Notes on the Taxonomy of the Recent Cymatiidæ and Naticidæ of New Zealand.

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[*Received by Editor, 12th August, 1932; issued separately, 28th February, 1933.*]

An attempt is here made to determine the taxonomic relationship of a number of genera of the families *Cymatiidae* and *Naticidae*. This is based upon combinations of what is considered to be the main taxonomic characters.

The writer's thanks are due to Miss M. K. Mestayer for the radula of *Globisinum venustum*, and to Dr H. J. Finlay for the loan of types and other specimens, as well as for some opinions concerning the genus *Charonia*.

I.—The CYMATIIDAE.

Owing to their great diversity and the superficial similarity of many of their members, the triton genera of the families *Cymatiidae* and *Bursidae* have been always a source of worry to the systematist.

The characters that are here considered to combine taxonomic importance with simplicity in application are as follows:—Three unrelated external features are supplied by (a) the operculum—a secretion of the foot; (b) the protoconch—the embryonic phase of the species; and (c) the post-nuclear shell—a secretion of the mantle of the animal (post-larval to adult). A feature of internal secretion is furnished by (d) the radula. In the case of one genus the male genital organ furnished an important distinction where other characters were less divergent.

In the key given below the family *Cymatiidae* is divided into three subfamilies, each of which is characterised by a distinctive combination of dental and opercular characters.

With regard to the protoconch, there are only two types in the species dealt with—Finlay's " Apex A," which is described as " tall, narrowly conical, pointed, of about four whorls set slightly oblique to the axis of the shell, entirely coated with a persistent brown horny envelope . . ." and his " Apex B," which " is similarly polygyrate, but turbinate, with globose rapidly increasing whorls, usually wider than high, the tip minute and planorbid, set almost symmetrically on shell, polished, white and shining, with no trace of horny envelope " (see Finlay, 1931, p. 8).

However, as shown by the key, the protoconch in the tritons suggests grouping that is found to be at variance with results indicated by the sum of other taxonomic characters.

Recently, Finlay (1931, p. 9) has pointed out that while no two species that have different types of apices can be classed together in the same genus, it does not follow that all species having the same type of apex belong to one group unless the sum of taxonomic characters is in complete agreement.

KEY TO SOME OF THE MORE IMPORTANT TRITON GENERA.

CYMATIIDAE.

Shell with posterior notch at most.

Lateral teeth plain.

Lateral teeth denticulate.

Central tooth broad and low, with almost straight basal margin.

Operculum with apical nucleus.

Subfamily *Ranelliinae.*

Apex (?) *Ranella* Lamk., 1816.
Gt. *gigantea* Lamk.

Apex (B) *Mayena* Iredale, 1917.
Gt. *australasia* Perry.

Central tooth broad and low, extremities upcurved, no basal plate.

Operculum with subapical nucleus.

Subfamily *Charoniinae.*

Apex (B) *Charonia* Gistel, 1848.

Central tooth broad and high, with arcuate basal margin.

Operculum with apical nucleus.

Subfamily *Cymatiinae.*

Apex (?) *Cymatium* Bolten, 1798.
Gt. *femorale* Linn.

Apex (B) *Cabestana* Bolten, 1798.
Gt. *cutaceus* Linn.

Apex (B) *Austrosassia* Finlay, 1931.
Gt. *parkinsonianum* Perry.

Apex (B) *Argobuccinum* (K) Herm., 1846.
Gt. *argus* Linn.

Apex (A) *Monoplex* Perry, 1811.
Gt. *parthenopeum* v. Salis.

Apex (A) *Lampusia* Schumacher, 1817.
Gt. *pileare* Linn.

BURSIDAE.

Shell with well-developed posterior canal.

Lateral teeth denticulate.

Central tooth with lateral prolongations of the base.

Operculum with lateral nucleus.

Apex (B) *Bursa* Bolten, 1798.
Gt. *bufonius* Gmel.

Apex (?) *Gyrineum* Link, 1807.
Gt. *spinosa* Lamk.

TYPES OF APEX.

Apex (A): "Tall, narrowly conical, pointed, of about four whorls, set slightly oblique to the axis of the shell, entirely coated with a persistent brown horny envelope . . ."

Apex (B): "Similarly polygyrate, but turbinate, with globose rapidly increasing whorls, usually wider than high, the tip minute and planorbid; set almost symmetrically on shell, polished, white, and shining, with no trace of horny envelope."

(Finlay, 1931, p. 8).

With regard to genera occurring in New Zealand, the status of *Fusitriton* has yet to be determined as the dental characteristics of that genus are unknown to the writer. It is probable, however, that the relationship will prove to be with the *Ranelliinae.*

All tritons evidently pass through a very efficient free-swimming larval stage which is characterised by an apical shell allied to the type known as *Sinusigera.* A very young shell of *parthenopeum* from Tom Bowling Bay has an apex of the *Sinusigera* shape, except that it lacks the characteristic claw. The *Sinusigera* apex is always associated with species of wide distribution, and Iredale (1911) has noted its presence in species of the families *Mitridae, Buccinidae, Nassariidae, Thaisidae, Pyrenidae, Coralliophilidae, Turridae,* and *Terebridae.*

Of the 13 species of tritons found in New Zealand seas only five have developed into recognisable regional species or subspecies, the remaining eight being considered to be identical with species known to be widely distributed in Australasian waters and elsewhere.

Two more species of the widely distributed type are herein recorded as new to New Zealand waters, and a third New Zealand species, previously recorded as identical with a South-western Australian species, is now described as a distinct regional subspecies.

Genus CABESTANA Bolten, 1798.

Type (subsequent designation, Dall, 1904), *Murex cutaceus* Linn.

Cabestana waterhousei segregata n. subsp. (Pl. 23, Fig. 3).

1927. *Cymatium waterhousei* (Adams & Angas) Powell. *Trans. N.Z. Inst.*, vol. 57, p. 560.

Waterhousei sensu lato occurs Recent in South Australia, Tasmania, the Kermadecs, New South Wales, and New Zealand, and a closely related fossil species is known from the upper Pliocene of New Zealand. The first specimen found in New Zealand waters was recorded by the writer in 1927; it came from Parengarenga Harbour in the far north. Recently, however, the writer found two living specimens among a quantity of *spengleri* which were taken on low-tidal rocks near Cornwallis, Manukau Harbour.

