The Paryphantidae of New Zealand
No. IV.
and
The Genus Placostylus in New Zealand

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Since the publication in these "Records" of my previous papers on the land molluscan family *Paryphantidae* (1930, Vol. 1, No. 1; 1932, Vol. 1, No. 3; and 1936, Vol. 2, No. 1), further new material has been received, and is here made the subject of my fourth contribution on the family. The second part of the paper deals with the New Zealand land snails of the genus *Placostylus* and includes descriptions of three new subspecies.

Although the forms I here separate are based upon small differences, the work can hardly be termed "species splitting," for the respective subspecific forms are constant within their restricted areas of distribution, and in no case can they be likened to variants that may crop up in any breeding colony irrespective of location.

Three new species and five new subspecies are described herein, and the types of all of them are in the Auckland Museum.

ACKNOWLEDGMENTS.

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PARYPHANTIDAE.

(Hochstetteri series.)

Paryphanta hochstetteri anatokiensis, n. subsp. Pl. 33, fig. 7.

Specimens from the ridge near the headwaters of the Anatoki, Slate and Snows Rivers, West Nelson, are at once distinguishable from the typical species by their reddish-brown colour resulting from a constant pattern of closely spaced and diffused narrow spiral dark reddish-brown bands. Although variable, typical *hochstetteri* never merges with the proposed subspecies, for it has a yellowish brown ground colour either sparsely

spirally banded or with broad zones of reddish brown, but allowing most of the yellowish-brown ground colour to show through.

The colour distinction is most marked on the dorsal surface, the prevailing colour of the typical species being citrine (Pl. 4, 21K) to orange-citrine (Pl. 4, 19K, Ridgway's Colour Standards and Nomenclature, 1912).

The dorsal surface of the new subspecies is chestnut (Pl. 2, 9 m) to mahogany-red (Pl. 2, 7K). The ventral surface is antique-brown (Pl. 3, 17K) to argus-brown (Pl. 3, 13 m), closely spirally banded with chestnut to warm sepia (Pl. 29, 13 m), variable but narrow bands. There are twelve definite spiral bands on the base of the holotype, from 13 to 15 in paratypes, and about fifteen spiral bands on the dorsal surface, but as they are diffused into a general red-brown colour it is impossible to count precisely the actual number of the spirals. In size, shape and sculpture the new subspecies is identical with the typical species.

The new subspecies occupies the western extremity of the Tasman system, which links up with the Pikikiruna Range through the Mt. Arthur Tableland. Typical *hochstetteri* extends over the entire Pikikiruna Range, the Mount Arthur Tableland, and along the Tasman Mountains to as far westward as Mt. Cobb.

Major diameter, 69 mm.; minimum diameter, 58 mm.; height, 31.5 mm. (holotype).

Holotype: Presented to the Auckland Museum by Mr. E. B. Langford.

Habitat: On range between Snows River and Anatoki River, West Nelson.

(Lignaria series.)

Paryphanta lignaria oconnori n. subsp. Pl. 33, figs. 3-6.

The coloration of the subspecies differs from that of the typical species in having fewer and wider-spaced reddish-brown axial streaks, allowing the buckthorn-brown (Ridgway, Pl. 15, 17 i) ground colour to predominate, resulting in a paler coloured red-brown shell at once distinguishable. A structural difference is noticeable also in the much finer spiral striae and malleations of the subspecific form.

Whorls 5, including typical buff to yellow-ochre protoconch of 1½ whorls. Spire whorls buffy-citrine (Pl. 16, 19K) to Dresden-brown (Pl. 15, 17K). Body whorl cinnamon-brown (Pl. 15, 15K) to chestnut (Pl. 2, 9M). Axial streaks narrow, few, irregularly spaced, dark sepia to almost black with diffused cinnamon-brown axial growth streaks in the interspaces. Parietal callus glaucous-gray (Pl. 48, 37F) to pale Medici-blue (Pl. 48, 41F).

From the present subspecies, *unicolorata rotella* differs in having still finer dorsal sculpture and a decidedly more olive ground colour with superimposed reddish-brown spiral lines on the dorsal surface.

Major diameter, 43 mm.; minimum diameter, 36.5 mm.; height, 25.5 mm. (holotype).

Major diameter, 51.5 mm.; minimum diameter, 42 mm.; height, 30 mm. (paratype).

Holotype presented to the Auckland Museum by Mr. A. C. O'Connor.

Habitat: Headwaters of the Leslie River, tributary of the Karamea River, 2,000 feet; between Gordon's Pyramid, 4,900 feet; and Mt. Arthur, 5,834 feet, western slopes from Mt. Arthur Tableland.

From Mr. A. C. O'Connor, who received his material from Messrs. A. P. Andrews, of Wellington, and L. Grooby, of Ngatimoti.

Paryphanta fletcheri n. sp. Pl. 33, figs. 12 and 13.

Shell comparable with that of *rossiana,* subdiscoidal, of moderate size, narrowly umbilicate, smooth and glossy. Colour mostly dark greenish-brown, turning to russet-brown above. Axial stripes few, wide spaced, showing distinctly only on the base. The nearest shade for the upper surface is Brussel's brown (Ridgway, Pl. 3, 15M) and for the base medal bronze (Pl. 4, 21M). The axial stripes are dark sepia, almost black. Apart from these widely spaced wheel-spoke like dark stripes the whole surface is crowded with very faint greenish-brown subsidiary axial stripes. Over the last eighth of the body-whorl dark brown axial streaks are crowded together.

Under a low power lens extremely faint and close spaced spiral striae is just visible beneath the surface glaze, but to the eye the shell appears perfectly smooth. Apertural details as in *rossiana,* callus smooth, coloured as body-whorl.

Compared with *rossiana,* the shell is flatter in the spire, has a more open umbilicus, one-seventh major diameter of the base (one-tenth in *rossiana),* the shell is sparsely not regularly axially streaked with the darker bands, and the coloration of the dorsal surface is distinctive. Whorls $4\frac{1}{2}$.

fletcheri.

Major diameter, 36 mm.; minimum diameter, 29 mm.; height, 20 mm.; depth of body whorl opp. aperture, 15 mm. (Paratype.)

Major diameter, 31 mm.; minimum diameter, 25.5 mm.; height, 17 mm.; depth of body whorl opp. aperture, 13 mm. (Holotype.)

rossiana.

Major diameter, 31 mm.; minimum diameter, 25 mm.; height, 19.5 mm.; depth of body whorl opp. aperture, 14.5 mm.

Major diameter, 35 mm.; minimum diameter, 27.5 mm.; height, 20.5 mm.*; depth of body whorl opp. aperture, 15 mm. (Holotype.) (*revised measurement.)

Holotype: Presented to Auckland Museum by Mr. Owen Fletcher.

Habitat: Mt. Tuhua, 3,688 feet, eastern side of Lake Kanieri, Westland. Found on the ground around bases of tussock. Collected by Mr. Owen Fletcher.

Paryphanta gagei n. sp. Pl. 33, figs, 10, 11.

Shell comparable with that of *rossiana* and *fletcheri,* the latter in particular; subdiscoidal, moderately large, narrowly umbilicate, smooth and glossy, but the upper surface sculptured with fine close anastomosing short spiral striations so broken up that the surface is best described as minutely malleated. The sculpture abruptly terminates above the periphery of the body-whorl at the upper third of its height. Whorls $5\frac{1}{4}$.

Coloration exactly as in *fletcheri,* Brussels-brown above and medal-bronze below, axially streaked with distant dark brown narrow bands and more numerous, much paler greenish and reddish-brown intermediates. Apex yellow ochre to buckthorn brown (Ridgway, Pl. 15, 17I); last eighth of body-whorl with crowded axial dark-brown stripes. Parietal callus so thin a glaze that the colour is identical with that of the base.

