable at sight. Moreover, they were beautifully clean specimens, such as had never been collected before. In New Zealand, even the smallest specimens of these Chitons are covered with ugly extraneous growths, and the earlier collected Kermadec specimens were dirty and worn. I have now concluded that this depressed form must be a deeper water dweller. It is easily separated from *E. perplexus* by its depressed form, different posterior valve, and longer teeth, whilst the coloration is also darker. It cannot be confused with either *E. nobilis* Gray or *E. huttoni* Pilsbry, and, on account of its pseudo-resemblance to the latter, I have called it *E. imitator*.

"There would seem to be grounds for supposing the depressed form to be the oldest, as juveniles of all four species are very flattened and scarcely determinable. The girdle is simply leathery with a crinkled appearance, with only signs of the short spinelets thereon. I have juveniles of the Kermadec species which I would not definitely distinguish, since I do not think they could be easily differentiated from juveniles of *E. nobilis* Gray, which I collected in the South Island of New Zealand. It is certain that the Kermadec species are smaller than the New Zealand ones, the valves being comparatively broader and the girdle comparatively narrower. The largest Kermadec specimen is under 70 mm. long and 45 mm. broad, whilst an average sized Neozelanic *E. nobilis* Gray, measures 75 mm. long by 50 mm. broad, and specimens 110 mm. in length are known to exist. These measurements are taken from specimens with the girdle well preserved and flattened."

EXPLANATION OF PLATE IX.

- Fig. 1. *Ischnochiton circumvallatus* Reeve, whole shell.
 2. *Quaestiplax wilsoni* Iredale & Hull, whole shell.
 3. *Terenoichiton inquinatus* Reeve, whole shell.
 4. *Terenoichiton inquinatus* Reeve, exterior of median valve, copied from Odhner, Stewart Island.
 5. *Terenoichiton inquinatus* Reeve, exterior of median valve, copied from Odhner, Campbell Island.
 6. *Terenoichiton inquinatus* Reeve, exterior of median valve, copied from Odhner, Auckland.
 7. *Terenoichiton norfolcensis* Hedley & Hull, whole shell.
 8. *Terenoichiton norfolcensis* Hedley & Hull, exterior of anterior valve.
 9. *Terenoichiton norfolcensis* Hedley & Hull, exterior of median valve.
 10. *Terenoichiton norfolcensis* Hedley & Hull, exterior of posterior valve.
 11. *Terenoichiton subtropicalis* Iredale, whole shell.
 12. *Terenoichiton subtropicalis* Iredale, side view of whole shell.

13. *Terenochiton otagoensis* Iredale & Hull, whole shell.
14. *Terenochiton catenatus* Hedley & Hull, whole shell.
15. *Terenochiton catenatus* Hedley & Hull, exterior of anterior valve.
16. *Terenochiton catenatus* Hedley & Hull, exterior of median valve.
17. *Terenochiton catenatus* Hedley & Hull, exterior of posterior valve.
18. *Terenochiton fairchildi* Iredale & Hull, whole shell.
19. *Terenochiton fairchildi* Iredale & Hull, exterior of anterior valve.
20. *Parachiton mestayerae* Iredale, whole shell.

EXPLANATION OF PLATE X.

- Fig. 1. *Icoplax empleura* Hutton, whole shell.
2. *Icoplax empleura* Hutton, exterior of anterior valve.
 3. *Icoplax empleura* Hutton, exterior of median valve.
 4. *Icoplax empleura* Hutton, exterior of posterior valve.
 5. *Icoplax empleura* Hutton, interior of posterior valve.
 6. *Icoplax kapitiensis* Mestayer, whole shell, copied from Mestayer.
 7. *Icoplax kapitiensis* Mestayer, side view of whole shell, copied from Mestayer.
 8. *Icoplax sulculata* Suter, anterior valve, copied from Suter.
 9. *Icoplax sulculata* Suter, posterior valve, copied from Suter.
 10. *Icoplax sulculata* Suter, girdle scales, copied from Suter.
 11. *Icoplax sulculata* Suter, median valve, copied from Suter.
 12. *Paricoplax crocina* Reeve, whole shell.
 13. *Paricoplax crocina* Reeve, exterior of median valve.
 14. *Paricoplax mortenseni* Odhner, whole shell, copied from Odhner.
 15. *Paricoplax mortenseni* Odhner, exterior of median valve, copied from Odhner.
 16. *Eudoxochiton perplexus* Iredale, whole shell.
 17. *Eudoxochiton perplexus* Iredale, side view of whole shell.
 18. *Eudoxochiton perplexus* Iredale, median valve to show elevation.
 19. *Eudoxochiton imitator* Iredale, whole shell.
 20. *Eudoxochiton imitator* Iredale, side view of whole shell.
 21. *Eudoxochiton imitator* Iredale, median valve to show elevation.
 22. *Eudoxochiton nobilis* Gray, median valve to show elevation.
 23. *Eudoxochiton nobilis* Gray, girdle covering.
 24. *Eudoxochiton huttoni* Pilsbry, median valve to show elevation, copied from Pilsbry.
 25. *Paricoplax perscrutanda* Iredale & Hull, whole shell.
 26. *Paricoplax perscrutanda* Iredale & Hull, girdle scales.
 27. *Icoplax kapitiensis* Mestayer, girdle scales, copied from Mestayer.



Iredale, Tom and Hull, A. F. Basset, Arthur Francis Basset. 1929. "The loricates of the Neozelanic region. Part I (Continued). Part II." *The Australian zoologist* 6, 75–95.

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