Although Australasian specimens are all referrable to *waterhousei* in a broad sense, the collection of series has shown that there are well-marked regional and bathymetric forms. Iredale (1929, p. 177) has described the New South Wales deep-water form as *C. waterhousei frigidulum,* and Finlay has named a New Zealand Castlecliffian fossil *C. debilior.*

The writer finds that recent specimens from New Zealand, the Kermadecs, and Tasmania represent one type, which is separable from South Australian littoral topotypes, the New South Wales deep-water form, and also the New Zealand Pliocene fossil. The New South Wales *frigidulum* and the New Zealand Pliocene *debilior* are both deep-water forms which have considerably taller spires than littoral shells.

The new subspecies *segregata* differs from South Australian typical *waterhousei* (Pl. 23, Fig. 1) in having a more capacious body-whorl and narrower and sharper varices. Furthermore, the primary spiral ridges are more prominently raised, and there are two instead of three keels showing on the spire whorls.

Height 60 mm.; diameter 33.5 mm. (holotype).
„ 52 mm.; „ 30 mm. (Parengarenga specimen).
„ 67 mm.; „ 38 mm. (Tasmanian specimen).

Holotype in writer's collection.

Habitat.—Near Cornwallis, Manukau Harbour (A. W. B. P., 6/11/1927) (type) and Parengarenga Harbour, New Zealand (W. La Roche); Sunday Island, Kermadecs (R. S. Bell); Frederick Henry Bay, Tasmania (W. H. Webster collection).

Dentition (Text Fig. 4).—The central tooth is very different in outline from that of either *spengleri* or *boltenianum*. However, as it has a median shallow sinus of the front margin it stands nearer to the former species. The whole tooth, however, is much broader than that of *spengleri,* and the basal margin is a simple concave arc without a convex central projection. The central tooth has seven or eight denticles on each side of the central cusp, and the laterals mostly six denticles. In *spengleri* there are eight small denticles on each side of the central cusp, and from five to seven on the laterals.

Cabestana bolteniana (A. Adams). (Pl. 23, Figs. 5-8.)

1854. *Triton boltenianus* A. Adams. *P.Z.S.*, p. 311, *Hab. Australia (Mus. Cuming).*
1881. *Triton boltenianus* A. Adams. *Tryon, Man. of Conch.*, vol. 3, p. 17.
1929. *Cymatium boltenianum* (A. Adams). Iredale, *Rec. Aust. Mus.*, vol. 17, no. 4, p. 173 (Pl. 41, Fig. 7).

For many years Australian writers have relegated this name to the synonymy of *C. spengleri.* However, Iredale has recently reinstated the species in the New South Wales faunal list, recording that it is quite distinct from the young of *spengleri,* and that it apparently never grows larger than the example figured (Pl. 41, Fig. 7), which is about 40 mm. in height.

The writer has recently found *bolteniana* in New Zealand waters. The first example obtained was a small living specimen from Mount Maunganui, Bay of Plenty, but later 50 well-preserved shells were gathered from an accumulation of sand and shells on a rocky beach at Kapo Wairua, at the extreme eastern end of Spirits Bay, North Auckland.

The finding of series covering intermediate growth stages clearly demonstrates the distinctive characters of the two species. Young *spengleri* of the size of adult *bolteniana* have much taller spires, are more angular, less thickened, and not so inflated. Furthermore, *bolteniana* grows a labial varix only in the adult shell, whereas *spengleri* leaves a varix at each growth stage.

The finding of this shell in numbers on a New Zealand beach shows that the species is now an established member of our fauna.

DESCRIPTION OF NEW ZEALAND SPECIMENS.

The original Latin description is a short one, unaccompanied by a figure or even dimensions. Iredale (1929, l.c.) supplied a figure of a New South Wales specimen which he had matched with the type, but gave no description, so the following notes on the New Zealand material will not be out of place.

Shell thick and ponderous, but rather small, usually about 30 to 40 mm. in height, although occasional specimens attain a size up to 55 and 60 mm. Unlike *spengleri*, which has several irregularly disposed varices, *bolteniana* forms a labial varix only in the adult stage.

Sculpture consisting of flat-topped, strongly raised, spiral carinae, those near the periphery being rendered nodulous by the presence of broadly rounded axial folds, which number 10 to 12 on the body-whorl. On the body and penultimate whorls the spiral carinae each become bisected by a median thread-like groove, and each of the intercarinal spaces is occupied by a secondary spiral. The whole of the post-nuclear whorls are crossed by closely packed flattened axial riblets, which have linear interspaces and their outer edges sharp, often delicately lamellate, for the attachment of the epidermis This epidermis is thin, with a delicate narrow frill along each of the axial riblets, the whole being crossed by regular spiral threads which are crowded with short bristles. The primary spiral carinae number six on the early spire whorls and 10 on the body-whorl. Spire blunt and low, very little more than half the height of the aperture. Outer lip much thickened, externally by a heavy varix and internally by a denticulated callus. Post-nuclear whorls four, protoconch missing in all specimens examined. Inner lip with a strong tubercle above, bordering posterior canal and numerous weak spiral plications, which extend down the whole length of the parietal callus.

Height 38 mm.; diameter 25 mm. „ 36 mm.; „ 23 mm. „ 36 mm.; „ 24 mm.	Spirits Bay, New Zealand (Figs. 6-8).
„ 37 mm.; „ 24.5 mm.	Ballina, New South Wales (Fig. 5).

Habitat.—Kapo Wairua, Spirits Bay, North Auckland (A. W. B. P., Feb., 1932); Mount Maunganui, Bay of Plenty (A. W. B. P., 1922); Taurikura Bay, Whangarei Heads (Miss A. M. Gillman). Also found in Tasmania and New South Wales.

Dentition.—Mount Maunganui specimen (Text Fig. 5).

The central tooth in this species has an outline quite distinct from that of either of the two related species, *spengleri* or *waterhousei*. The most marked difference is in the front margin of the tooth, which is a simple arc without a median sinus. There are six moderately strong denticles on the laterals in *bolteniana*. The marginals in all three species are very similar to one another.

Kapo Wairua specimens in Auckland Museum collection, Mount Maunganui specimen in writer's collection.

Cabestana labiosa (Wood)*. (Pl. 23, Fig. 9.)

1828. *Murex labiosus* Wood. *Index. Test Supp.*, p. 15 (Pl. 5, Fig. 18).