Compared with *fletcheri,* the shell reaches a larger adult size and is further distinguished by the presence of a malleate-striate upper surface extending down over one-third the depth of the body-whorl. Both *fletcheri* and *rossiana* are glossy all over.

Umbilicus one-eighth major diameter of base.

Major diameter, 42.5 mm.; minimum diameter, 34 mm.; height, 24 mm.; depth of body-whorl opp. aperture, 16.5 mm. (holotype).

Holotype: In Auckland Museum.

Habitat: Head of Seven Mile Stream, 2,800 feet, Rewanui, Greymouth. "Found in a niche in a moist mossy bank under stunted yellow-pine and spider-wood." Mr. Maxwell Gage.

Fragmentary specimens of what appears to be the same species were collected by Mr. H. Wellman from Kirwan's Hill, 3,500 feet, seven miles N.E. of Reefton.

Paryphanta unicolorata rotella, n. subsp. Pl. 33, figs. 8, 9.

The typical form of *unicolorata* is uniformly olive-brown without axial stripes and at the most with faint spiral reddish-brown lines on the dorsal surface only. The type locality is Seddonville, West Coast, Nelson, around flax (Phormium) bushes near the State Mine.

Examples from the western slopes of Mount Glasgow, between the Mokihinui and Ngakawau Rivers, differ in having a dense pattern of dark red-brown spiral lines on the dorsal surface, thinning out over the periphery and becoming practically obsolete on the base. In addition, they have a few bold wide spaced dark brown axial streaks. The ground colour is nearest to Ridgway's ecru-olive (Pl. 30, 21, I). *Lignaria* has a decidedly reddish-brown ground colour, cinnamon-rufous to hazel (Pl. 14, 11, I and K). Parietal callus bluish-white as in typical species.

Major diameter, 42.5 mm.; minimum diameter, 35 mm.; height, 24.5 mm. (estimated, apex damaged). (Holotype.)

Major diameter, 49 mm.; minimum diameter, 40 mm.; height, 28 mm. St. Andrew's Stream, 1,800-2,000 feet.

Holotype: Presented to the Auckland Museum by Mr. W. H. Johnston.

Habitat: Between headwaters of St. Andrew's and St. George's Streams, tributaries of the Ngakawau River, at 1,200 feet, western slopes of Glasgow Range, West Nelson (holotype). Vicinity of headwaters of St. Andrew's Stream at 1,800-2,000 feet (larger specimen, and one half grown). Ridge betwen Coal Creek and Chasm Creek at 700 feet, tributary of Mokihinui River. (Collected by Mr. W. H. Johnston.)

Paryphanta spedeni Powell 1932.

Rec. Auck. Inst. Mus., vol. 1, no. 3, p. 159.

Mr. A. C. O'Connor, who collected a series of living specimens of this species, states that the locality as given by the collector, Mr. J. Speden, is not quite correct. It should read: "on range at about 3,200 feet, west side of Mataura River, opposite East Dome, Southland."

The distribution of this species is now known to extend to the vicinity of Lake Monowai, as shown by specimens collected by Mr. S. W. Mayo at 3,000 feet on the Billow Mountains, which rise from the south-western shore of the lake.

(Gilliesi series.)

Paryphanta gilliesi montana Powell 1936.

Rec. Auck. Inst. Mus., Vol. 2, no. 1, p. 33.

Mr. E. B. Langford, the finder of this subspecies, informs me that the locality he gave, "Mt. Stevens, 3,800 feet," is incorrect, and should be Bock Peak, about 3,300 feet. Bock Peak is on the same ridge as Mount Stevens, but is of lesser altitude.

Paryphanta gilliesi brunnea, n. subsp. Pl. 33, fig. 14.

The type series of *gilliesi kahurangica* (Powell 1936, Rec. Auck. Inst. Mus., Vol. 2, no. 1, p. 33) came from south of Paturau River, West Coast, Nelson, and the same form occurs at Kahurangi Point, some fifteen miles to the south. Recently Mr. A. C. O'Connor received from Mr. H. Scrimgeour, of Paturau, a series of snails from the north side of the Paturau River which differ from *kahurangica* in having a more or less uniformly brownish base free from spiral bands, apart from the lower of two peripheral dark bands which, when viewed from the base, is just visible around the circumference of the shell. Also it reaches a larger adult size, the usual reddish brown basal tint of *gilliesi* and *kahurangi* is lacking, and the parietal callus is black, crowded with fine granules, whereas in *kahurangica* this callus is drab-grey with the granules not so clearly defined.

It would seem that the type lot of *kahurangica* really came from a location much to the south of Paturau River, and nearer to Kahurangi Point.

The recently collected specimens from north of the Paturau are so distinctive and constant in their characteristics that they must be considered typical of that area.

In Ridgway's terminology, the basal coloration of *g. brunnea* is antique-brown (Pl. 3, 17 K), deepening towards the umbilicus from amber-brown (Pl. 3, 13 K) to chestnut (Pl. 2, 9 M).

Major diameter, 53 mm.; minimum diameter, 46 mm.; height, 30 mm. (holotype).

Major diameter, 56 mm.; minimum diameter, 47 mm.; height, 32 mm. (paratype. Collection of Mr. A. C. O'Connor).

Holotype: Presented to Auckland Museum by Mr. A. C. O'Connor.

Locality: 20-30 feet above sea, north side of Paturau River, West Nelson. Collected by Mr. H. Scrimgeour and Mr. W. J. Jameson.

Paryphanta traversi tararuaensis n. subsp. Pl. 33, fig. 2.

This is a high-country form of the lowland *traversi.* The typical species comes from Waiopehu Reserve, Levin, and the species was formerly well distributed in the lowland forest of that area, the average height above sea level being 120 feet.

The new subspecies occurs at from 1,500 to 2,000 feet at Kaihinu, on the Tararua Range, east of Tokomaru, a railway station 76 miles north from Wellington and 16 miles north of Levin, on the Wellington-Palmerston North line. Although the Tararua Range has been fairly well searched for large snails, Kaihinu is the only high country occurrence for them so far known. Specimens were first located by Mr. K. Rudall in 1934, and subsequently in numbers during the summer of 1937-38 by Mr. A. C. O'Connor, of Wellington.

The new subspecies is characterised by the coloration of the base and parietal callus, the former being more uniformly greenish-olive than in *traversi*, and the pattern always much more delicate, consisting of fine, close spaced lines rather than broad bands or zones. A notable feature is the bright purplish-lilac parietal callus compared with the dull purplish grey of the typical species.

Shell of similar size, shape and sculpture to that of *traversi* typical. Whorls 5, including buff to yellow-ochre typical protoconch of 1½ whorls. Dorsal surface with a ground colour of mummy-brown (Ridgway, Pl. 15, 17 M) to Dresden-brown (Pl. 15, 17 K) close banded with narrow spiral lines of Mars-brown (Pl. 15, 13 M). Three, sometimes more, heavier, linear spaced spiral bands at periphery. Ventral surface dull-citrine (Pl. 16, 21 K) to olive-citrine (Pl. 16, 21 M), faintly spirally striped with close spaced but somewhat irregular lines of Saccardo's-olive (Pl. 16, 19 M) and Roman-green (Pl. 16, 23 m).

There is also a diffused patch of Mars-brown (Pl. 15, 13 M) about one-third the major diameter of the shell, in width, extending outward from the umbilicus. Parietal callus purplish-lilac (Pl. 37, 65 D), irregularly streaked axially with Argyle-purple (Pl. 37, 65 B).

Major diameter, 43 mm.; minimum diameter, 35 mm.; height, 22 mm. (holotype). Major diameter, 54 mm. (specimen in Mr. O'Connor's collection).

Holotype: Presented to Auckland Museum by Mr. A. C. O'Connor.

