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MOLLUSCA FROM THE CONTINENTAL SHELF OF  
EASTERN AUSTRALIA.

BY

TOM IREDALE.

(Plates xli-xliii, and map.)

INTRODUCTION.

Our knowledge of the fauna of the continental shelf is so imperfect that any additional data are acceptable. This year, Mr. C. W. Mulvey, manager of the New State Fish and Ice Company, Sydney, has interested himself in assisting the Australian Museum by presenting specimens trawled by his fleet, and has given facilities for members of the Museum staff to collect. The results of Mr. Mulvey's activities form the basis of this report.

The oldest material from the continental shelf consists of a few hauls made by the "Challenger," which, curiously enough, were overlooked and mixed with Atlantic material, and, when reported upon, caused a lot of trouble which, even now, needs rectification. Simultaneously the "Gazelle" made a haul or two, from which a few species were described. The "Thetis" trawled along the coast in depths up to eighty fathoms, and the study of the material by Hedley instigated further research and he continued the work until the arrival of the "Endeavour." This ship explored the shelf from end to end, but, unfortunately, through the tragic ending of the enterprise, the results are comparatively unknown. A brief account, culled from some notes left by the lamented Dannevig, was published under Hedley's direction. In that paper a scanty résumé of the nature of the continental shelf was presented, but nothing relating to the fauna. Only a few large molluscs were recorded from Dannevig's collection, all from the south-east corner of this State, but I find a small series of smaller molluscs in the Australian Museum, and I have utilised some of these in this report.

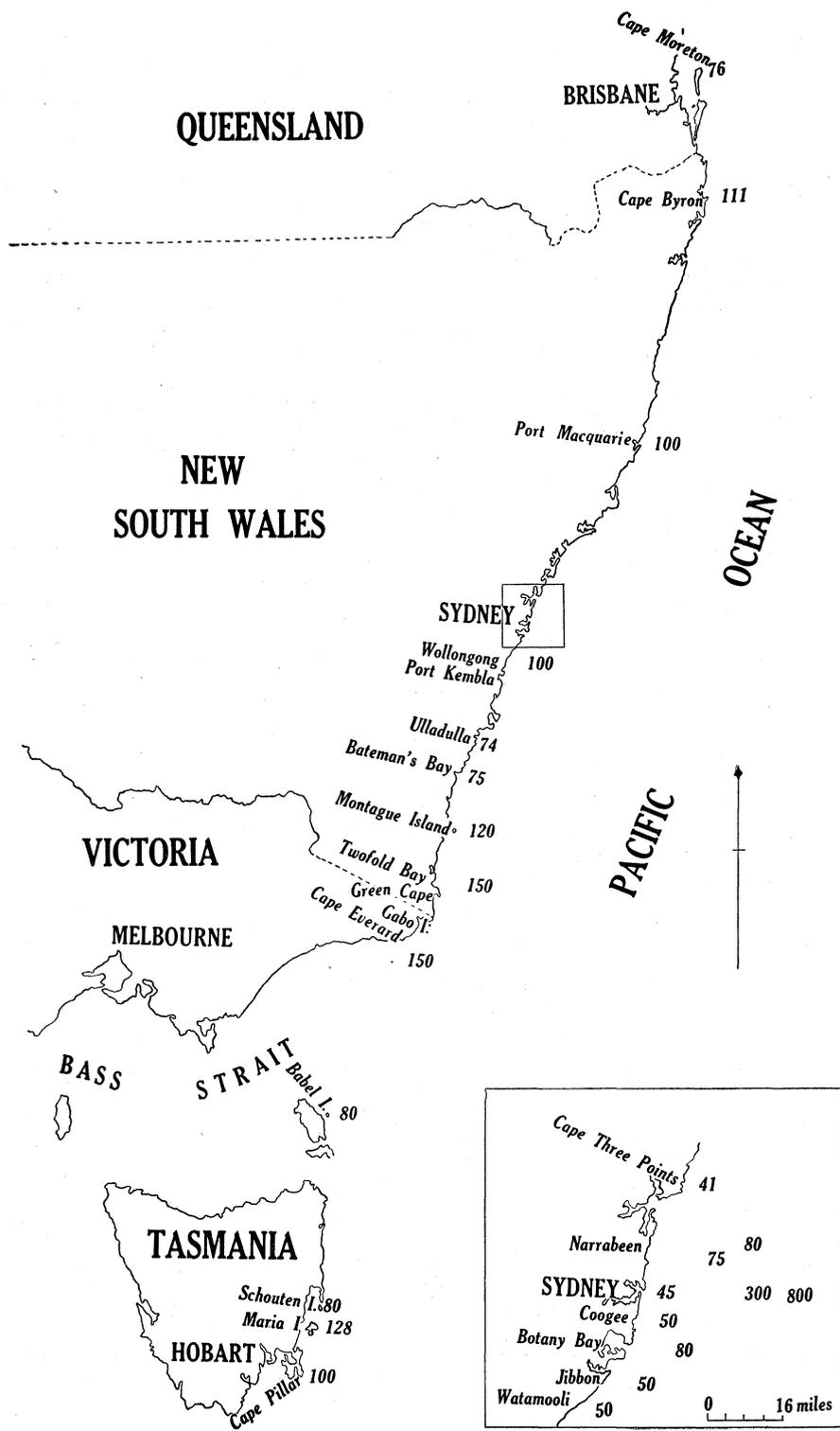
In the introduction to his report on the "Thetis" mollusca, written over twenty years ago, Hedley concluded: "The above facts suggest certain inferences. Firstly, that such beds as the Eocene of Muddy Creek, Victoria, represent a fauna of the hundred fathom zone; and that, if the age of the Tertiary beds are to be calculated by Lyellian percentages, an exploration of the hundred fathom zone in existing Australian seas must precede an estimation of the dates of Australian Tertiaries. Secondly, that some living representatives of the Eocene Mollusca of Victoria now dwell six or seven degrees north of where their predecessors lie; a conclusion agreeable to the hypothesis that the Eocene climate was warmer than the present."

Roy Bell made a large collection of mollusca in and around Twofold Bay, upon which I have reported, and during my study of this collection I became impressed with the fact, that the so-called Eocene shells of Muddy Creek, Victoria, were living in that locality in water from twenty to seventy fathoms deep. Further I found that the shallow water species appreciably changed as they survived in deeper water, and that these deepwater forms were scarcely specifically separable from the "Eocene" fossils. I suggested that the best way of expressing the relationship was by means of a trinomial nomenclature, as, when series were examined, the value of the differences observed became prejudiced by the personal equation, some authors denying, others affirming the specific identity of the fossils and recent species. Study of the present collections has given me the opportunity of comparing other species, and I am more than convinced that the relationship can be clearly seen only if trinomials be utilised. I also suggest that if trinomial nomenclature were used in zonal work, many of the difficulties now met with by palaeontologists would soon be dissipated.

Judging from the series I have now examined, I believe that on the continental shelf most of the species of the upper beds of Muddy Creek, correlated with the Kalimnan, will be found living, and that the Lyellian percentage method would class these beds very high. Apparently, so far, little attention has been paid by palaeontologists to the differences to be observed in the species found in these beds, and variable fossils have been distributed as typical without reference to the type description or locality; for example, shells from Muddy Creek have been distributed as norms of species described from Table Cape, and vice versa, and shells in the Australian Museum, forwarded as typical of fossil species, are quite discrepant, and in some instances more than one species is represented in such a lot. The study of palaeoconchology, when once again it is undertaken in Australia, must first of all deal with series of topotypes of described species before discussing the sequence and age of the beds. Simultaneously, series of recent shells should be accumulated from depths varying from shallow to deep water and from northern and southern localities. Comparison of such series would enable trustworthy deductions to be made. In the following notes suggestions are made, through study of series of recent shells, as to the relationship of some apparently allied fossils.

I have compiled a list of the localities on the continental shelf whence collections of molluscs are at present available, and in the accompanying map the position of the shelf is indicated by the soundings in the neighbourhood of the hundred fathoms line.

The name in brackets indicates the worker who has discussed the collection and A.M. signifies material in the Australian Museum not previously reported upon.





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In addition to these, reference must be made to Verco's papers—on the mollusca dredged in deep water off the south and west Australian coasts—running through many years in the Transactions of the Royal Society of South Australia, also to Hedley's "Report on the Mollusca obtained by the F.I.S. 'Endeavour', chiefly off Cape Wiles, South Australia<sup>1</sup>," and his "Results of Dredging on the Continental Shelf of New Zealand<sup>2</sup>."