1881. *Triton labiosum* (Wood). Tryon. *Man. of Conch.*, vol. 3, p. 17 (Pl. 9, Figs. 64 and 65).

1910. *Cymatium labiosum* (Wood). Iredale, *Proc. Mal. Soc.*, vol. 9, p. 73.

1915. *Cymatium labiosum* (Wood). Oliver, *Trans. N.Z. Inst.*, vol. 47, p. 528.

1929. *Cymatium labiosum* (Wood). Iredale, *Mem. Queensland Mus.*, vol. 9, pt. 3, p. 280.

This adds another new record to the New Zealand fauna. A single well-preserved specimen, not long dead, was picked up by the writer on the beach at Takapaukura, Tom Bowling Bay, northernmost New Zealand, on the 16th February, 1932.

Some confusion has been caused regarding the identity and distribution of this species, owing to the fact that Tryon (1881), followed by Iredale (1910), considered the Australian *strangei* to be a synonym of *labiosa*. Later, however, Iredale (1929) admitted that *strangei* was distinct from *labiosa*. The most obvious difference between the two species is in the form of the canal, that of *strangei* being almost straight, while that of *labiosa* is conspicuously twisted.

Oliver (1915) recorded the dead shells of *labiosa* as frequent on the beaches of Sunday Island, Kermadec Group. All the Sunday Island specimens that the writer has seen are identical with the New Zealand shell.

The main characters of the species are the sharply raised sculpture and twisted and recurved canal. The whole surface of the shell is crowded with sharply raised spiral ridges, all of which are delicately beaded, due to close and regular transverse axial grooving. There are four massive keels on the body-whorl, the uppermost being widest and strongest. Each of the lower keels is surmounted by three closely spaced spiral ridges, but the peripheral spiral is a double one bearing six ridges. Apart from the axial grooving there are distant, strong, fold-like axials which become prominently nodulous at the periphery. Spire equal to height of aperture without canal. Colour pinkish-buff tinged with orange.

Height 25 mm.; diameter 16.5 mm. (Tom Bowling Bay specimen).
„ 24 mm.; „ 15 mm. (Sunday Island specimen).

Tom Bowling Bay specimen in Auckland Museum collection.

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* This species is referred to *Cabestana* with some hesitation, as both dental and opercular characters are unknown to the writer. Although the shell of *labiosa* somewhat resembles that of *exarata*, the latter species belongs to *Monoplex*, which is characterised by a very different type of apex. The apex in *labiosa* is type "B" in shape, and differs from that of *Cabestana* only in the presence of a brown horny envelope. However, this envelope peels off readily, and is not a persistent feature, as in type "A" apices.

Genus MONOPLEX Perry, 1811.

Type (fide Iredale, 1915), *Monoplex australasiae* Perry = *M. costata* Born = *Cymatium parthenopeum* (Von Salis).

Monoplex parthenopeum (Von Salis).

After comparing a series of New Zealand littoral and dredged specimens with a few from New South Wales, the writer was unable satisfactorily to apply Finlay's (1926, p. 398) statement that " New Zealand specimens have a longer canal, a different outer lip, and a considerably smaller aperture than Australian shells," and in consequence the use of Hutton's name *Triton acclivis* for the New Zealand shells is not considered necessary. In fact, among the specimens examined those with the longest canal and the smallest aperture respectively were from the New South Wales littoral.

Dentition (Text Fig. 7).—The central tooth is broader and lower than in *Cymatium, Cabestana,* or *Austrosassia,* and the laterals are quite distinctive in outline and in the erect position of the main cusp.

Monoplex is here separated generically from *Cabestana,* as the protoconchs differ radically, that of *parthenopeum* being type " A," polygyrate, with persistent horny envelope, while that of *cutacea,* the genotype of *Cabestana,* is type " B," polygyrate turbinate, without a horny envelope.

The dentition of *exaratum* is not known to the writer, but it is assumed to be of the *Monoplex type,* as both *parthenopeum* and *exaratum* have identical protoconchs, and their shells are not dissimilar.

Genus CHARONIA Gistel, 1848.

The classification of the Australasian species of *Charonia* presents many difficulties, some of which cannot be satisfactorily settled until a wider range of material is assembled for study. However, the few notes contained in this paper, while not adequate for a comprehensive review of the Australasian species, may prove useful to some future monographer equipped with more extensive material.

At one period Iredale (1915, p. 459) considered that Australian, Kermadec, New Zealand, and Mediterranean specimens were all one species, and recommended that they should bear the name *lampas* Linn. Later, in Finlay (1926, p. 397), Iredale reconsidered his previous decision and admitted that there was geographic localisation.

The first obviously necessary separation is that of the Mediterranean *lampas* from the New Zealand species. This is evident from the dentition, although no shells have been compared. Troschel (see Tryon, 1881; Pl. 2, Fig. 5), whose figures of molluscan dentition were always faithfully drawn, has shown that the lateral teeth of *lampas* have four denticles, and the central, six denticles on each side of the central cusp, whereas the writer has found that North Island specimens ascribed to *capax euclioides* have only three denticles on the laterals, and the central tooth has only five denticles on each side of the central cusp.

Another species that has been rightly separated from *lampas* is the Australian littoral *rubicunda.* This shell is characterised by spirally striate early whorls without nodules. Dr. Finlay has called the writer's attention to an Australian Tertiary species (*Charonia* n. sp. from " Abattoirs Bore," Adelaide, South Australia, older Pliocene) that has similarly sculptured early whorls, showing that the *rubicunda* type of shell has long been established in Australian waters. There are two types of *Charonia* in Australia, the littoral *rubicunda,* which is a broad obtuse-spired shell and a deeper-water more slender type, *euclia,* which differs from *rubicunda* in having nodulous early whorls. Apparently the two are not directly related, for in Western Australia the littoral *rubicunda* does not occur, although *euclia* is found in the deeper waters of that area.

Likewise in New Zealand, two types of *Charonia* are distinguishable, one broad and obtuse-spired, shaped like the New South Wales *rubicunda,* and the other slender and similar to the Western Australian *euclia.* Both, however, have nodulous keels on the early whorls, so are evidently not directly derived from *rubicunda.* The identification of shells from Northern New Zealand is difficult, owing to the fact that the types of Finlay's species, *capax* and *capax euclioides,* were both from moderately deep water off Otago Heads, and that apart from the holotypes no further specimens from South Island localities have been collected.