Habitat: 1,500-2,000 feet, Kaihinu, Tararua Range, living on the ground under decaying leaves, around the roots of the fern *Blechnum discolor*, and especially under piripiri "bidibidi" on the outskirts of the forest. Collected by Mr. A. C. O'Connor, of Wellington.

SCHIZOGLOSSA Hedley 1892.

Type (orig. desig.): *Daudebardia novoseelandica* Pfeiffer.

Schizoglossa major n. sp. Pl. 33, figs. 15, 16.

Shell very large for the genus, solid, and heavily callused within. Ovate, strongly convex, scarcely angulate along back margin. Sculptured with a few irregular and waved radial furrows, not clearly showing owing to the state of preservation of the specimens. Protoconch typical, well defined, of 1½ rapidly increasing whorls. Whorls 2¼, being a quarter of a whorl more than in *novoseelandica*. As the post-nuclear whorls increase with great rapidity, the extra quarter of a whorl results in a much larger shell than in the Recent genotype.

With age *novoseelandica* becomes proportionately longer, with subparallel sides. The much larger *major* retains it regularly ovate outlines at exactly twice the linear dimensions of the largest *novoseelandica* I have seen, and that both are adult forms

is shown by the well developed internal callosity in the small Recent species as well as in the Subrecent form here described.

major.

Major diameter, 36 mm.; minimum diameter, 26 mm.; height, 8.5 mm. (holotype).

Major diameter, 40 mm.; minimum diameter, 28.5 mm.; height, 10 mm. (Three dimensions estimated from damaged paratype).

gigantea.

Major diameter, 32 mm.; minimum diameter, 19 mm.; height, 6 mm. (holotype).

novoseelandica.

Major diameter, 20 mm.; minimum diameter, 14 mm.; height, 4.75 mm.

Major diameter, 20 mm.; minimum diameter, 13 mm.; height, 6 mm. (senile specimen).

Holotype: In Auckland Museum.

Locality: Subrecent, in limestone crevice with "moa" remains, ½ mile S.W. of Pukemiro, Waikato, North Island. Collected by Mr. J. H. Hill and Mr. Gilbert Archey.

The new species *major* is larger than the Subrecent *gigantea* Powell 1930 (Rec. Auck. Inst. and Mus., vol. 1, no. 1, p. 54), and of very different outline, convexity and sculpture.

FAMILY PARYPHANTIDAE.

(Synopsis of New Zealand members of the genus *Paryphanta.)*

PARYPHANTA Albers 1850. (Type: NANINA BUSBYI Gray.)

(a) BUSBYI series (typical).

1. *P. busbyi* (Gray 1840). North Auckland Peninsula.

(b) HOCHSTETTERI series.

2. *P. hochstetteri* (Pfeiffer 1862). Pikikiruna-Tasman Ranges, Nelson.
3. *P. hochstetteri anatokiensis* Powell n. subsp. Headwaters of Anatoki, western end of Tasman Range, Nelson.
4. *P. hochstetteri obscura* Beutler 1901. Western Marlborough Sounds.
5. *P. hochstetteri bicolor* Powell 1930. Eastern Marlborough Sounds.
6. *P. hochstetteri consobrina* Powell 1936. Mt. Duppa, Marlborough, and vicinity.
7. *P. marchanti* Powell 1932. Ruahine Range, North Island.

(c) LIGNARIA series.

8. *P. lignaria Hutton* 1888. Karamea to Mokihinui River, West Nelson.
9. *P. lignaria oconnori* Powell n. subsp. Headwaters of Leslie River, western slopes of Mt. Arthur, Nelson.
10. *P. annectens* Powell 1936. Gunner Downs, south to Karamea, West Nelson.
11. *P. mouatae* Powell 1936. Gouland Downs, West Nelson.
12. *P. superba* Powell 1930. Eastern side of Aorere Valley, southern part of Whakamarama Range and across Gouland Downs to Rocks Point, West Nelson.

13. *P. unicolorata* Powell 1930. Mokihinui River to Westport, West Nelson.
14. *P. unicolorata rotella* Powell n. subsp. Slopes of Mt. Glasgow, West Nelson.
15. *P. gagei* Powell n. sp. Rewanui, Paparoa Range, Greymouth to Kirwan's Hill, N.E. of Reefton?
16. *P. fletcheri* Powell n. sp. Mt. Tuhua, Kanieri, Westland.
17. *P. rossiana* Powell 1930. Mt. Greenland and Mt. Rangitoto, Ross, Westland.
18. *P. spedeni* Powell 1932. East Dome to Billow Mountains, Monowai, Southland.

(d) GILLIESI series.

19. *P. gilliesi* Smith 1880. Northern end of Whakamarama Range, West Nelson.
20. *P. gilliesi brunnea* Powell n. sp. North of Paturau River, West Nelson (coastal).
21. *P. gilliesi kahurangica* Powell 1936. South of Paturau River to Kahurangi Point, West Nelson (coastal).
22. *P. gilliesi montana* Powell 1936. Whakamarama Range, south of Kaituna-Patarau break.
23. *P. gilliesi subfusca* Powell 1930. North side of Westhaven Inlet to Wairaki, Puponga (low country).
24. *P. compta* Powell 1930. Eastern side of Aorere Valley, West Nelson.
25. *P. jamesoni* Powell 1936. Gouland Downs, West Nelson.
26. *P. fallax* Powell 1930. Ngarino and Onekaka Ridges, West Nelson.
27. *P. traversi* Powell 1930. Levin, North Island (low country).
28. *P. traversi tararuaensis* Powell n. subsp. Kaihinu, Tararua Range.

BULIMULIDAE.

Placostylus Albers 1850. (Type fide Martens 1861) *Limax fibratus* Martyn. (*Placostylus* Beck 1837 a list name only.)

The genus *Placostylus* in New Zealand is restricted to the North Auckland Peninsula and outlying islands, and on the mainland has not been found south of Whangarei. It is decidedly coastal in distribution, nowhere having been found at more than a mile from the sea. Forty or fifty years ago a study of the distribution of the local races of these snails would have been a simple matter. To-day, unfortunately, through the clearing away of coastal vegetation and the ravages of pigs and rats little in the way of living material remains. Fortunately, series of localised specimens are available in museums, and I have, during the past fifteen years, made collections of living material at the few remaining mainland localities. One of these colonies has since been destroyed through the liberation in the area of domestic pigs, one other is of such small extent that it must inevitably go, and a third colony may at any time be destroyed by fire.

The Auckland Museum now has what must be the largest and most representative collection of N.Z. *Placostylus* in existence. so I take this opportunity of recording my conclusions on the genus, as it is unlikely that any better one will be afforded later.

The type of *Placostylus hongii* was taken by Gabert at Kerikeri, Bay of Islands. The species has long been exterminated in that area and, strangely enough, no topotypic specimens, with the exception of a deformed example from the collection of the late Mr. Augustus Hamilton, appear to have been preserved in local collections. Fortunately, however, I was able to obtain a Bay of Islands specimen from the Cox collection in the Australian Museum, Sydney, and this is here figured as representing

the typical species. Of the localities listed by Suter in the "Manual of the N.Z. Mollusca," p. 767, I have not seen examples from Kaitaia, Mangonui or Chicken Island, but on the other hand a number of additional localities are here added, which considerably extend the range in respect to the outlying islands.

Suter lists as a variety, *Bulimus novoseelandicus* Pfeiffer 1862, based upon a specimen collected by Hochstetter at Whangaruru, and characterised by a white peristome, parietal callus and interior of the aperture. At Mokau, to the south of Whangaruru, I collected a number of living examples which included about five per cent. only with a white aperture, the remainder being typical *hongii*. The only other localities where I have observed this feature are Whangaruru two out of five specimens, and again about five per cent. in a number of examples from a small islet off the southern end of Poor Knights Islands, which are situated fifteen miles almost due east from Whangaruru.