The new names proposed in this paper are as follows:—

*Barbatia (pistachia) separata* nov.

*Ovaleda* gen. nov. for *Sarepta? tellinaeformis* Hedley.

*Nuculana oculata* sp. nov.

*Lima [bassii] benthonimbifer* nov.

*Chlamys instar* sp. nov.

*Chlamys famigerator* sp. nov.

*Chlamys perillustris* sp. nov.

*Vimentum* subgen. nov. for *Venericardia dilecta* Smith.

*Venericardia excelsior leguleja* subsp. nov.

*Venericardia (excelsior) semota*, nov.

*Placamen* gen. nov. for *Venus placida* Philippi.

*Placamen placidum molimen* subsp. nov.

<sup>1</sup> Hedley—Biol. Results "Endeavour," i, 1911, pp. 90-114; *id.*, 1914, pp. 65-70.

<sup>2</sup> Hedley—Trans. New Zealand Inst., xxxviii, 1905, (1906), pp. 67-75.

- Emarginula curvamen* sp. nov.  
*Emarginula amitina* sp. nov.  
*Fautor legrandi tentabundus* subsp. nov.  
*Obex mulveyana* gen. et sp. nov.  
*Fusus (schoutanicus) conterminus* nov.  
*Fusus bednalli volaticus* subsp. nov.  
*Berylsma (grandis) levifida* nov.  
*Fax* gen. nov. for *Phos tabidus* Hedley.  
*Fax (tenuicostata) conspicienda* nov.  
*Tasmeuthria* gen. nov. for *Siphonalia clarkei* Ten.-Woods.  
*Trigonostoma vinnulum* sp. nov.  
*Cancellaria purpuriformis anxifer* subsp. nov.  
*Microsveltia* gen. nov. for *M. recessa* sp. nov.  
*Pepta* gen. nov. for *Admete stricta* Hedley.  
*Ctenocolpus* gen. nov. for *Turritella australis* Lamarck.  
*Ctenocolpus australis diffidens* subsp. nov.  
*Terebra (lauretanae) tabifica* nov.  
*Scaphander illecebrosus* sp. nov.  
*Obrussa bracteata* gen. et sp. nov.  
*Stilapex lactarius* gen. et sp. nov.

BARBATIA (PISTACHIA) SEPARATA *nov.*

The specimens, picked from a boulder trawled off Narrabeen, 75-80 fathoms, differ, in a few minor details, from a series collected on the littoral at Port Fairy (Victoria), and Twofold Bay (New South Wales). They agree in showing a sharp angulation posteriorly and being shortly rounded anteriorly while they have less height; they are white inside, with four brownish lines radiating laterally from umbo. I have supported the recognition of Lamarck's *Arca pistachia*<sup>3</sup> as being identical with Smith's *A. radula*<sup>4</sup>, described from Bass Straits, the illustration of specimens from 4½ to 38 fathoms agreeing very closely with the Port Fairy shells. The relationship of the deeper living shell is best represented by the trinomial above given, but the fossils, *Barbatia consutilis* Tate<sup>5</sup>, from Muddy Creek, Victoria, type 41 x 20 x 16 mm., distinguished from *Barbatia limatella* Tate<sup>6</sup> by its attenuate posterior side, and the latter, from Aldinga Bay—compared with *decussata* Sowerby, from which it was separated "by its longer and straighter hinge-line, longer posterior side, and

<sup>3</sup> Lamarck—Hist. Anim. s. Verteb., vi, 1, July, 1819, p. 41.

<sup>4</sup> Smith—Challenger Reports, Zool., xiii, 1885, p. 260, pl. xvii, fig. 3, a.b.

<sup>5</sup> Tate—Trans. Roy. Soc. South Austr., viii, 1886, p. 142, pl. ii, fig. 15.

<sup>6</sup> Tate—Trans. Roy. Soc. South Austr., viii, 1886, p. 141, pl. x, fig. 2.

by the stronger and more laminar and oblique teeth on the marginal areas"—appear to be as nearly allied. The characters used in diagnosing the fossil species are not very reliable when a series of specimens of the recent variable species is criticised. Trinomial nomenclature, as advised by me<sup>7</sup>, seems the only mode of writing the relationships.

OVALEDA TELLINAEFORMIS *Hedley*.

Hedley described *Sarepta ? tellinaeformis*<sup>8</sup>, and then later<sup>9</sup> admitted the identity of his species with the fossil *Leda obolella*<sup>10</sup> Tate, but noted slight differences and considered his reference to *Sarepta* justified on account of the presence of an exterior ligament. The species recalls *Yoldia* much more than *Sarepta*, and there appears to be a group of southern bivalves superficially like *Yoldia*, even as *Malletia* is mimicked by *Pseudomalletia*. I have examined series of recent and fossil shells, and note that the recent forms are generally higher, deeper, with coarser sculpture, the beaks a little more angulate, and the hinge teeth fewer. These differences seem to call for the use of a trinomial; thus *Ovaleda [obolella] tellinaeformis* Hedley would immediately show that the relationship between the two forms was very close and of disputable value. I propose the generic name *Ovaleda*, naming Hedley's *Sarepta ? tellinaeformis* as type. This species is in the Australian Museum from off Port Kembla, Cape Three Points, Botany Heads, Sydney and Narrabeen, but not, as yet from southern localities.

NUCULANA OCLATA *sp. nov.*

(Plate xlii, fig. 9.)

Shell large for the genus, very solid, white, almost equilateral, apically smooth, followed by shallow poorly marked ridges, more like pronounced growth lines. Posterior side almost straight, a little concave, angulate, anterior side sloping, faintly convex, dorsal margin shallowly curved. Umboes a little incurved. Hinge teeth very long, angulate, fourteen to sixteen on each side, ligament pit deeply sunk. Muscle scars deep, pallial line well marked, with a small pallial sinus.

Length, 17.5 m.m.; height, 13 mm.

Off Narrabeen, 75-80 fathoms.

Only a single left valve occurred, but as it needs comparison with no other species, either recent or fossil, I have named it.

<sup>7</sup> Iredale—Proc. Malac. Soc. Lond., xv, 1922, pp. 37-8.

<sup>8</sup> Hedley—Rec. Austr. Mus., iv, 1901, pp. 26, f.8 in text.

<sup>9</sup> Hedley—Mem. Austr. Mus., iv, 1902, p. 295.

<sup>10</sup> Tate—Trans. Roy. Soc. South Austr., viii, 1886, p. 129, pl. v, fig. 3, a, b.

LIMA [BASSI] BENTHONIMBIFER *nov.*

Dealing with the common recent shell, known as *Lima multicositata* Sowerby, I named it *Lima nimbifer*<sup>11</sup>, and concluded: "The deep water shell<sup>12</sup> known as *L. bassii* Tenison-Woods<sup>13</sup> (given to a fossil) appears to be the benthal representative of this species." Good specimens were found alive on the block trawled off Narrabeen in 75-80 fathoms, and they appear to be smaller and a little more regular, with the sculpture a little better defined than the littoral shell, and, as Hedley proposed<sup>12</sup>, may be referred to the fossil, or perhaps are, as I regarded them, little changed forms of the recent species. Hedley's figure is of a small shell, and the largest one from deepwater yet examined measures 22 x 17 mm.; the fossil also appears to be small, while the littoral shell reaches a fine size, up to 60-70 x 40-45 mms., a fragment of a giant suggesting that it may reach even up to 90 or 100 mm. in length.

*Limatula strangei* Sowerby<sup>14</sup> appears to vary more. Hedley<sup>15</sup> has indicated Thiele's confusion with the littoral forms, and the fossil *Lima jeffreysiana* Tate<sup>16</sup> was distinguished "by its straighter sides, by its more numerous [number not given, but stated to be distant] and acute ribs, and by being more ventricose." These are very variable features in the growth stages of the littoral forms, and therefore indicate the very close affinity of the species, whose relationship would be best expressed by means of trinomials, though the differences are more pronounced than in the case of the *Lima*.

CHLAMYS INSTAR *sp. nov.*

(Plate xli, figs. 5, 6, 7.)