The common benthal form of *Charonia* in the North Island waters is very similar to the Otago Heads *capax euclioides,* and is here tentatively regarded as being conspecific. Certainly northern shells are not quite so slender, nor have they so many keels exposed on the later spire whorls. However, this discrepancy is explained by the fact that the holotype of *euclioides* is an abnormally coiled specimen, which exposes more of the keels than would obtain in a normal specimen. Although the writer has classed all the slender northern shells as *euclioides,* later it may be necessary to separate subspecifically the northern littoral shell, a form characterised by bright colouring, and found at the Kermadec Islands as well as in Northern New Zealand. However, the status of several exotic species needs to be investigated before the identity of this form can be settled.

With regard to *capax,* there are northern shells of similar proportions to the holotype, but they present differences in sculpture and in colouration, and here again, in the event of a series of southern shells becoming available, the northern shells may prove to be distinct.

Variation in this genus is so great, however, that for the present all the New Zealand *Charonias* are best referred to either *capax* or *capax euclioides.* The main characteristic of *capax,* apart from its broad shell and squat spire, is the persistence of the spiral cords, which are not interrupted by the nodulous keels. In *capax euclioides* the shell is more slender, and the spiral cords become obsolete on the nodulous keels.

A good figure of the northern "*capax*" appeared in Bucknill's "Sea Shells of New Zealand," 1924 (Pl. 4, Fig. 3). This is one of a series of six specimens collected by Dr. Bucknill from under rocky ledges and around boulders near the "Stone Wharf," Pilot Bay, Tauranga Harbour. Eggs were observed on the side of a large boulder on July 27, 1922, and were described by Dr. Bucknill as pink, translucent, elongated, and clubbed at the free extremity. They were closely spaced and in a single layer.

The following measurements may be helpful in separating the two New Zealand forms:—

Height 165 mm.;	diameter 90 mm.;	spire angle	55	*capax* (holotype, Otago Heads, 20 f.).
„ 141 mm.;	„ 86 mm.;	„	„	54	*capax* (Tauranga Harbour, littoral).
„ 165 mm.;	„ 116 mm.;	„	„	54	*capax* (Tauranga Harbour, littoral).
„ 227 mm.;	„ 138 mm.;	„	„	58	*capax* (Whangape, littoral).
„ 210 mm.;	„ 100 mm. (estimated);	„	„	43	*capax euclioides* (holotype, 20 f.).
„ 193 mm.;	„ 115 mm.;	„	„	46	*capax euclioides* (Cape Colville, 25 f.).
„ 170 mm.;	„ 85 mm.;	„	„	44	*capax euclioides* (Cape Colville, 25 f.).
„ 150 mm.;	„ 77 mm.;	„	„	44	*capax euclioides* (Manukau Heads, littoral).
„ 133 mm.;	„ 69 mm.;	„	„	43	*capax euclioides* (Great Barrier. littoral).
„ 130 mm.;	„ 68 mm.;	„	„	43	*capax euclioides* (Kermadec Islands, littoral).
„ 123 mm.;	„ 74 mm.;	„	„	56	*rubicunda* (New South Wales, littoral).

Genus RANELLA Lamarck, 1816.

Type (subsequent designation, Children, 1823), *Ranella gigantea* Lamk. (see Grant and Gale, 1931, p. 734).

Ranella multinodosa (Bucknill).

1927. *Mayena multinodosa* Bucknill. *Trans. N.Z. Inst.*, vol. 58, p. 312 (Pl. 35, Fig. 2).

1930. *Fusitriton multinodosa* (Bucknill) Finlay. *Trans. N.Z. Inst.*, vol. 61, p. 249.

Bucknill's *multinodosa* is not a *Mayena,* nor does it belong to *Fusitriton,* to which genus it has been referred by Finlay. Both shell and dental characters show that its nearest relative is the genotype of *Ranella,* a species which is found in the Mediterranean, the south coast of Ireland, and along the Atlantic coast of Europe to the south of the English Channel.

Compared with the northern species, *multinodosa* has a more widely expanded body-whorl, and the spiral rows of tubercles are less regular. These vary in their relative strengths, the middle one being strongest and the two uppermost weakest; otherwise there is practically nothing to separate southern from northern shells.

The type of *multinodosa* is a dead shell which was inhabited by a hermit-crab, and came from the Cavalli Islands, near Whangaroa, in 25 fathoms. Recently the writer secured a live specimen and examined four others, all of which were trawled in 50 fathoms off Maunganui Bluff, West Coast.

Dentition (Text Fig. 1).—The central tooth is broad and rectangular, having a massive central cusp and four smaller cusps on each side of it. The central tooth in *Mayena australasia* is very similar, except that the side cusps are fewer and stronger. The radula of both *Ranella* and *Mayena* differs from that of all other tritons so far examined in the form of the laterals, which are entirely without denticles.

Genitalia.—The penis in *Ranella multinodosa* is broad and roughly rhomboidal in shape, quite unlike that of *Mayena,* which is long and leaf-like as in other species of the *Cymatiidae.* The most distinctive feature about the penis of *multinodosa, however,* is in the course of the seminal-furrow which first runs towards the outer edge, bends back at a sharp angle, runs back diagonally to the inner edge, and then continues along the inner margin right to the extremity (see Text Figs. 11, 12, and 13).

The long canal and curious male genital organ of *multinodosa* demonstrate the impracticability of merging *Mayena* with *Ranella* (= *Eugyrina*) as Hedley has done (1918, p. 66).

MAYENA Iredale, 1917.

Type (original designation), *Biplex australasia* Perry.

Mayena australasia (Perry).

1811. *Biplex australasia* Perry. "*Conchology*" (Pl. 4, Figs. 2 and 4).
1926. *Mayena zelandica* Finlay. *Trans. N.Z. Inst.*, vol. 57, p. 400 (Pl. 20, Fig. 66).

The writer hesitates to use the name provided by Finlay for the New Zealand shell, as no constant points of difference between New Zealand and Australian specimens are apparent when large series are examined.

Finlay (l.c.) stated that the New Zealand shell has "a subobsolete lower keel and many nodules on the peripheral keel (about nine between varices in specimen figured)." However, only a few of the New Zealand shells have as many as nine nodules between the varices, the average number for eight New Zealand specimens being 6.875, and for the same number of New South Wales specimens 6.625; the difference is negligible. Further, the majority of the New South Wales specimens examined also have the subobsolete lower keel, and in two instances this is more strongly developed than in any of the New Zealand examples.