The variety *novoseelandica* is clearly an albinistic form and has no taxonomic status, but is interesting nevertheless in respect to the supposed origin of the Poor Knights stock. It is surmised that the species has been distributed on the Poor Knights, Great Barrier Island and Fanal Island, in the Mokihinui group, either intentionally or by accident through the Maori people. All these island occurrences are on or adjacent to Maori pa sites. In the case of the Great Barrier Island this snail has apparently never been generally distributed, but only in the vicinity of three such pa sites.

If the occurrences had been natural, one would expect subspecific differences, for in the case of the Poor Knights Islands, other snails, *Rhytida pycrofti* Powell and *Allodiscus cooperi* Suter, have achieved full specific distinction from their mainland relatives. Also the comparatively recently separated Cape Maria van Diemen Island, a mere few hundred yards distant from the mainland, supports a *Placostylus* that has noticeably diverged from mainland stock.

With regard to the possible dispersal of these snails by Maoris, it is suggested that the young could easily have been transported amongst leaf mould in the transplanting of "karaka" trees by the natives. Mr. George Graham, of Auckland, informs me that it is known that Maoris were in the habit of transplanting such food plants when a change in residence was made, and even for reasons of sentiment when they knew that the "karaka" and flax would occur in their new home. The fact that "karaka" leaves are, when available, the staple food of *Placostylus hongii* is significant.

Suter's other subspecies, *ambagiosus* (Journ. de Conch. 1906, vol. 54, p. 253, pl. 8, f. 4, and Man. N.Z. Mollusca, p. 768), is more difficult, for undoubtedly there are several local variants, in spite of the fact that the "subspecies" probably never extended beyond the northernmost tip of the North Auckland Peninsula. It had, it is considered, a lateral distribution of some 35 miles along the

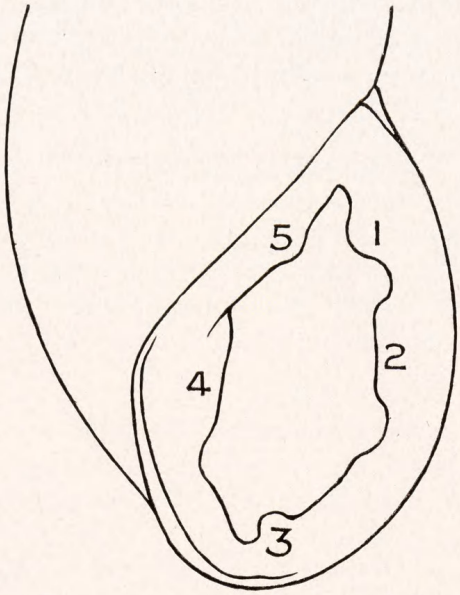
northern coastline, and did not extend much below Parengarenga Harbour on the East Coast and Scotts Point on the western side. Below this the extensive sand dune country seems to have proved an effective barrier in segregating this "subspecies" from typical *hongii*. It is unfortunate that the Kaitaia and Mangonui records can no longer be substantiated by specimens, but in lieu of the topography and present distribution of vegetation it seems likely that these two occurrences would have been allied to the typical stock rather than to *ambagiosus*.

The position is complicated in respect to *ambagiosus* by the presence of these variants and the fact that changes in the coastal plant cover have resulted in the extinction of these snails over most of their former range, living examples having survived only at Cape Maria van Diemen Island, Unuwhao, between Spirits Bay and Tom Bowling Bay, and an isolated occurrence from the North Cape mainland.

Evidence that coastal vegetation once existed on the sites of present drifting sand dunes at Cape Maria van Diemen mainland, Spirits Bay and Tom Bowling Bay is provided by the occurrence along with extremely abundant bleached *Placostylus* of attendant species that require shade and dampness. These are *Rhytida duplicata*, *Paryphanta busbyi* and the extinct *Succinea archeyi*. The conclusion reached is that the ancestral species is represented by examples from consolidated sand dunes from between Cape Maria van Diemen mainland and Twilight Beach, probably of Pleistocene age. With them occur fragments of moa bones, moa egg-shells, *Rhytida duplicata* and *Paryphanta busbyi*. In the later sub-recent drifting dunes which are widely distributed about the same locality, occurs a second form which is found in identical drifting dunes throughout the length of Spirits Bay, and similarly at Tom Bowling Bay and at Waikuku. This form survives at Unuwhao, 1,063 feet, between Spirits Bay and Tom Bowling Bay, in one of the few remaining patches of virgin coastal bush in the area. These living examples are somewhat larger than any of the subrecent dune specimens, but this may be accounted for by lack of competition in respect to their reduced numerical strength, when compared with the myriads that formerly inhabited the sites of the present drifting dunes.

On the slopes of the low headland that faces Cape Maria van Diemen Island, a third form occurs which became extinct within the memory of local residents. They are obtainable around flax (*Phormium tenax*) roots, and still show apertural colour as against the form two of the sand dunes, which is always entirely bleached. Its divergence may be accounted for by its presumed struggle against increasing aridity, whereas form two has survived at Unuwhao through not encountering such stress. The fourth form is the typical *ambagiosus* confined to Cape Maria van Diemen Island, where it has survived but has become modified to its present form, in association with the flax, again under semi-arid conditions. A small drifting sand-dune with bleached *Placostylus* occurs on the island also and some examples, larger

and heavier than typical living ones, can be matched with the mainland form two. This is easily accounted for, as the island is a mere four hundred yards from the mainland, and its separation evidently took place at no distant date.



Ambagiosus exhibits the earliest conditions of the aperture which is strengthened by tubercular processes both on the parietal callus and on the inside of the outer lip. I have numbered these tubercles in the text figure 1-5, and they are present to a varying degree in all forms of *ambagiosus*. In typical *hongii*, on the other hand, only tubercle 3 perists, with 1 sometimes vestigial, and for this reason I propose to separate as a valid species Suter's *ambagiosus* and associate with it three subspecific forms as described below.

Placostylus hongii (Lesson 1830). Pl. 35, figs. 2-11.

1830 *Bulimus shongii* Lesson Voy. Autour du Monde la Corvette S.M. "La Coquille" Zool., 2, p. 321 (1830), pl. 7, f. 4, 5 (1826).
1853 *Bulimus bovinus* Brug.: Petit. Journ de Conch., p. 404.
1862 *Bulimus novoseelandicus* Pfeiffer, Mal. Bl. vol. 8, p. 149.
1864 *Bulimus bovinus* "var. b., *candida*, etc." Crosse, Journ. de Conch., vol. 12, p. 124. (See footnote†.)
1880 *Placostylus bovinus:* Hutton Man. N.Z. Moll., p. 14.
1880 *Placostylus novoseelandicus* Hutton, l.c. p. 14.
1884 *Bulimus hongii* Lesson and Martinet "Les Polynesiens," vol. 4, p. 227 (emended spelling of specific name).
1884 *Placostylus bovinus:* Hutton, Trans. N.Z. Inst., vol. 16, p. 190, Hutton.
1884 *Placostylus bovinus* var. *neozelanicus:* Hutton l.c., p. 190.
1884 *Placostylus bovinus* var. *candidus:* Hutton l.c., p. 190.
1893 *Placostylus bovinus:* Crosse & Suter Note Prelim. Faune Mal. Terr. et Fluv. de la Nouvelle-Zelande, etc. Paris, p. 29.
1893 *Placostylus bovinus* var. *candida:* Crosse & Suter l.c., p. 30.