*Chlamys antiaustralis* Hedley, Biol. Res. F.I.S. "Endeavour" i, 1, 1911, p. 96 (specimens from 100 fathoms, off Cape Pillar only). *Id.*, May, Proc. Roy. Soc. Tasm., 1912, p. 44, and Check-list Moll. Tasm., 1921, p. 10, and Illustr. Index Tasm. Moll., 1923, pl. iii, fig. 8. Not *C. antiaustralis* Tate, Trans. Roy. Soc. South Austr., viii, 1886, p. 106, pl. 9, fig. 7.

This is the species referred to by Hedley as being represented in the Cape Pillar dredging by numerous valves reaching up to 100 mm. Adult shell nearly orbicular with ears nearly equal; immature shell higher than broad with ears normally unequal. The adult sculpture is distinctive, in that the ribs bear closely appressed lamellae throughout, while the *asperrimus* series have the lamellae erect. The juvenile

<sup>11</sup> Iredale—Proc. Linn. Soc. N.S.W., xlix, 1924, p. 196.

<sup>12</sup> Hedley—Proc. Linn. Soc. N.S.W., xxviii, 1904, p. 201, pl. ix, f. 28.

<sup>13</sup> Tenison-Woods—Proc. Roy. Soc. Tasm., 1876, p. 112.

<sup>14</sup> Sowerby—Conch. Icon., xviii, 1872, pl. iii, sp. 15.

<sup>15</sup> Hedley—Proc. Linn. Soc. N.S.W., xlvi, 1923, p. 302.

<sup>16</sup> Tate—Trans. Roy. Soc. South Austr., viii, 1885 (1886), p. 119, pl. iv, f. 8.

sculpture consists of about twenty-four rather distant flattened ribs without lamellae, the prodissoconch rather large, smooth, shining; the interstices between the ribs, at first smooth, develop regular curved lines like the rungs of a ladder, but these soon close up and the small ribs develop small scales regularly appressed. At each side of the primary a small rib similarly ornamented arises, and then, as growth continues, another similar stronger rib is intercalated, the interval between each bunch of five riblets also showing a central ridge. The elevation of the primary rib preserves the lamellae on the adjoining ribs, whilst those on the rib itself disappear.

Colour variable, generally creamy to pale buff externally, purple internally, with a small pallial line and a large white muscle scar, generally coalescing with the line. Hinge line straight, very minutely serrate medially, deep triangular ligament pit. Ears with radials, numerous and ornamented with minute lamellae in left valve, few on auricles of right valve, six on posterior, four to six on anterior, etenolium large and furrowed.

Type, length (or height) 97 mm.; breadth 96 mm.; depth of single valve 14 mm.; juvenile figured, right valve, height 17 mm., breadth 14 mm.

Off Cape Pillar, Tasmania, in 100 fathoms.

*CHLAMYS FAMIGERATOR* *sp. nov.*

(Plate xli, figs. 1, 2.)

*Chlamys antiaustralis* Hedley, Biol. Res. F.I.S. "Endeavour," i, 1 1911, p. 96 (specimens from 100 fathoms off Wollongong, N.S.W., not those from 100 fathoms off Cape Pillar, Tas., and perhaps those from 100 fathoms off Cape Wiles, South Australia).

*Chlamys antiaustralis* Hedley, Check-list Marine Fauna, New South Wales, Mollusca, p. M 8 (Journ. Roy. Soc. N.S.W., li, Suppl.), June 19, 1918. Not *C. antiaustralis* Tate.

Shell small, flattened, ears unequal, suborbicular, sculpture peculiar; prodissoconch small, smooth, about twenty-four ribs developed, a little flattened and unadorned at first, then developing lamellae in a discrepant manner on the left valve, more regularly on the right, which is a little more convex. On the left valve the lamellae occur on every third or fourth rib, the intervening ribs remaining smooth. At a little older stage the ribs on the right valve are regularly surmounted by smaller scaly lamellae, the broad interstices are at first concentrically lined but the sculpture becomes irregular and broken with age, and intercalating ribs spring up.

Colour variable; shades of yellow and orange, sometimes pinkish, variegated with white or paler blotches or streaks, internally similarly coloured.

Hinge-line straight, narrow, right valve with long ridge bearing minute serration on each side of small ligament pit, with corresponding serrated groove in left valve.

Ears: In the right valve the posterior auricle is small, with four wavy radials not much sculptured; the anterior auricle is large, with six radials crossed with erect scales, etenolium deep. The left valve has the ears unequal, the anterior large with nine radials, distantly scaled, posterior small, with five similarly ornamented radials.

Type: Right valve, height 15; breadth, 14 mm.; left valve, height 17 mm.; breadth 16 mm. Off Green Cape, 50-70 fathoms (R. Bell). type locality. Off Bateman's Bay, 75 fathoms (Mulvey). Off Eden, 30 fathoms (Livingstone and Fletcher). Off Wollongong, 100 fathoms (Hedley).

Apparently well distributed, but no large specimens yet recognised. This species is allied to *Pecten (Chlamys) dichrous* Suter<sup>17</sup>, from New Zealand, which Suter refers to the neighbourhood of the Miocene fossil *Pecten chathamensis* Hutton<sup>18</sup>, but I have not yet traced the Australian fossil representative. The New Zealand *dichrous* measures as much as 32 mm. by 36 mm., retaining the peculiar sculpture, so that the Australian shell may also continue with the erratic ornamentation, though at first sight this seems doubtful.

The species, fossil and recent, of the *asperrimus*<sup>19</sup> group are in a chaotic state, owing to the variability of the common shell, and it has been a difficult task to separate the present species. Roy Bell sent me an extensive series of large and small shells and valves of *Chlamys* from Twofold Bay, 20-25 fathoms, and off Green Cape, 50-70 fathoms. After as many as possible were referred to *asperrimus*, three distinct species could be recognised: the one here named, another unnamed form, and one determined as *blandus* Reeve<sup>20</sup>, but the last-named seemed a form of *asperrimus* with peculiarly well-developed lamellae.

The reference of the present species to *C. antiaustralis* Tate seemed doubtful, and upon application to Mr. F. A. Singleton, of the University of Melbourne, he forwarded me a series of the species recognised by the Victorian palaeontologists as Tate's species. These agreed with Tate's description, but were specifically inseparable from the shell regarded as Lamarck's *asperrimus*. Consequently, if any species were to be called *antiaustralis*, it would be a deepwater shell, such as we now regard as *asperrimus*. The two species here described have been confused and recorded as *antiaustralis*, but they are clearly separable, the young of the large species being of a different shape when equivalent in size to the smaller species.

<sup>17</sup> Suter—Proc. Malac. Soc. (Lond.), viii, 1909, p. 264, pl. xl, fig. 31.

<sup>18</sup> Hutton—Cat. Tert. Moll. New Zeal., 1873, p. 29.

<sup>19</sup> Lamarck—Hist. Anim. s. Verteb., vi, 1819, p. 174.

<sup>20</sup> Reeve—Conch. Icon., viii, 1853, pl. xxxiv, sp. and fig. 162.

*CHLAMYS PERILLUSTRIS* *sp. nov.*

(Plate xli, figs. 3, 4.)

While on the difficult group of *Chlamys*, the present beautiful and distinct deep-sea species may be named.

Shell of medium size, flattened, ears very unequal, thin, obliquely oval. Right valve apically smooth, then ornamented with about twenty slender radial ribs, the interstices between very broad; the ribs are a little wavy at first, later obliquely radiating with a gentle curve; lamellae arise and these are placed rather distant, and, growing angulate and tallish, resemble thorns; the interstices between the ribs are minutely scratched longitudinally; the sculpture on the left valve is similar, but the prickles begin at an earlier stage, and are more closely packed posteriorly.

Colour pale orange to orange brown; internally white.

Hinge line straight, ligamental pit triangular, small, with scarcely perceptible ridge and corresponding groove very minutely serrated.

Ears: the posterior auricle of the right valve is small, obliquely ranged with three or four prickly lines; the anterior auricle has four ribs crossed by strong lines almost like lamellae, and the etenolium is broad, shallow and lined; the posterior auricle of the left valve is small and scarcely ribbed, only oblique growth lines occurring; the anterior auricle has half a dozen linear ribs furnished with fine prickles.

Length (height) of type 29 mm., breadth 25 mm.

From 150-250 fathoms off Gabo Island. Also from 128 fathoms 20 miles east of Maria Island. This species has little to do with any other Australian scallop, save *Pecten challengerii* E. A. Smith<sup>21</sup>, dredged by the "Challenger" in 410 fathoms off Sydney (station 164b).