Dentition (Text Figs. 2 and 3).—The radula of *Mayena australasia* differs from that of *Ranella multinodosa* only in the side denticles of the central, which are fewer and stronger, and in the shape of the laterals. The side denticles are so variable in shape, size, and number even in one radula that it is impossible to discriminate between New Zealand and New South Wales specimens.

It is probable that *Fusitriton* and *Priene* are related to *Ranella and Mayena,* but the writer has seen neither radulae nor opercula from the first mentioned genera.

NEW ZEALAND RECENT CYMATIIDAE.

Family *Cymatiidae.*

Subfamily *Cymatiinae.*

Cabestana spengleri (Perry, 1811).
Cabestana bolteniana (A. Adams, 1854).
Cabestana waterhousei segregata Powell, 1932.
Cabestana labiosa (Wood, 1828).
Austrosassia parkinsoniana (Perry, 1811).
Monoplex parthenopeum (Von Salis, 1790).
Monoplex exaratum (Reeve, 1844).
Argobuccinum tumidum* (Dunker, 1862).

Subfamily *Charoniinae*†.

Charonia capax Finlay, 1926.
Charonia capax euclioides Finlay, 1926.

Subfamily *Ranelliinae.*

Ranella multinodosa (Bucknill, 1927).
Mayena australasia (Perry, 1811).
Fusitriton laudandum Finlay, 1926.

* Grant and Gale, 1931, p. 734, stated that "*Argobuccinum* should not be used as of Morch, 1852, but of Klein in Hermannsen, 1846, with the type *Murex argus* Linnaeus by original designation." Acting upon the assumption that *Argobuccinum* in Hermannsen, 1846, is not valid, Finlay (1926, p. 399) proposed *Gondwanula,* with *Ranella tumida* as type. The dentition of *tumida* (Text Fig. 8) is very similar to that of the South African *argus.* An interesting point is that the denticulate laterals and form of the central tooth indicate close relationship with the *Cymatiinae,* but nothing in common with *Mayena australasia* of the *Ranelliinae,* with which *tumidum* was formerly classified.

† *Charonia tritonis* (Linn.) is omitted from the New Zealand list, as the writer has not seen a single authentic New Zealand specimen, all of the Ahipara shells seen being extra large *capax.* Smith (1915, *Brit. Antarct. Exped., Moll.,* pt. 1, p. 84) has recorded a *Charonia species* from off the North Cape in 11-20 fathoms, but this is a juvenile only 11.5 mm. in length, and no doubt it is the young of *capax.* Evidently Smith compared the North Cape apex with that of the Australian *rubicunda,* a species which does not occur in New Zealand, and this would account for his statement that the protoconch in *rubicunda* is purplish, and the following normal whorls are finely spirally striated and without rows of pustules.

II.—THE NATICIDAE.

The facts here brought together by an investigation of the New Zealand Recent Naticoids prove so discordant with the accepted grouping, which is based primarily upon opercular characters, that obviously a drastic revision of the whole family is desirable. It would be inopportune, however, for the writer to attempt this at present, as there is neither sufficient material nor literature available for the purpose in New Zealand.

The classification of the New Zealand species, given below, is based upon what is considered to be the four main taxonomic characters of the family. They are the radula, the operculum, the protoconch, and the funicle. It was found that in some cases the operculum was very similar in species that differed radically in respect to the three other taxonomic characters; therefore the use of the operculum alone in the correllation of species cannot be regarded as a guarantee of genetic affinity. How else can we account for simple or bifid laterals, unicuspid or tricuspid central teeth, and three distinct types of apex* being present in one or another of the series *zelandica, australis, and migratoria?*

Application of the rule that no two species are closely allied unless all four of the above-mentioned taxonomic characters are identical would go a long way towards unravelling the phylogeny of a family that is hopelessly conservative in its superficial characters. It would mean the employment of a greater number of genera, but eventually a more natural classification would result.

It was soon realised that species with horny opercula are not so widely sundered from those with calcareous opercula as we have been accustomed to believe. For instance, the radula of the Eastern American *Polinices (Neverita) duplicata* Say has all the essential characters of that of the *marochiensis* series and the New Zealand *australis,* yet both of the latter have calcareous opercula.

The relationship of the horny operculate genera to the calcareous operculate series remains to be determined. No doubt many of those of the calcareous type have been derived, independently, at different times, from those of the horny type, and very probably the reverse also has taken place.

Cossmann (1919, p. 385) cited the case of *Natica dillwynni* Payr., which is stated to have an operculum partly horny and partly calcareous. Also, just as in the calcareous operculate genera, there are species of the horny operculate type with radulae having either simple or bifid inner marginals combined with a tricuspid central tooth, and at least two types of protoconch.

The evidence furnished by the facts of geographic distribution is also significant. Quoy and Gaimard's *zelandica,* for which Marwick (1931, p. 98) has proposed the generic name *Tanea,* is restricted to

* The protoconch in *zelandica* is of three smooth flattened helicoid whorls, with a small tip, and a deeply impressed suture; that of *australis* is paucispiral of one and a-half whorls, the tip of which is a flattened blob; and that of *migratoria* is dome-shaped of three and a-half whorls, with a tiny planorbid tip.

New Zealand, and has an ancestry extending back to *Oligocene* times. The writer's *migratoria,* however, is found both in Northern New Zealand and New South Wales*, and is very closely allied to two other species of wide range, the tropical Pacific *gualteriana* and the North African *marochiensis.* Obviously this group has a more efficient pelagic larva than *Tanea,* and although the two are very much alike in shell and opercular characters, the diverse dental and apical features indicate that no close relationship exists.

No suitable generic name† for the *marochiensis* series appears to be available, so the new name *Notocochlis* is proposed, with *migratoria* Powell (1927, p. 560) as type. The genus is defined by the following combination of the four taxonomic characters. Protoconch dome-shaped, of three and a-half whorls, with a tiny planorbid tip + smooth calcareous operculum with a single marginal sulcus + well-developed funicle + radula with tricuspid central and bifid inner marginals.