1893 *Placostylus bovinus* var. *novoseelandica:* Crosse & Suter l.c., p. 30.
1900 *Placostylus shongii:* Pilsbry, Man. Conch. (2), vol. 13, p. 22.
1900 *Placostylus shongii* var. *novoseelandicus:* Pilsbry l.c., p. 24.
1913 *Placostylus hongii:* Suter Man. N.Z. Moll., p. 765.
1913 *Placostylus hongii* var. *novoseelandicus:* Suter l.c., p. 768.

†The varietal name *candida* is difficult to place. I am indebted to Mr. T. Iredale, of the Australian Museum, for a transcription of Crosse's original reference, which shows that he had no intention of proposing a varietal name, for the entry under *Bulimus bovinus* reads "var. B. candida, columella subverticale," etc.; the word "candida" being part of the original diagnosis, although later it was interpreted by Hutton 1884 as a varietal name and was subsequently accepted as such by Crosse himself in Crosse & Suter 1893. The original description gives neither locality nor source of the specimen described, but the diagnosis "Columella subvertical, peristome white; aperture buff-whitish within; the basal margin with a single tubercle, right lip slightly sinuated within, above" (Pilsbry's translation, 1900) shows that with a single basal tubercle the shell belongs to typical *hongii* rather than to *ambagiosus* or any of its subspecies. The position, however, is complicated by Crosse & Suter 1893 giving as locality for *candida*, "Ile du Nord: Cap Maria," for typical *hongii* does not occur in that area. Hutton 1884 seems to be the first use of the name in a varietal sense, but with the lack of a figure, definite locality, and reference only to the original inadequate diagnosis, which does not indicate anything other than a bleached specimen of the typical species, the name *candida* is best considered as a nomen nudum.

Localities:

At the cascade of Keri Keri, Bay of Islands, under the trees bordering the river of that name (Gabert) (type): Near Russell, Bay of Islands (bleached shells) 1936: Whangaroa (3 specimens in Canterbury Museum): Tauranga Bay, Whangaroa; bleached shells in consolidated sand on foreshore; collected A.W.B.P. Feb. 1932: Whangamumu (1 specimen in Auck. Museum in A.W.B.P. Coll.): Whangaruru (type locality of *Bulimus novoseelandicus):* south end of Mokau Beach, Whangaruru, in "karaka" grove near sea (typical *hongii* and albinistic *novoseelandicus* form); collected A.W.B.P. Jan., 1935: northern end of Mimiwhangata Beach, Paparahi, south of Helena Bay on headland with "karaka," "pohutukawa" and "flax." Collected A.W.P.B. Nov., 1927, and Jan., 1935: Matapouri Bay; bleached specimens from sand dunes collected by Mr. B. Given, 1935: Goat Island, about 2 miles south of Ngunguru; collected by Mr. B. Given and L. W. Delph, 1934: Whangarei Heads (Charles Cooper specimens not separated from Poor Knights Is. examples in his collection): known to have occurred definitely at Smuggler's Bay, Reotahi, and Parua Bay, Whangarei Heads: Poor Knights Is., Tawhiti Rahi (very abundant); Aorangi (almost killed out by wild pigs, but these have lately been exterminated by Captain G. F. Yerex, of the Department of Internal Affairs, October, 1936); a small unnamed islet with archway off southern end of Aorangi (very abundant): Great Barrier Island, on old pa site midway round Tryphena Bay, last living specimen taken by Mr. J. Blackwell about 1913; formerly abundant there, but only bleached fragments now remain: Maori Bay, three fresh specimens taken after a burn in April, 1924 (Mr. W. La Roche); headland at northern

end of Schooner Bay (Messrs. H. Osborne and N. H. Goulstone), living specimens taken: Fanal Island, Mokohinau Group, several fragments taken by Mr. A. T. Pycroft and R. A. Falla, Sept., 1933.

In addition to these Suter lists Chicken Island (C. Cooper), Kaitaia and Mangonui, but I have been unable to locate any specimens from these localities. The northern localities cited by Suter, North Cape and Cape Maria van Diemen, refer to *ambagiosus*.

The species survives, so far as is known, only at the Poor Knights Islands, Mokau, and Schooner Bay, Great Barrier Island.

Figures of Bay of Islands (typical), Whangaroa, Whangaruru, Mokau, Mimiwhangata, Ngunguru, Poor Knights Islands and Great Barrier Island specimens are given, as well as the following measurements:—

Height, 85 mm.; breadth, 37 mm.; height of aperture (inside measurement), 32 mm. Bay of Islands (topotype).

Height, 84 mm.; breadth, 35 mm. Whangaroa (Canterbury Museum).

Height, 80.5 mm.; breadth, 35 mm. Whangaroa (Canterbury Museum).

Height, 74 mm.; breadth, 31 mm. Whangaroa (Canterbury Museum).

*Height, 79 mm.; breadth, 39 mm. Whangamumu (Dominion Museum).

Height, 75.5 mm.; breadth, 37 mm. Whangamumu (Dominion Museum).

*Height, 76 mm.; breadth, 35.5 mm. Whangaruru (Canterbury Museum) (topotype of *novoseelandica*).

Height, 83.5 mm.; breadth, 36 mm.; height of aperture (inside measurement), 33 mm. Mokau.

*Height, 82 mm.; breadth, 36 mm.; height of aperture (inside measurement), 34 mm. Mokau.

Height, 79.5 mm.; breadth, 37.5 mm.; height of aperture (inside measurement), 34 mm. Mokau.

Height, 67.5 mm.; breadth, 33 mm.; height of aperture (inside measurement), 27 mm. Mokau.

Height, 74 mm.; breadth, 32 mm.; height of aperture (inside measurement), 32 mm. Mimiwhangata.

Height, 71 mm.; breadth, 32 mm.; height of aperture (inside measurement), 30 mm. Mimiwhangata.

Height, 67.5 mm.; breadth, 35 mm.; height of aperture (inside measurement), 31 mm. Mimiwhangata (sinistral).

Height, 86.5 mm.; breadth, 36 mm.; height of aperture (inside measurement), 33 mm. Poor Knights Is., Tawhiti Rahi.

Height, 85 mm.; breadth, 36 mm.; height of aperture (inside measurement), 32 mm. Poor Knights Is., Tawhiti Rahi.

*Height, 78 mm.; breadth, 35 mm.; height of aperture (inside measurement), 33 mm. Poor Knights Is , Tawhiti Rahi.

*Height, 74 mm.; breadth, 32 mm.; height of aperture (inside measurement), 29 mm. Poor Knights Is., Tawhiti Rahi.

Height, 71 mm.; breadth, 30 mm.; height of aperture (inside measurement), 26 mm. Goat Id. Ngunguru.

Height, 69 mm.; breadth, 31.5 mm.; height of aperture (inside measurement), 29 mm. Goat Id. Ngunguru.

Height, 62 mm.; breadth, 27 mm.; height of aperture (inside measurement), 25 mm. Goat Id. Ngunguru.

Height, 83 mm.; breadth, 39 mm.; height of aperture (inside measurement), 33 mm. Maori Bay, Gt. Barrier.

Height, 77 mm.; breadth, 35 mm.; height of aperture (inside measurement), 31 mm. Schooner Bay, Gt. Barrier.

Height, 72 mm.; breadth, 33 mm.; height of aperture (inside measurement), 31 mm. Schooner Bay, Gt. Barrier.

All the dimensions given above are of adult specimens, which are shown to have a maximum variation of 23 millimetres. The only conclusion reached in respect to size is that a dwarf race apparently existed on the mainland from Helena Bay southward to Whangarei Heads. So few specimens, however, are available from this area that their apparent smaller adult size may not have been a constant factor.

A sinistral specimen taken at Paparahi, between Helena Bay and Mimiwhangata, is here figured, it being the only known example of the species exhibiting this abnormality.