*VENERICARDIA EXCELSIOR* *Verco.*

(Pl. xlii, fig. 8.)

*Venericardia calva* Hedley, Check-list Marine Fauna, New South Wales, Mollusca, p. M. 17 (Journ. Roy. Soc. N.S.W., li, Suppl.). Not *Cardita calva* Tate, Trans. Roy. Soc., S.A., ix, 1886, p. 189, pl. xx, fig. 14.

Specimens from Ulladulla, 74 fathoms, were easily recognised as being referable to the group ranged round *dilecta* Smith<sup>22</sup>, which may be subgenerically designated by the new name *Vimentum*. Upon investigation the shells appear to be referable to Verco's species, but

<sup>21</sup> Smith—Proc. Zool. Soc. (Lond.), 1891, p. 443, pl. xxxv, fig. 25.

<sup>22</sup> Smith—Challenger Reports, Zool., xiii, 1885, p. 213, pl. xv, figs. 4, 4a.

may be classed as variants thereof. Hedley has accepted the reference to Tate's fossil species *calva*, which is incorrect. Tate's species was described from the older beds of Muddy Creek, has twenty ribs, measuring 5.25 x 5 mm., while Verco's *excelsior*<sup>23</sup> has nearly thirty ribs, and the New South Wales shells have thirty or over. While the size of *excelsior* is given as 7.8 x 7.3 mm., and the habitat is from 100-150 fathoms off the South Australian coast, the Ulladulla shells reach 9 x 8 mm., and are similar to specimens from 80 fathoms off Narrabeen, and 100 fathoms off Wollongong. A single valve from 111 fathoms off Cape Byron is referable to a distinct species. Specimens from 7-10 fathoms off Montague Island are easily separable by their larger size, are notably flatter, with the dorsal edge straighter, and measure 10 x 9 mm.

A complex series is thus observed: Smith's *dilecta* from 17-45 fathoms, Bass Strait and South Australia, is represented in 100-150 fathoms, South Australia, by Verco's *excelsior*. The fossil *calva* Tate is more distantly allied, not conspecific. On the east coast a representative of Verco's *excelsior* is met with in 74-100 fathoms, and a well marked form in shallow water, 7-10 fathoms. The relationships may be written thus:—

VENERICARDIA, subgenus VIMENTUM,

*Venericardia calva* Tate. Fossil.

*dilecta* Smith, Bass Strait, and South Australia, 17-45 fathoms.

(*dilecta*) *excelsior*, Verco, South Australia, 100-150 fathoms.

*excelsior leguleja* subsp. nov. East Australia, 74-100 fathoms.

(*excelsior*) *semota*, nov. (Pl. xlii, fig. 8), East Australia, 7-10 fathoms.

There seems to be a rule that deep-water molluscs from the east coast are represented by very similar forms on the south coast in deeper water.

CLAUSINELLA PLACIDA *Philippi*.

Under this name a fairly common species is included by Hedley<sup>24</sup>, and illustrated by May<sup>25</sup>. When Roy Bell's shells were received numerous specimens were recognised from shallow water, but these were at once seen to differ from the type of *Clausinella*, a British species, in the hinge teeth. A long series of species occur in Australasian waters, so that I propose the new generic name *Placamen*, naming *Venus placida* Philippi<sup>26</sup> as type. The relationship of the

<sup>23</sup> Verco—Trans. Roy. Soc. S.A., xxxii, 1908, p. 348, pl. xiv, fig. 9.

<sup>24</sup> Hedley—Check-list Marine Fauna, N.S.W., Moll. 1918, p. M. 24 (Journ. Roy. Soc. N.S.W., li, suppl.).

<sup>25</sup> May—Illustr. Index Tasm. Shells, 1923, pl. x, fig. 9.

<sup>26</sup> Philippi—Abbild. Besch., i, Apl. 1844, pt. 28, Venus, pl. 2, fig. 2.

forms is interesting, as *Venus placida* was described from a small shell from "Insula Van Diemen," which does not show the characteristics of the southern Tasmanian form. In this the shape is somewhat triangular, the ribs erect and distant, about fifteen on a normal shell, thus agreeing with the fossil *subroborata* Tate<sup>27</sup> which was separated on account of its fewer ribs, namely fifteen, the comparison being made with a more closely ribbed form like that from Twofold Bay; the fossil, however, differs in the prolongation of the posterior side. The Twofold Bay shell differs more from the southern recent shell than that does from the fossil, being less triangular, more closely ribbed, twenty ribs being easily counted in a shell of the same size, the posterior edge still less angulate, and the ribs less erect. This form extends up to Sydney. From the Ulladulla boulder trawled in 74 fathoms, a few dead valves, apparently representing a deeper water form, were obtained; these were proportionately still broader and more closely ribbed.

The names suggested at present read:—

*Placamen placidum* Philippi, Southern Tasmania.

= *roboratum* Hanley<sup>28</sup>, same locality.

*placidum molimen* subsp. nov., New South Wales.

[*placidum*] *subroboratum* Tate, fossil.

EMARGINULA CURVAMEN *sp. nov.*

(Plate xlii, figs. 10, 11.)

Shell elevated, round-backed, apex incurved, projecting beyond the edge of the base, anterior slope very convex, posterior slope almost perpendicular. Colour cream.

Slit long, about one-fourth the length of anterior slope, furrow a channel showing distant growth bridges, the edges a little uneven. Sculpture consisting of about twenty primary ribs, with about an equal number of subordinate ones crossed by twenty to forty concentric ridges, forming indistinct nodulation at points of intersection and shallow pits at intervals.

Length 8.5; breadth 5.5; height 4 mm.

From 128 fathoms, twenty miles east of Maria Island, Tasmania.

This distinct species needs no comparison with any described form.

<sup>27</sup> Tate—Trans. Roy. Soc. South Austr., ix, 1886 (Mch., 1887), p. 157, pl. xiv, fig. 17.

<sup>28</sup> Hanley—Proc. Zool. Soc., (Lond.), 1844 (Feb., 1845), p. 161; Recent Shells, 1856, p. 361, pl. 16, sp. 25.

*EMARGINULA AMITANA* sp. nov.

(Plate xlii, figs. 12, 13.)

Shell depressed, apex posterior, at about posterior fourth, incurved, anterior slope convex, posterior slope a little concave, steep. Colour very indefinite, greeny white alive, chalky white as dead shells. Slit very long, about one-third the length of anterior slope, furrow a canal, marked with regular rather distant growth bridges. Sculpture consisting of about fifty strong evenly spaced radials, crossed by about twenty concentric ridges, forming indistinct nodules, the interspaces appearing as pits. The sculpture becomes bolder with age, the juvenile shell being comparatively weakly engraved.

Length 11.5; breadth 7.5; height 4 mm.

Off Ulladulla, 74 fathoms; two live specimens living on boulder, the edges of the shell being, in consequence, uneven. Though the figure may suggest *E. bajula* Hedley<sup>29</sup>, it is no close relation, as this species is referable to *Emarginula*, while *E. bajula*, judging from the muscle scars, is a species of *Emarginella*<sup>30</sup>, a conclusion also arrived at by Hedley since the publication of his check-list. On the boulder was also living another *Emarginula*, which I cannot separate from *E. hedleyi* Thiele<sup>31</sup>, though a series might show variation from that littoral species. A fossil relation of this species appears to be *Emarginula transenna* Tenison-Woods<sup>32</sup> from Table Cape, which may be intermediate between *E. candida* A. Adams<sup>33</sup> and *E. hedleyi* Thiele.

## NARICAVA ANGASI A. Adams and Angas.

*Adeorbis angasi*, A. Adams and Angas, Proc. Zool. Soc. (Lond.), 1863 (1864), p. 424, pl. 37, figs. 11, 12.

*Naricava angasi* Hedley, Proc. Linn. Soc., N.S.W., xxxviii, 1913, (Nov. 5), p. 294.

When Hedley proposed the genus *Naricava* at the place quoted, he referred it to the neighbourhood of *Vanikoro*, and later placed it in the family Merriidae (*Merria*=*Vanikoro*), but did not describe the operculum, nor have I seen any description.

A live specimen, picked from the boulder trawled off Ulladulla in 75 fathoms, shows the operculum to be thin, horny, paucispiral, like that of *Uber* (= *Polinices olim*), and not like that of *Merria*. I have described a similar operculum for *Korovina*<sup>34</sup>, which may thus prove closely allied.