The New Zealand *australis* represents another aberrant type. It is so like the horny operculate *vitrea* in shell features that when fossils minus opercula are considered their identity cannot always be definitely settled. Marwick (1924, p. 553) described his *denticulifera* as being related to *australis,* but also remarked that it may be related to *vitrea.*

A comparison between *australis* and *vitrea* shows that they both have a paucispiral apex, the tip of which is a somewhat immersed flattened blob, and also that the obsolete or nearly obsolete funicle is a feature of both species.

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* Finlay has wrongly rejected my claim that *migratoria* is found outside New Zealand waters, and has described the New South Wales shells as a new species, *Cochlis vafer* (1930, p. 232). Reconsideration of a series of specimens from both countries has strengthened the writer's original opinion that New Zealand and New South Wales specimens are identical, for the characters cited by Finlay as being peculiar to the New South Wales specimens are not always in evidence, and, further, are also present in some New Zealand topotypes.

† Woodring (1928, p. 379) has shown that owing to Iredale's designation of *Cochlis albula* (Bolten) as type of *Cochlis,* that genus becomes a synonym of *Natica* s. str. *Natica* s. str. is not available, as it has an operculum with two strong marginal ribs and denticles down the inner side, a different apex, and a radula probably with a unicuspid central and simple marginals as in *lineata,* a species which agrees with the genotype in all other respects (the radula of the actual genotype is unknown to the writer). *Naticarius* is also unsuitable, as it has a multispiral operculum, and the apparently congeneric Mediterranean *millepunctatus* Lamarck has a tricuspid central combined with simple marginals. *Tanea* also cannot be used, as it is one of the few naticoids with a unicuspid central, and in this respect it resembles *Natica* (s. str.) *lineata,* but the protoconch and details of the operculum are quite dissimilar in the two species.

As it has been shown that the same type of dentition is often found in naticoids quite irrespective of the horny or calcareous nature of their opercula, it is not unreasonable to postulate closer relationship between the *australis* and *vitrea* groups than has been recognised.

The reference of *australis* to any of the recognised calcareous operculate genera is not desirable, so it is accordingly separated as the type of another new genus, having probable relationship with the horny operculate *Uberella**. The characters of this new genus, which is named *Proxiuber,* are:—Protoconch paucispiral, the tip of which is a somewhat immersed flattened blob + smooth calcareous operculum with two linear marginal grooves + obsolete or nearly obsolete funicle + radula with tricuspid central and bifid inner marginals.

A radula of *Globisinum venustum* (Suter) (Text Fig. 19) was received from Miss M. K. Mestayer, of the Dominion Museum, Wellington, and this proves to have a very unusual central tooth that is quite unlike anything the writer has seen. However, as the genus can be traced back to the Cretaceous in New Zealand, and is now living nowhere else, it is not reasonable to expect very close similarity between the dental characters of *Globisinum* and those of other naticoids.

Marwick (1924, p. 574) has remarked on the resemblance of the shell of *Globisinum* to that of *Vanikoro* (i.e., *Merria*),but the dentition of *V. cancellatus* Lamk., a drawing of which was kindly made for the writer by Lieutenant-colonel A. J. Peile from a slide in the Gwatkin collection, makes it possible definitely to rule out any relationship with that genus and the family to which it belongs.

In *cancellatus* all the teeth, central, lateral, and marginals are profusely dentate, whereas in *Globisinum venustum* they are all smooth.

The shield-shaped base of the central tooth of *Globisinum,* with its two incipient hinder teeth or plates, is so peculiar that the writer has no hesitation in separating the genus under a distinct subfamily of the *Naticidae.*

Unfortunately, the operculum was shed prior to the specimen reaching the Dominion Museum.

A list of the New Zealand Recent Naticoids is given below.

With regard to the Tertiary species, the genus *Notocochlis* does not seem to occur, most of the calcareous operculate species being referrable to *Tanea,* except *denticulifera,* which probably belongs to *Proxiuber.*

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* The dentition of *Uberella* is not known.

Family *Naticidae.*

Subfamily *Naticiinae.*

Tanea zelandica (Quoy & Gaimard, 1832).
Notocochlis migratoria (Powell, 1927).
Proxiuber australis (Hutton, 1878).
Proxiuber denticulifera (Marwick, 1924).
Uberella vitrea (Hutton, 1873).
Uberella barrierensis (Marwick, 1924).
? *Uberella amphialis* (Watson, 1881).
Friginatica pisum Hedley, 1916.
? *Friginatica apora* (Watson, 1881).

Subfamily *Globisininae.*

Globisinum wollastoni Finlay, 1927.
Globisinum venustum (Suter, 1907).

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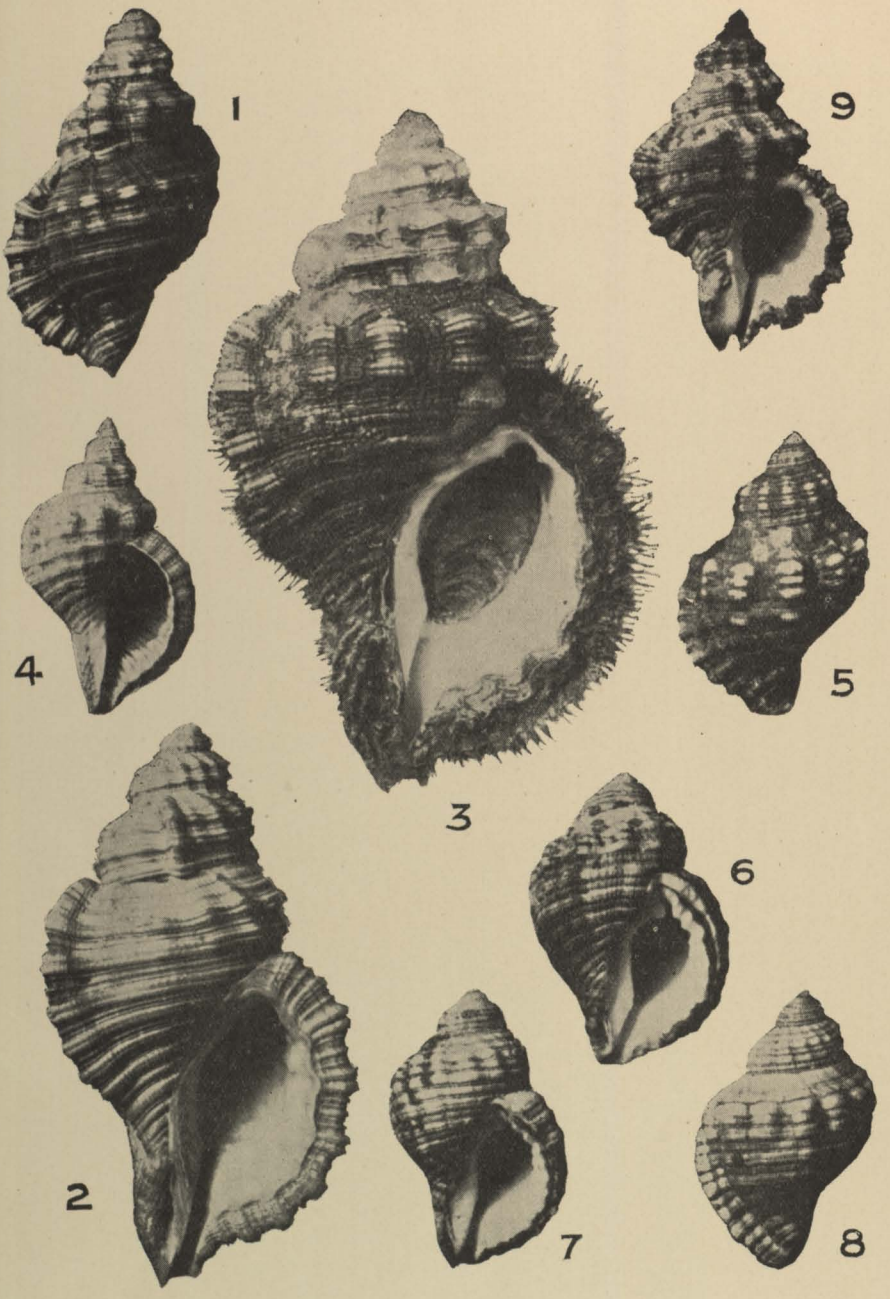