*Albinistic examples (i.e., Pfeiffer's *novoseelandicus.)*

During the northern cruise of the Auckland ketch "Will Watch" in February, 1934, 100 specimens of this snail were taken and liberated for future observation on Motuhurakia, a small, rather inaccessible islet in the Noises Group, about sixteen miles from Auckland. In a brief subsequent visit I failed to find any traces of the snails, but this is not surprising, for my visit was only for one hour, and there is an abundance of cover on the islet. If the stock had died one would have expected dead shells to have been in evidence. Certainly they had moved from the site where they had been liberated.

Placostylus ambagiosus Suter 1906. Pl. 34, fig. 1.

1906 *Placostylus hongii ambagiosus* Suter, Journ. de Conch., Paris, vol. 54, p. 253, pl. 8.

1913 *Placostylus hongii ambagiosus:* Suter Man. N.Z. Moll., p. 768, not Suter, Pl. 48, f. 15 (Atlas, 1915).

Locality: Cape Maria van Diemen Island. Small colonies still exist around the roots of flax on the cliff faces, according to Mr. F. Young, Principal Light Keeper, in May, 1934.

Placostylus ambagiosus annectens n. subsp. Pl. 34, figs. 2-6.

1915 *Placostylus hongii ambagiosus* Suter Atlas of Plates, Man. N.Z. Moll., Pl. 48, f. 15 (not of Suter 1906).

Compared with typical *ambagiosus* this subspecies is of much greater adult size, darker brown epidermis, a much narrower white subsutural border and a deeper red-brown apertural colour. The prevailing apertural tint in *ambagiosus* is salmon-orange (Pl. 2, 11B, Ridgway's Colour Standards and Colour Nomenclature, 1912) to orange rufous (Pl. 12, 11I), while in *annectens* it is English red (Pl. 2, 7I) to Brazil red (Pl. 1, 5I). The epidermis in *ambagiosus* runs through ochraceous-tawny (Pl. 15, 15I) and russet (Pl. 15, 13K) to Mars brown (Pl. 15, 13M), with occasional streaks of dark sepia. In *annectens* the range is from russet (Pl. 15, 13K) to Mars brown (Pl. 15, 13M), the body-whorl being completely diffused with dark warm-sepia. The reflexed edge of the peristome is light ochraceous-salmon (Pl. 15, 13D).

Aperture (outside dimension) very little less than height of spire. Peristome much thickened. Apertural tubercles completely developed (see text figure).

No. 1 conical, No. 2 long (10 mm.), rectangular, No. 3 long (10-12 mm.) with a high, squarish tubercle at lower extremity next to a deep narrow basal sinus. Parietal wall—No. 5, low conical tubercle, 12 mm. within aperture, and below, No. 4, a long (10 mm.) projection on the columella.

ambagiosus annectens.

Height, 94 mm.; breadth, 40 mm.; height of aperture (inside), 36 mm. (holotype).

Height, 92 mm.; breadth, 38 mm.; height of aperture (inside), 35 mm. (paratype).

Height, 88 mm.; breadth, 38 mm.; height of aperture (inside), 32.5 m.m. (paratype).

ambagiosus (typical).

Height, 74 mm.; breadth, 33 mm.; height of aperture (inside), 27 mm.; (holotype).

Height, 77 mm.; breadth, 32.5 mm.; height of aperture (inside), 27 mm. (topotype).

Height, 70 mm.; breadth, 30 mm.; height of aperture (inside), 26 mm. (topotype).

Height, 69.5 mm.; breadth, 30 mm.; height of aperture (inside), 25 mm. (topotype).

Holotype: In Auckland Museum.

Habitat: Unuwhao, 900 feet, on track between Spirits Bay and Tom Bowling Bay, under leaf mould in coastal rain forest, about one mile in from the coast. Dominant tree, *Metrosideros tomentosa*, the Pohutukawa. The snails sheltered around the roots

of a sedge. One abnormal specimen was found living in an almost inaccesible gully near North Cape by Mr. R. A. Falla and Mr. A. H. Watt in February, 1932.

Apart from these Recent occurrences, *annectens* is represented in subrecent sand dunes along the full length of Tom Bowling Bay, Waikuku Beach, Spirits Bay, and Cape Maria van Diemen, both on the island and also on the mainland. All, with the exception of Cape Maria Island specimens, were collected by the writer in February, 1932.

At Unuwhao the nests of *ambagiosus annectens* were found: cylindrical depressions in the soil of about one inch in width and the same in depth. The eggs, which were thin shelled, of pale buff colour and measuring 7 mm. x 6 mm., numbered from 15 to 18 per nest. A very disconcerting feature was that most of the eggs had been eaten out by ants, and probably only about two or three out of each batch survive.

Placostylus ambagiosus consobrinus subsp. Pl. 34, figs. 7, 8.

This is a Cape Maria van Diemen mainland form that became extinct within the memory of local residents. As explained earlier, it is considered to be a variant produced from *annectens* stock in an attempt to adapt itself to the increasing aridity of its location. The type specimens (dead and partly bleached) were gathered from around the roots of flax *(Phormium tenax)* on the eastern side of the hill which terminates in the cliff that faces Cape Maria van Diemen Island.

From *annectens, consobrinus* differs in having a smaller aperture, heavily callused, but with tubercles 1 and 2 almost obsolete, 3 as a rounded tubercle only, without lateral extension, and 4 and 5 very well developed, as in *annectens.* The spire is $1\frac{1}{4}$ times the external height of the aperture.

Height, 80 mm.; breadth, 35 mm.; height of aperture (inside), 25 mm. (holotype).

Height, 78.5 mm.; breadth, 34.75 mm.; height of aperture (inside), 26 mm. (paratype).

Height, 78.5 mm.; breadth, 34.75 mm.; height of aperture (inside), 25 mm. (paratype).

Holotype and a series of paratypes in Auckland Museum. Collected by A.W.P.B., February, 1932.

Placostylus ambagiosus priscus n. subsp. Pl. 34, figs. 9, 10.

This is the earliest known New Zealand *Placostylus;* found in consolidated sand-dunes of supposed Pleistocene age from between Cape Maria van Diemen mainland and Twilight Beach. From *annectens, priscus* differs in its elongate sub-cylindrical outline and narrowly ovate aperture, and particularly in respect to the parietal callus, which is much more obtusely angled, has the

parietal tooth, No. 5, weak, as also is No. 4 on the columellar. On the other hand, Nos. 1, 2 and 3 on the inside of the outer lip are very strongly developed. Spire one and one-sixth external height of aperture.

Height, 77 mm.; breadth, 31 mm.; height of aperture (inside), 27 mm. (holotype).

Height, 82 mm.; breadth, 33.5 mm. height of aperture (inside), 28 mm. (paratype).

Height, 76 mm.; breadth, 29.5 mm.; height of aperture (inside), 26 mm. (paratype).

Holotype in Auckland Museum, collected by A.W.P.B., Feb., 1932.

Placostylus bollonsi 1908. Pl. 35, fig. 1.

1908 *Placostylus bollonsi* Suter. Trans. N.Z. Inst., vol. 40, p. 341.

1913 *Placostylus bollonsi* Suter. Man. N.Z. Moll., p. 763.

1935 *Placostylus bollonsi* Powell. Proc. Malac. Soc. (Lond.), vol. 21, pt. 4, p. 247.

In my 1935 paper (see above) I expressed the view that this species, found on the Big King, Three Kings Islands, is now extinct, and that the discoverer, the late Captain J. Bollons, considered that only fifty specimens were ever taken. I listed 27 specimens known to be in Museums and private collections, and to this number I now add:—Australian Museum, Sydney, 1 specimen, and Dr. H. J. Finlay's Collection (now in Auckland Museum), 1 specimen.

FAMILY BULIMULIDAE.

(Synopsis of New Zealand members of the genus *Placostylus.)*

PLACOSTYLUS Albers 1850. (Type: LIMAX FIBRATUS.)