<sup>29</sup> Hedley—Proc. Linn. Soc. N.S.W., xxxviii, 1913, p. 276.

<sup>30</sup> Pilsbry—Man. Conch., xii, 1891, pp. 249, 269.

<sup>31</sup> Thiele—Conch. Cab., B. ii, Abth. 4a, 1915, p. 81, pl. ix, figs. 27, 28.

<sup>32</sup> Tenison-Woods—Proc. Roy. Soc. Tasm., 1876, (1877), p. 103.

<sup>33</sup> A. Adams—Thes. Conch., iii, 1863, p. 213, pl. 246, figs. 45, 46.

<sup>34</sup> Iredale—Proc. Malac. Soc., (Lond.), xiii, 1918, p. 31.

FAUTOR LEGRANDI TENTABUNDUS *subsp. nov.*

I<sup>35</sup> added the species <sup>36</sup> to the New South Wales fauna by means of dead shells dredged by Roy Bell, but Livingstone and Fletcher, of the Australian Museum, collected live specimens in 25-30 fathoms off Twofold Bay, which show the northern form to possess much weaker sculpture, which is clearly seen on the base. The postnuclear whorls also show faint nodulation, and the sutures are noticeably, though shallowly channeled. On the typical form thirteen cords can be counted on the base, with sometimes intercalating lines, the interstices crossed with fine radial threads. In the present form the base is sculptured with half a dozen flattened ribs near the umbilicus, generally followed by a smooth space about the width of three ribs, and then three weaker ribs with no distinct radials. Operculum typically trochoid. With the lot was also a typical *Fautor comptus* A. Adams<sup>37</sup>, the type of the genus *Fautor*<sup>38</sup>.

Since my separation of the Trochoid groups I have received Thiele's "Revision des Systems der Trochacea," (which although titled "Eingesandt in Dezember 1921" was apparently published only in February, 1924) as a separatum from the Mittheil. Zool. Mus., Berlin, Band xi, pp. 47-74. This revision is based primarily on radular characters, and Thiele has pointed out that the European shells referred to *Calliostoma*, and recently allowed subgeneric rank as *Jujubinus*, are not related to *Calliostoma* in the widest sense, but are near *Cantharidus*, a genus of the Trochoids proper. Thiele places *Jujubinus* as a sub-genus of *Cantharidus*, allowing two other subgenera *Thalotia* and *Bankivia*. Then *Phasianotrochus* is regarded as a section of *Cantharidus* s. str., *Leiopyrga* as a section of *Bankivia*, and *Alcyna* and *Odontotrochus* as sections of *Thalotia*. Throughout the essay Thiele's groups are of unequal value, and most of his subgenera should at once be raised to genera, and many of his sections also deserve that value. In the present case *Leiopyrga* is generically distinct from *Bankivia*, while *Alcyna* is decidedly not congeneric with *Thalotia*. The placing of *Fautor* next to *Thalotia* can be recommended, as I have already suggested.

In the subfamily Margaritinae Thiele places *Stomatella*, observing that the radula proves it to be related to *Euchelus*, and no relation of *Stomatia* at all. As *Stomatella* is the oldest generic name the name of the subfamily should have been Stomatellinae, and we can use this for our series of shells without discussing the relationship of the Arctic *Margarites* at all. Thiele classes *Perrinia*, *Danilia*, *Euchelus* with section *Herpetopoma* and subgenus *Tallorbis*, *Stomatella* with section *Hybochelus*, and *Solariella*=*Machaeroplax*. The last named may be omitted from our series as I have already given some notes on this subject.

<sup>35</sup> Iredale—Proc. Linn. Soc. N.S.W., xlix, 1924, p. 229.

<sup>36</sup> Tenison-Woods—Proc. Roy. Soc. Tasm., 1875 (1876), p. 154.

<sup>37</sup> A. Adams—Proc. Zool. Soc., (Lond.), 1854 (1855), p. 38.

<sup>38</sup> Iredale—Proc. Linn. Soc. N.S.W., xlix, 1924, p. 230.

TELEOCHILUS ROYANUS *Iredale*.

This new species, described<sup>39</sup> from shallow water, appears in a more delicate deep-water form all along the continental shelf. I find that the "Endeavour" brought in a dead specimen from 80 fathoms off Gabo Island. Livingstone and Fletcher found a couple (dead) off Eden, and I collected a dead shell from the boulder trawled in 75-80 fathoms off Narrabeen; all these were inhabited by hermit crabs. None approach the fossil more closely than the original lot, but, as these show variation, the fossils from different localities may also intergrade, and a series necessitating the use of trinomials be secured.

OEBEX MULVEYANA, *gen. et sp. nov.*

(Plate xliii, fig. 22.)

A genus of the Cymatiidae (?), small size, no posterior canal, sculpture peculiar, variced each half whorl.

Shell small, elongately fusoid in shape, spire longer than aperture, aperture narrow.

Colouration pinkish brown mottled with darker blotches, the varices showing one or two cream bands, the basal half of the last whorl paler pink strongly mottled with brown.

Whorls seven, plus an erect apical smooth two and a half whorls, convex, sutures impressed, varices each half whorl, a little irregularly placed, broad, and distinctly seen as a convex band. Sculpture consisting of from twelve to sixteen longitudinal ribs, between each varix cut into nodules by weak transverse cords, which increase from five on the second whorl to eleven on the penultimate, increasing in numbers on the body whorl. Columella smooth, continued as a glaze on body whorl, anteriorly produced angularly. Mouth obliquely oval, anterior canal short, open, no trace of posterior canal, outer lip thickened internally, not toothed, edge thin.

Length of type 35; breadth 15; aperture 16 x 5 mm. Paratype (apical whorls missing), 35 x 16 mm.

From block trawled in 74 fathoms off Ulladulla.

This fine new species is named after Mr. C. W. Mulvey, as it was through his enthusiasm that the shells were secured.

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<sup>39</sup> Iredale—Proc. Linn. Soc. N.S.W., xlix, 1924, p. 264.

*Relations.*—The group or groups of which this is one of the finest members, may later prove of immense value to palaeontologists, as many species have been described by Tate, under the genus *Epidromus*, from various fossil deposits, and now they are commonly turning up on the continental shelf. At present *Fusus brazieri* Angas<sup>40</sup>, *Fusus bednalli* Brazier<sup>41</sup>, *Fusus mestayerae* Iredale<sup>42</sup>, and *Fusus schoutanicus* May<sup>43</sup>, are known, but two or three other species are in the Australian Museum collection, and a form of the last named was obtained from the boulder trawled off Narrabeen in 75-80 fathoms, but only one dead shell was secured. The present species needs comparison with *Epidromus texturatus* Tate<sup>44</sup>, a fossil from Muddy Creek. The apex of *Fusus mestayerae*, compared with that of *F. schoutanicus*, was figured by May, when he introduced the latter species. As above noted a similar small form reaches as far north as Narrabeen in the same depth, but from 100-250 fathoms off Gabo Island many specimens of a form allied to *schoutanicus*, yet almost as large as *mestayerae*, were trawled and these may be named *Fusus (schoutanicus) conterminus* nov. Compared with *F. mestayerae* this form is broader, the sculpture is coarser, the varices more pronounced, and the apex comparatively smaller. Contrasted with *F. schoutanicus* it is much larger, sculpture more delicately marked, the shell thinner, and the apex more strongly sculptured. Variation in size and shape are seen in all three forms.

*Fusus bednalli* was described as *Epidromus bednalli* by Brazier from Guichen Bay, South Australia, and the New South Wales shell so identified is much smaller, smoother, narrower, and is probably specifically distinct, but until more material is available, it may be classed as a subspecies with the new name *Fusus bednalli volaticus*. A near fossil ally is *Epidromus leptoskeles* Tate<sup>45</sup> from the lower beds at Muddy Creek, while *Pisania tenuicostata* Tenison-Woods<sup>46</sup> should be compared with May's *schoutanicus* and *conterminus* above.

It will be noted that I am here discussing *Fusus* in connection with the genus *Obex*, which I have placed in the family Cymatiidae (?), although *Fusus* has been shown to belong to a different family, Fusidae. My reason for doing this is to attract attention to the relationship of the fossils, which have never been carefully criticised. The apex of *Obex* and some of the fossils, for example *E. texturatus* Tate, is of a different kind, and needs serious consideration. There is generally an eccentric twisting in the larger species of *Fusus*, as *brazieri* Angas, which is not seen at present in *Obex*.