1.—*Cabestana waterhousei* (Adams & Angas). Hardwicke Bay, South Australia.

2.—*Cabestana waterhousei* (Adams & Angas). Western Australia.

3.—*Cabestana waterhousei segregata* Powell. (Holotype) N.Z.

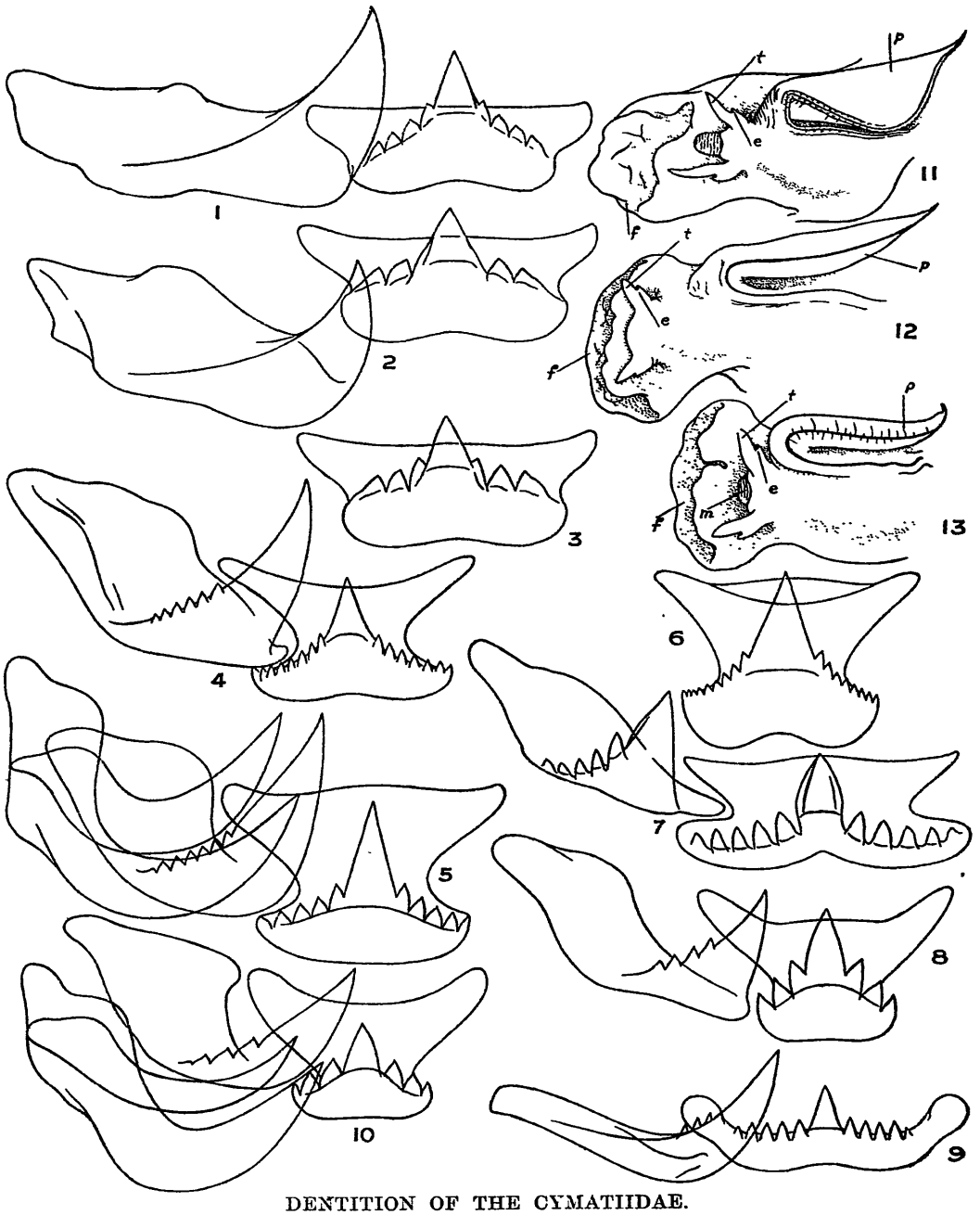
4.—*Cabestana spengleri* (Perry). (Young specimen, Mount Maunganui, Bay of Plenty, N.Z.)

5.—*Cabestana bolteniana* (A. Adams). Ballina, New South Wales.

6, 7, 8.—*Cabestana bolteniana* (A. Adams). Kapo Wairua, Spirits Bay, N.Z.

9.—*Cabestana labiosa* (Wood). Tom Bowling Bay, N.Z.