1. *P. hongii* (Lesson 1830.) East Coast of North Auckland Peninsula, Whangaroa to Whangarei Heads, Poor Knights Islands, Great Barrier Island and Fanal Island.
2. *P. ambagiosus* Suter 1906. Cape Maria van Diemen Island (Recent).
3. *P. ambagiosus annectens* Powell n. subsp. (Recent). Unuwhao, between Spirits Bay and Tom Bowling Bay. (Subrecent) Northern extremity of North Auckland Peninsula and Cape Maria van Diemen Island.
4. *P. ambagiosus consobrinus* Powell n. subsp. Cape Maria van Diemen mainland, recently become extinct.
5. *P. ambagiosus priscus* Powell n. subsp. Fossil in consolidated dunes (Pleistocene?) between Cape Maria van Diemen mainland and Twilight Beach.
6. *P. bollonsi* Suter 1908. Big King, Three Kings Islands.

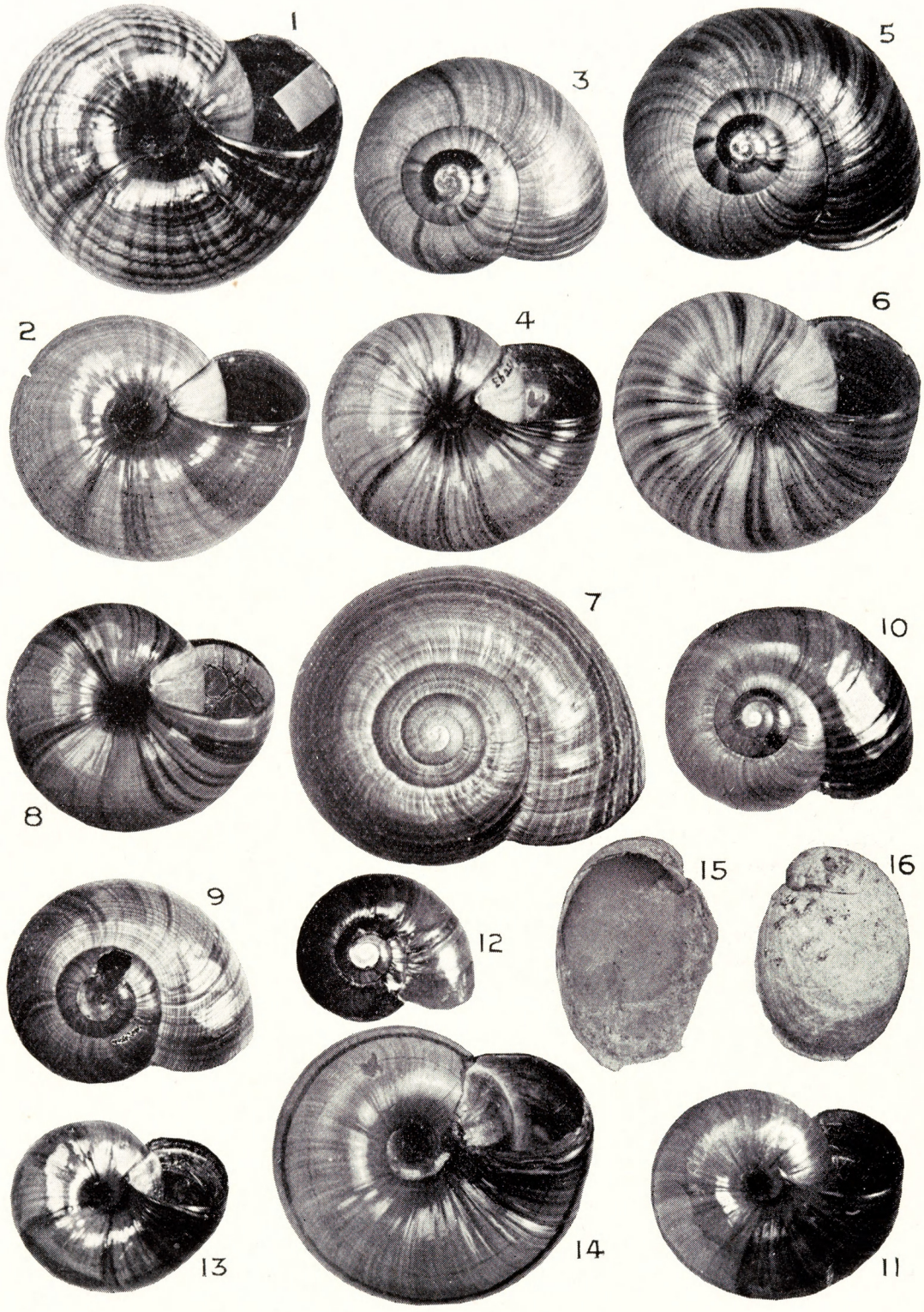


Fig. 1. *Paryphanta traversi* Powell 1930 (holotype).
Fig. 2. *Paryphanta traversi tararuaensis* Powell n. sp. (holotype).
Figs. 3 and 4. *Paryphanta lignaria oconnori* Powell n. subsp. (holotype).
Figs. 5 and 6. *Paryphanta lignaria oconnori* Powell n. subsp. (paratype).
Fig. 7. *Paryphanta hochstetteri anatokiensis* Powell n. subsp. (holotype).
Figs. 8 and 9.—*Paryphanta unicolorata rotella* Powell n. subsp. (holotype).
Figs. 10 and 11. *Paryphanta gagei* Powell n. sp. (holotype).
Fig. 12. *Paryphanta fletcheri* Powell n. sp. (holotype).
Fig. 13. *Paryphanta fletcheri* Powell n. sp. (paratype).
Fig. 14. *Paryphanta gilliesi brunnea* Powell n. subsp. (holotype).
Fig. 15. *Schizoglossa major* Powell n. sp. (paratype).
Fig. 16. *Schizoglossa major* Powell n. sp. (holotype).