<sup>40</sup> Angas—Proc. Zool. Soc., (Lond.), 1869, p. 46, pl. ii, fig. 3.

<sup>41</sup> Brazier—Proc. Linn. Soc. N.S.W., i, 1875, p. 6.

<sup>42</sup> Iredale—Trans. New Zeal. Inst., xlvii, 1914 (1915), p. 466.

<sup>43</sup> May—Proc. Roy. Soc. Tasm., 1910, p. 389, pl. 14, fig. 14.

<sup>44</sup> Tate—Trans. Roy. Soc. S.A., x, 1887, p. 139, pl. vi, fig. 10.

<sup>45</sup> Tate—*Ibid.*, p. 129, pl. iv, fig. 10.

<sup>46</sup> Tenison-Woods—Proc. Linn. Soc. N.S.W., iii, 1878, p. 224, pl. xxi, fig. 6.

CYMATIUM WATERHOUSEI *A. Adams and Angas.*

*Triton waterhousei*, A. Adams and Angas, Proc. Zool. Soc. (Lond.), 1865, p. 35. Port Lincoln, South Australia.

A shell referable to this species was found among a large series of shells, trawled off Twofold Bay in thirty fathoms, which Mr. Mulvey allowed to be examined. This is the first record of the species from New South Wales.

BERYLSMA WAITEI *Hedley*

In the lot just mentioned above half a dozen specimens of this species inhabited by hermit crabs, some from shallower water, some from deeper water, showed benthal variation exactly as I<sup>47</sup> suggested recently. A shore shell, stout, heavy, measured 120 mm. in length and 61 mm. in breadth, the aperture and canal measuring 70 mm. A specimen from thirty fathoms was pale orange coloured, lighter, mouth not much strengthened, lining weak, 135 mm. long by 61 mm. broad, the aperture and canal measuring 80 mm. A deep water shell from 60-70 fathoms was delicate, pure white, outer lip thin, not lined internally, not much glaze on inner lip, 148 mm. long by 61 mm. broad, the aperture and canal measuring 90 mm. This last was obviously a typical *Fusus waitei*<sup>48</sup>, which measured 150 mm. x 60 mm., the ribbing also agreeing in character, extending on the whorls, whereas with the shallow water forms it was more restricted to the shoulders.

A corrected nomenclature would therefore read:—

*Berylsma grandis* Gray. Tasmania.

*Berylsma (grandis) levifida* nov. Off Twofold Bay, shallow water.

*Berylsma (grandis) waitei* Hedley. Off New South Wales coast, deeper water, 50-80 fathoms.

FASCIOLARIA BAKERI *Gatliff and Gabriel*

*Fasciolaria australasia* Perry var. *bakeri* Gatliff and Gabriel, Victorian Naturalist, xxix, 1912, p. 47, pl. xiii, figs. 3, 4 (lettered 1, 2).

In the same lot was a large series of this species accompanied by a single typical *F. a. coronata* as understood in New South Wales: these are of great importance as they definitely establish the specific

<sup>47</sup> Iredale—Proc. Linn. Soc. N.S.W., xlix, 1924, p. 267.

<sup>48</sup> Hedley—Mem. Austr. Mus., iv, 1903, p. 373, pl. 37.

distinction from the recent *coronata*, but they undoubtedly are closely related to the fossil *Fasciolaria decipiens* of Tate<sup>49</sup>, who, when describing this species from the "Lower beds at Muddy Creek; gastropod-bed at the River Murray Cliffs; Table Cape . . ." observed: "Each locality has its own racial variety, and it may be desirable, when fuller material is at hand, to apply distinctive names to each." *Fasciolaria* [*decipiens*] *bakeri* Gatliff and Gabriel would succinctly indicate the relationship of the recent form.

*Fax* gen. nov.

(Plate xliii, figs. 19, 21.)

I propose this generic name for the shell Hedley introduced as *Phos tabidus*<sup>50</sup>, but later transferred to *Euthria*<sup>51</sup>. I<sup>52</sup> have recently discussed the varied species referred to the genus *Euthria* in connection with Cooke's<sup>53</sup> illustration of the radular features. The present species was brought back by Livingstone and Fletcher from 39-46 fathoms off Twofold Bay (pl. xliii, fig. 19) and was not at first determined as it was unlike a *Euthria*. I found in the Australian Museum collection a young live specimen from 27 miles south and east of Cape Everard in 90-150 fathoms that contained the operculum, which is oval, horny, nucleus apical.

Apparently an allied species is Tenison-Woods' *Cominella tenuicostata*<sup>54</sup>, which is placed under *Euthria* by May<sup>55</sup>, and which may be transferred to *Fax*. From 100 fathoms off Cape Pillar, Tasmania, a beautiful deep water shell was recorded by Hedley and May as *tenuicostata*, which should certainly be distinguished as *Fax (tenuicostata) conspicienda* nov. (Pl. xliii, fig. 21). This is longer, narrower, much more finely sculptured, lacking the strong longitudinal costae, and of more delicate texture and beautifully coloured, being pale cream marked with square spots of orange. The fossil *Phos cominelloides* Tate<sup>56</sup> should be carefully compared with this. The other species placed under *Euthria* by May, *Siphonalia clarkei* Tenison-Woods<sup>57</sup>, has more resemblance to the Neozelanic *Euthria*, but still differs, so that I propose to retain the association by introducing the new generic name *Tasmeuthria*, naming *S. clarkei* as type.

<sup>49</sup> Tate—Trans. Roy. Soc. S.A., x, 1887 (1888), p. 150, pl. viii, fig. 1.

<sup>50</sup> Hedley—Proc. Linn. Soc. N.S.W., xxix, 1904, p. 191, pl. 8, fig. 8.

<sup>51</sup> Hedley—Check-list Mar. Fauna N.S.W., 1918, Moll. p. M 87 (Journ. Roy. Soc. N.S.W., li, suppl.).

<sup>52</sup> Iredale—Proc. Malac. Soc. (Lond.), xiii, 1918, pp. 33-34.

<sup>53</sup> Cooke—Proc. Malac. Soc. (Lond.), xii, 1917, pp. 232-235.

<sup>54</sup> Tenison-Woods—Proc. Roy. Soc. Tasm., 1876 (1877), p. 135.

<sup>55</sup> May—Check-list Moll. Tasm., 1921, p. 81.

<sup>56</sup> Tate—Trans. Roy. Soc. South Austr., x, 1887 (1888), p. 167, pl. iv, f. 11.

<sup>57</sup> Tenison-Woods—Proc. Roy. Soc. Tasm., 1875 (1876), p. 6.

*Family* CANCELLARIIDAE.

A beautiful new species, secured by Roy Bell, was left unnamed in my essay, as there were so many complications. Some more specimens referable to this family necessitate an attempt (which I find Hedley had intended to make) to unravel the tangle. Firstly, it is doubtful if any true *Cancellaria* appears in this fauna, but the name may be used in the wide sense pending further research. Again, species of varied aspect are numerous in the fossil beds. Then, the *Trigonostoma* series is easily recognisable at sight, and *Admete* does not occur in any sense in Australian waters.

The species on Hedley's New South Wales list when reorganised would be:—

- |             |                                          |
|-------------|------------------------------------------|
| 801 and 803 | <i>Trigonostoma vinnulum</i> Iredale.    |
| 802         | <i>Cancellaria undulata</i> Sowerby.     |
| 805         | <i>Cancellaria scobina</i> Hedley.       |
| 805A        | <i>Cancellaria purpuriformis</i> Kuster. |
| 804         | <i>Microsveltia exigua</i> Smith.        |
| 804A        | <i>Microsveltia recessa</i> Iredale.     |
| 806         | <i>Pepta stricta</i> Hedley,             |

and some more species to be added.

*Genus* TRIGONOSTOMA *Blainville*.

*Trigonostoma* Blainville, Manuel de Malac., 2nd edition, 1827, p. 652.

Type by monotypy and tautonymy *Delphinula trigonostoma*.