Face p. 168]



DENTITION OF THE CYMATIIDAE.

1.—*Ranella multinodosa* (Bucknill). Maunganui Bluff, in 50 fath., West Coast. Central and lateral.

2. and 3.—*Mayena australasia* (Perry). Shellharbour, New South Wales. Central and lateral.

4.—*Cabestana waterhousei segregata* Powell. Near Cornwallis, Manukau Harbour. Central and lateral.

5.—*Cabestana bolteniana* (A. Adams). Mount Maunganui, Bay of Plenty. Central, lateral, and marginals.

6.—*Cabestana spengleri* (Perry). Langholm, Manukau Harbour. Central.

7.—*Monoplex parthenopeum* (von Salis). Near Cornwallis, Manukau Harbour. Central and lateral.

8. *Argobuccinum tumidum* Dunker. Castle Point, East Coast, Wellington. Central and lateral.

9.—*Charonia capax euclioides* Finlay. Off Mayor Island, in 25-30 fath., Bay of Plenty. Central and lateral.

10.—*Austrosassia parkinsoniana* (Perry). Taupo Bay, Whangaroa. Central, lateral, and marginals.

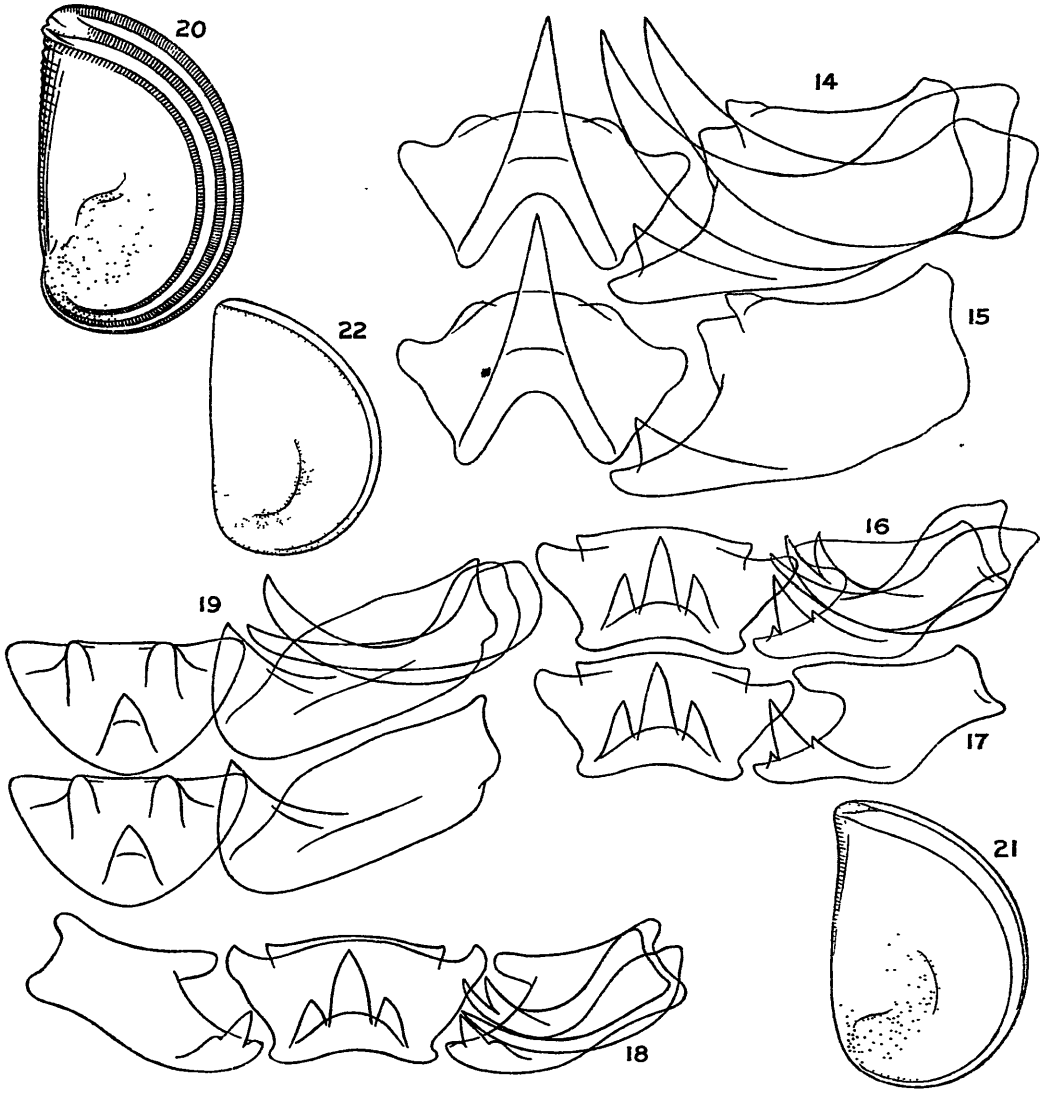
EXTERNAL FEATURES OF ANIMALS OF CYMATIIDAE.

11.—*Ranella multinodosa* (Bucknill). Maunganui Bluff, 50 fath.

12.—*Cabestana spengleri* (Perry). Cornwallis, Manukau Harbour.

13.—*Mayena australasia* (Perry). Parengarenga Harbour.

(e) eye; (f) foot; (m) mouth (proboscis); (p) penis.



DENTITION OF THE NATICIDAE.

14, 15.—*Tanea zelandica* (Q. & G.). Pohara Beach, Takaka. Central, lateral, and marginals.

16.—*Notocochlis migratoria* (Powell). Shellharbour, New South Wales. Central, lateral, and marginals.

17.—*Notocochlis migratoria* (Powell). Parengarenga Harbour, N.Z. (paratype). Central and lateral.

18.—*Proxiuber australis* (Hutton). Port Fitzroy, Great Barrier Island. Central, lateral, and marginals.

19.—*Globisinum venustum* (Suter). Cape Campbell, in 50 fath., Marlborough. Central, lateral, and marginals.

OPERCULA OF NATICIDAE.

20.—*Natica vitellus* Linn. (*rufa* Auct.) Samoa?

21.—*Tanea zelandica* (Q. & G.). Mount Maunganui, Bay of Plenty.

22.—*Notocochlis migratoria* (Powell). Parengarenga Harbour (paratype).