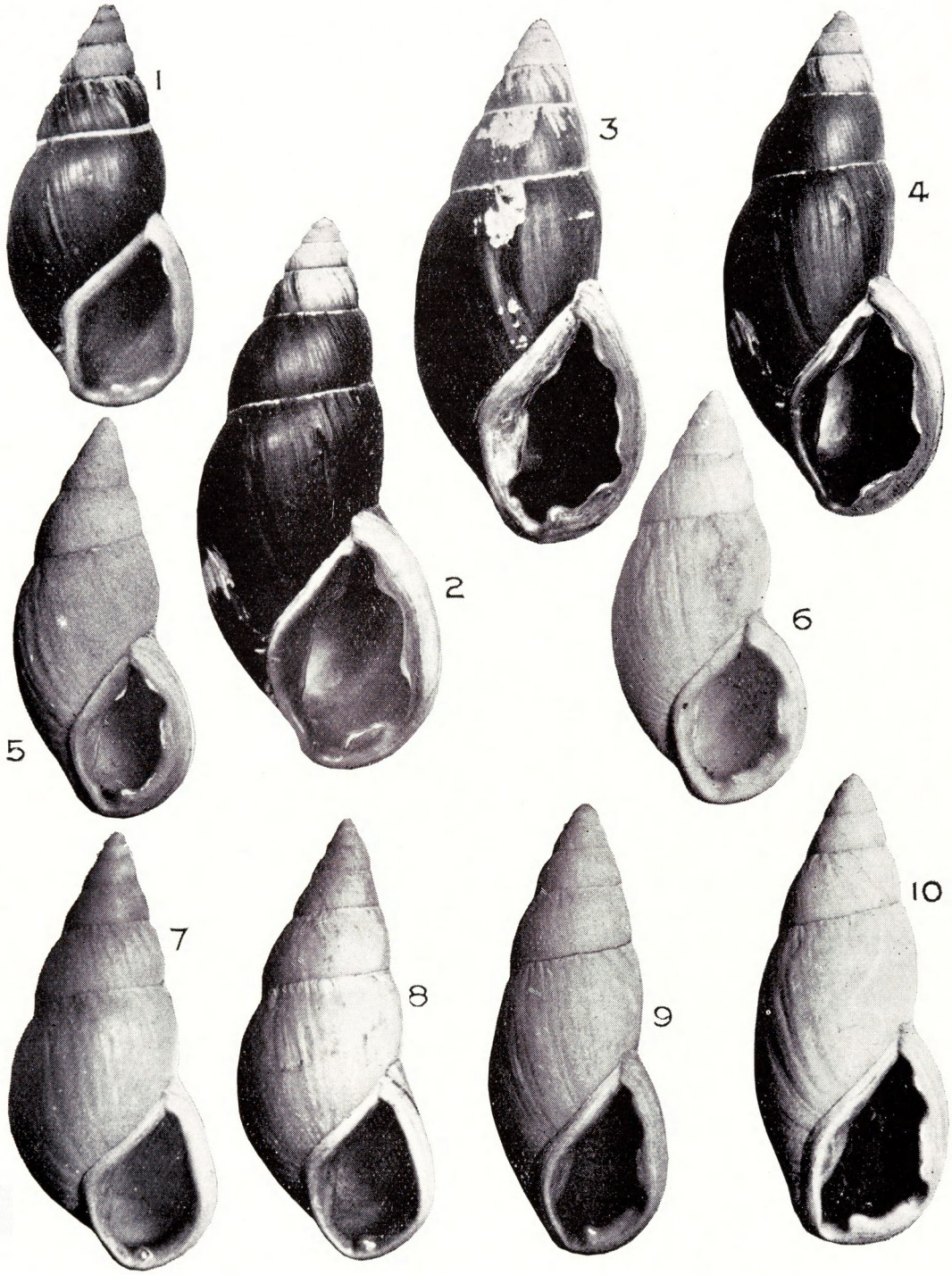


Fig. 1. *Placostylus ambagiosus* Suter 1906 (topotype).
Fig. 2. *Placostylus ambagiosus annectens* Powell n. subsp. (paratype).
Fig. 3. *Placostylus ambagiosus annectens* Powell n. subsp. (holotype).
Fig. 4. *Placostylus ambagiosus annectens* Powell n. subsp. (paratype).
Figs. 5 and 6. *Placostylus ambagiosus annectens* Powell n. subsp. (subrecent Tom Bowling Bay).
Fig. 7. *Placostylus ambagiosus consobrinus* Powell n. subsp. (holotype).
Fig. 8. *Placostylus ambagiosus consobrinus* Powell n. subsp. (paratype).
Fig. 9. *Placostylus ambagiosus priscus* Powell n. subsp. (paratype).
Fig. 10. *Placostylus ambagiosus priscus* Powell n. subsp. (holotype).

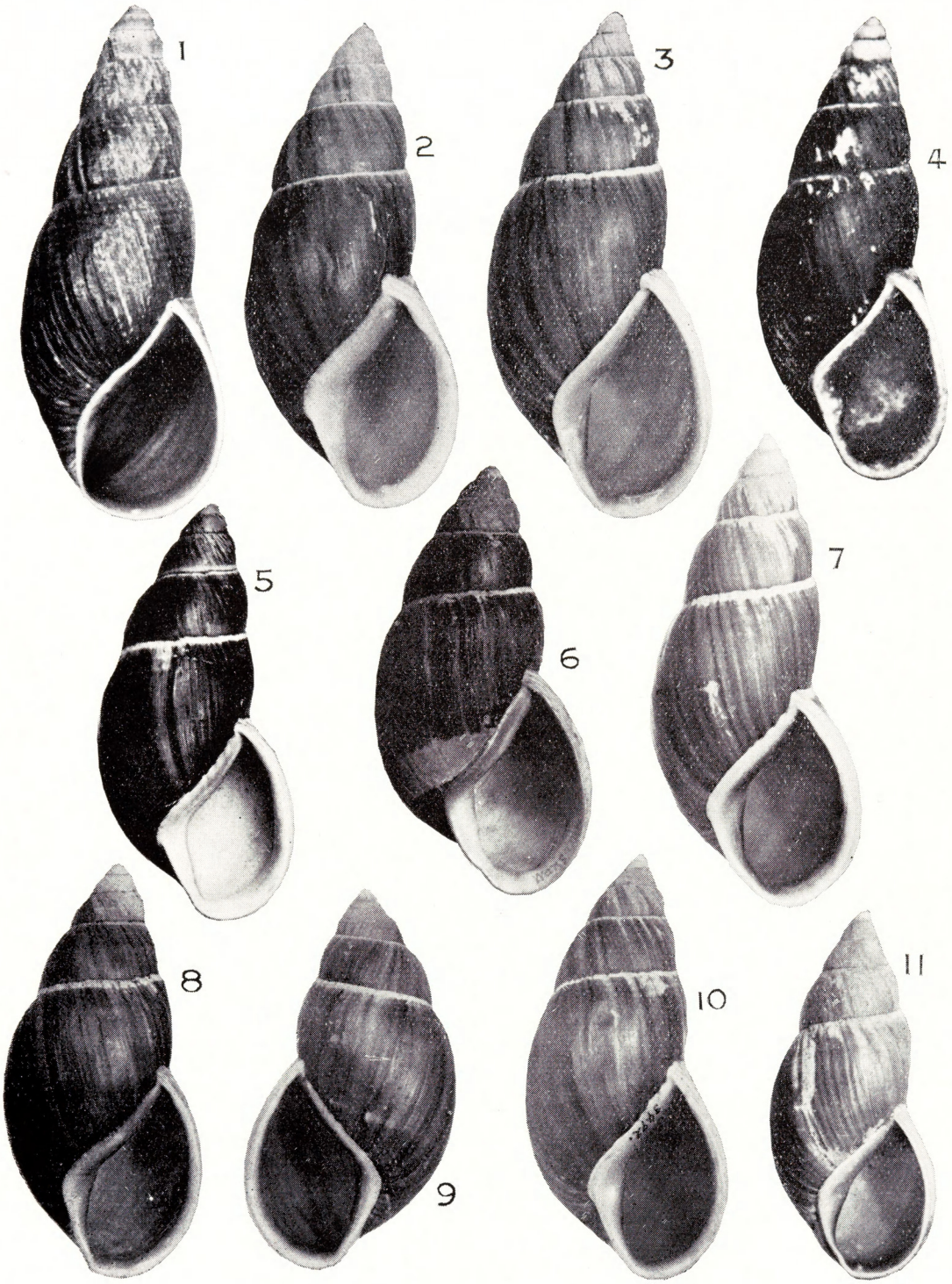


Fig. 1. *Placostylus bollonsi* Suter 1908 (paratype).
Fig. 2. *Placostylus hongii* (Lesson 1830) Bay of Islands (topotype).
Fig. 3. *Placostylus hongii* (Lesson 1830) Mokau, Whangaruru.
Fig. 4. *Placostylus hongii* (Lesson 1830) Whangaroa.
Fig. 5. *Placostylus hongii* (Lesson 1830) Whangaruru.
Fig. 6. *Placostylus hongii* (Lesson 1830) Whangamumu.
Fig. 7. *Placostylus hongii* (Lesson 1830) Poor Knights Islands.
Fig. 8. *Placostylus hongii* (Lesson 1830) Mimiwhangata.
Fig. 9. *Placostylus hongii* (Lesson 1830) Mimiwhangata (sinistral).
Fig. 10. *Placostylus hongii* (Lesson 1830) Schooner Bay, Gt. Barrier Id.
Fig. 11. *Placostylus hongii* (Lesson 1830) Goat Island, Ngunguru.