I have not noted the record of a second edition of Blainville's work, but at Marseilles I bought a copy of the first issue in its original boards, which was completed at p. 648. In the usual copies of this second edition, "Nouvelle additions et Corrections aux Genera" occupy p. 649-664. These begin with the words, "Je comprendrai sous ce même titre un certain nombre d'observations nouvelles, qui me sont parvenues depuis la publication du Manuel de Malacologie." On p. 653, Octobre 1826 is quoted, and on p. 654 the genera *Westernia* and *Gervisia* of Quoy and Gaimard mentioned, which are commonly quoted as of Rang's "Manuel Mollusques," p. 139, May, 1829.

TRIGONOSTOMA VINNULUM *sp. nov.*

(Pl. xliii, fig. 18.)

Shell small, solid, oval fusiform, minutely perforate, mouth practically free. Colour creamy fawn, banded with reddish brown, the bands noticeable on the outer lip.

Apical whorls, one and a half, smooth, the succeeding five whorls with stout, elevated, somewhat rounded ribs, twelve on the penultimate whorl crossed by six threads, the shoulder concave, ribs higher than suture, slanting forwards.

Umbilicus small, narrow, edged with rib, lined internally. Mouth triangular; columella three plaited, the anterior smallest, the posterior plait largest; a distinct glaze crosses body whorl to posterior angle of outer lip. Outer lip thick, bevelled internally, with ten to fifteen lines inside, a posterior angular nodule present.

Type: Length 12.5; breadth 7 mm.; aperture about half length of shell.

From Twofold Bay, 25 fathoms (Roy Bell).

Also in the Australian Museum from 25-30 fathoms off Nora Head, New South Wales, and 33-56 fathoms off Botany Heads, New South Wales, both collected by McNeill and Livingstone. Also from Green Point, Watson's Bay, Port Jackson, collected by J. Brazier in 1873. Apparently this latter was recorded by Angas<sup>58</sup> as *Cancellaria antiquata* Hinds, to which it is related only generically; it seems also to be the species Angas included as *Cancellaria costifera* Sow. var., to which it bears some resemblance.

CANCELLARIA PURPURIFORMIS Kuster.

(Plate xliii, fig. 24.)

*Cancellaria purpuriformis* Kuster, Coquilles Vivants, Canal, ii, 1841, p. 37, pl. 7, fig. 4, from unknown locality. Reeve, Conch. Icon., x, Dec., 1856, pl. xvi, fig. 76, hab. unknown.

*Cancellaria tasmanica* Tenison-Woods, Proc. Roy. Soc. Tasm., 1875 (1876), p. 150. King Island.

*Cancellaria maccoyi* Pritchard and Gatliff, Proc. Roy. Soc., Vict., xi, n.s. 1899, p. 182, pl. xx, fig. 6. Western Port, Victoria.

In general form a specimen secured by Livingstone and Fletcher in 25-30 fathoms off Eden agrees with this species, and is a new record for the State. As the shell is more elongate and is weakly longitudinally ribbed throughout, about eighteen ribs on the penultimate and body whorls, it may represent a distinct species, but at the present time it seems best to name it as a subspecies only, *Cancellaria purpuriformis anxifer*, subsp. nov.

While dealing with *Cancellaria*, another correction may be made. May illustrates *Cancellaria laevigata* Sowerby, which also occurs in Victoria. Kuster<sup>59</sup> has figured *Cancellaria lactea* Deshayes, from the type, noting that Sowerby<sup>60</sup> has since named the same species *laevigata*, which is correct, so that *Cancellaria lactea* Deshayes<sup>61</sup> must displace *C. laevigata*.

<sup>58</sup> Angas—Proc. Zool. Soc. (Lond.), 1877, p. 186.

<sup>59</sup> Kuster—Coquilles Vivants, Canal, ii, 1841, p. 36, pl. vi, fig. 4. Loc. unknown.

<sup>60</sup> Sowerby—Conch. Illus., 1841, p. 3, pl. 11, fig. 24.

<sup>61</sup> Deshayes—Encyc. Meth., iii, 1832, p. 180. (The first 180, as there are two sets of pp. 1-256.)

MICROSVELTIA RECESSA *gen. et sp. nov.*

(Plate xliii, fig. 16.)

I propose the genus *Microsveltia* for the group of small species, naming the present one as type, but which would include *Cancellaria exigua* Smith, and some fossil species like *C. micra* Tate, but not *C. scobina* Hedley.

Shell very small, elongately oval, semicanalicate, imperforate spire longer than aperture, whorls shouldered. Colour dead brownish. Apical whorls large, one and half, smooth, adult whorls four, ornamented with ten slanting longitudinal ribs, elevated and a little rounded forming a strong shoulder; transverse cords cross the shell, two on the penultimate, and one on the shoulder, five, sometimes six, on the body whorl. A short, shallow, anterior canal may be noted, the columella two plaited, the anterior one larger, an umbilical chink sometimes seen in the adult, numerous striae rarely appearing on the base of the body whorl, and between the cords. The outer lip sharp, but the heavy rib behind sometimes obscures this.

Length 6; breadth 3.5 mm.

Off Bateman's Bay, 75 fathoms.

Near *C. exigua* Smith<sup>62</sup> and *C. micra* Tate<sup>63</sup>, but not identical with either.

The confusion with regard to these small species requires discussion. Smith first described *C. exigua* from the notorious "Challenger" station 164b, 410 fathoms off Sydney, 6 mm. x 3 mm., with one columella fold. Hedley and Petterd then added *Cancellaria scobina*<sup>64</sup>, a rather larger fine species, but later, after examining a collection from 80 fathoms off Narrabeen, Hedley regarded some small shells as conspecific with his *C. scobina*, and then still later observed "I have compared an example of *C. scobina* from 80 fathoms off Narrabeen with the type of *C. micra* Tate. The fossil has more and finer spirals, but weaker radials. In size, shape, and other respects the shells are identical," and therefore reduced his *scobina* to a variety of *micra*.

Then, through acceptance of some incorrect generic location, he described *Admeta stricta*<sup>65</sup>, and in his check-list placed his *scobina* under the genus *Admete*. The two species here noted are about as unlike the northern type of *Admete* as any shell could be, and almost certainly do not belong even to the same family.

<sup>62</sup> Smith—Proc. Zool. Soc. (Lond.), 1891, p. 439, pl. xxxiv, fig. 11.

<sup>63</sup> Tate—Trans. Roy. Soc. S.A., xi, 1889, p. 158, pl. x, fig. 8.

<sup>64</sup> Hedley and Petterd—Rec. Austr. Mus., vi., 1906, p. 222, pl. 38, fig. 12.

Hedley—Rec. Austr. Mus., vi., 1907, p. 360.

<sup>65</sup> Hedley—Rec. Austr. Mus., vi., 1907, p. 295, pl. 54, fig. 10.

The present small species from off Bateman's Bay, 75 fathoms, caused me to examine the shells above mentioned, and as suggested, I regard *Cancellaria scobina* as referable to *Cancellaria (sensu lato)*. I determine the Narrabeen shells as distinct in every way, much nearer *exigua*, but not conspecific with Tate's *micra*, which has seven spirals on the penultimate whorl. In the Australian Museum are many sets; from 80 fathoms off Gabo Island; from 65 fathoms, 20 miles east of Babel Island; 80 fathoms off Narrabeen; and a dead fragment (probably washed down) from 800 fathoms off Sydney.

The species, named by Hedley *Admete stricta*, is so unlike the type of *Admete* as to need little comparison, but as remarked at the time is not unlike the fossil *Cancellaria turriculata* Tate<sup>66</sup>. I propose for the recent species the genus *Pepta* and provisionally leave it in this family.

#### *Family* TURRITELLIDAE.

I have written at some length about members of this family in my essay on Roy Bell's Twofold Bay shells, but already there is much to add. When Tate<sup>67</sup> dealt with the fossil species he began with "from the great variability in form and sculpture of the majority of our fossil species of this genus, one is tempted to conclude that no satisfactory position can be taken up anywhere between the extremes regarding the whole genus as an enormous protean species, or describing nearly every colony as a separate species." Fortunately we are able by means of study of recent shells to find out the characters of the operculum and radula that are of value, and then associate these with shell features, thus preparing a good basis for work upon the fossils. The genera *Gazameda* and *Colpospira* have been differentiated<sup>68</sup>, and it is now possible that *Platycolpus* may be recognisable, and also other groups, as I propose *Ctenocolpus* for Lamarck's *Turritella australis*<sup>69</sup>. From 8-15 fathoms off Gabo Island, Victoria, Roy Bell sent a series of *Turritella* which were quite different from any received from New South Wales. They were obviously a recognisable variant of *Turritella australis* Lamarck, with the noduling missing. The apex was small, there was only a shallow sinus, not deep like that of *Colpospira* or *Platycolpus*; the whole facies of the shell was distinct, and the operculum was simple, concave exteriorly, horny and multispiral. Tate has described *Turritella pagodula*<sup>70</sup> from the Miocene of the Gippsland Lakes, not uncommon, which he stated "has some affinity with *T. granulifer* Tenison-Woods<sup>71</sup>, which is, however,

<sup>66</sup> Tate—Trans. Roy. Soc. South Austr., xi, 1889, p. 156, pl. x, fig. 14.

<sup>67</sup> Tate—Trans. Roy. Soc. South Austr., xvi, 1893, p. 334.

<sup>68</sup> Iredale—Proc. Linn. Soc. N.S.W., xlix, 1924, p. 247.

<sup>69</sup> Lamarck—Hist. Anim. s. Verteb., vii, 1822, p. 59.

<sup>70</sup> Tate—Trans. Roy. Soc. South Austr., xvi, 1893, p. 336, pl. viii, fig. 10.

<sup>71</sup> Tenison-Woods—Proc. Roy. Soc. Tasm., 1875 (1876), p. 142.

conspicuously different by its granulated keels." *Turritella warburtoni* Tate<sup>72</sup>, from the Eocene of Table Cape, common, is more distantly related. The recent shell here noted shows subobsolete nodulation on the early whorl, otherwise there appears to be no difference from the fossil *pagodula*. It is to be remarked that the recent shell is living in the same locality as the fossil, a factor noted in other cases of Kalimnan fossils. A few dead shells and fragments from off Port Kembla, 75 to 63 fathoms, were left unnamed when Hedley reported upon the "Thetis" material, and later they have been regarded as *australis* Lam., but as no fresh material turned up this species was not included in the New South Wales list. These fragments appear to be related to the smooth form here discussed, not to the nodulose *granulifer* form which is figured by May<sup>73</sup> as *australis* Lam. I propose to name the Gabo Island form *Otenocolpus australis diffidens* subsp. nov. (Plate xliii, fig. 17.)

*TURRITELLA SOPHIAE* Brazier.

(Plate xliii, fig. 23.)

*Turritella incisa* Ten.-Woods, Proc. Linn. Soc., N.S.W., ii, 1878, p. 262. Not *T. incisa* Reeve, Conch. Icon., v, 1849, *Turritella*, pl. xi, fig. 63.

*Turritella sophiae* Brazier, Proc. Linn. Soc., N.S.W., viii, 1883, p. 227; new name for *T. incisa* Ten.-Woods. Hedley, Mem. Austr. Austr. Mus., iv, 1903, p. 348. Hedley, Check-list Marine Fauna N.S.W., 1918, Moll. p. M 59 ( Journ. Roy. Soc. N.S.W. li, suppl.).

The type of this species, preserved in the Australian Museum, has been carefully examined and proves to be a young specimen of *T. sinuata* Reeve<sup>74</sup>; the shell recorded by May<sup>75</sup>, under the name *T. sophiae* is not the same, and seems like *C. guilleaumei* Iredale<sup>76</sup>.

GLYPTOZARIA OPULENTA Hedley.

*Turritella opulenta* Hedley, Rec. Austr. Mus., vi, 1902, p. 292, pl. liv, fig. 4.

Common and widely distributed over our continental shelf. Hedley observed "The sculpture is subject to considerable variation; in some examples the spiral sculpture is less, and the radial more pronounced than in the individual figured," which measured 6 x 2 mm.

<sup>72</sup> Tate—Trans. Roy. Soc. South Austr., xvi, 1893, p. 337, pl. viii, fig. 2.

<sup>73</sup> May—Illustr. Index Tasm. Shells, 1923, pl. xxviii, fig. 3.

<sup>74</sup> Reeve—Conch. Icon., v, 1849, pl. xi, f. 62.

<sup>75</sup> May—Proc. Roy. Soc. Tasm., 1915, p. 78; Check-list Moll. Tasm., 1921, p. 61; Illustr. Index Tasm. Shells, 1923, pl. xxviii, fig. 11.

<sup>76</sup> Iredale—Proc. Linn. Soc. N.S.W., xlix, 1924, p. 248.

A specimen occurred in the material from 75 fathoms off Narra-been, and I note that the fossil representative, very little changed, is *Turritella transenna* Tenison-Woods<sup>77</sup> from Muddy Creek, measuring 8.5 x 3 mm.

Tate transferred this species to *Mathilda*, but that location seems as unsatisfactory as *Turritella*, so that *Glyptozaria* may for the present remain in the Turritellidae.

TEREBRA LAURETANAE *Tenison-Woods*.

Roy Bell dredged two magnificent live specimens in 25 fathoms in Twofold Bay; they were at first regarded as new, but later recognised as a variant of this species<sup>78</sup>, judging from Hedley's figure<sup>79</sup>. The two shells were much broader and showed a pronounced postsutural collar and incised line; one, fully adult with mouth free and apical whorls missing, measured 48 x 11 with fifteen whorls; the other younger, beautifully perfect and well coloured, had thirteen adult whorls, and one and a half smooth apical whorls, in a length of 40 x 9.5 mm., the mouth immature; the sculpture below the collar consists of marked longitudinal growth striae and fine transverse scratching. Another specimen received from the same locality agrees in detail, measuring 31 x 8 mm. for eleven whorls and one and a half apical whorls.

Hedley's figure showed a very narrow shell with no postsutural collar and measured 41 x 7 for sixteen whorls. This was dredged in 300 fathoms off Sydney, and as it is obviously distinct I here name it *Terebra (lauretanae) tabifica* nov. Tate's type measured 20 x 6.5 mm. In the Australian Museum collection is another specimen from off Babel Island, 59-80 fathoms, which measures 45 x 8.5 mm. for fifteen whorls and apical one and a half; this shows a narrow indistinct postsutural collar with no line. With this might be contrasted *Terebra simplex* Tenison-Woods<sup>80</sup>, from Table Cape, with no infrasutural groove, though anterior whorls show a faint depression in the posterior third. A more distant relation appears to be *Terebra platyspira* Tate<sup>81</sup>, later figured<sup>82</sup> from the lower beds at Muddy Creek, very narrow and collared.

<sup>77</sup> Tenison-Woods—Proc. Linn. Soc. N.S.W., iii, 1879, p. 234, pl. 20, fig. 8.

<sup>78</sup> Tenison-Woods—Proc. Linn. Soc. N.S.W., ii, 1877 (1878), p. 262.

<sup>79</sup> Hedley and Petterd—Rec. Austr. Mus., vi, 1906, p. 222, pl. xxxvii, fig. 9.

<sup>80</sup> Tenison-Woods—Proc. Roy. Soc. Tasm., 1875, p. 2, tab. fig. 1.

<sup>81</sup> Tate—Southern Science Record, Jan., 1886, p. 6.

<sup>82</sup> Tate—Trans. Roy. Soc. South Austr., xi, 1888 (1889), p. 159, pl. viii, fig. 12.

*SCAPHANDER ILLECEBROSUS sp. nov.*

(Plate xlii, fig. 14.)

Shell oval, rather solid, creamy white, transversely punctate throughout, apex imperforate. Spire concealed, so that only the last whorl is visible. Sculpture consists of rows of oval pits set concentrically, the pits of the same size in the row but with some rows of smaller pits. Aperture very large, outer lip a little sinuous posteriorly, produced medially, and well rounded basally. Inner lip as a heavy glaze across the body whorl. Columella nearly straight, imperforate.

Length 12.5; breadth 9 mm. From 20 miles east of Babel Island, 65 fathoms.

Resembles *S. mundus* Watson<sup>83</sup> from 800 fathoms off the Aru Islands, but the sculpture is different. The figure of *S. tatei* Cossmann<sup>84</sup>, an Eocene fossil, somewhat resembles this, but Cossmann wrote "spire largement perforée au sommet," which effectually separates it. This is the first species from the continental shelf to be referred to *Scaphander*, and the animal will probably show easily recognised differences from the northern type.

*OBRUSSA BRACTEATA gen. et sp. nov.*

(Plate xlii, fig. 15.)

A genus of the Acteonidae (?).

Shell small, thin, oval, aperture about two-thirds the length of the shell, white, perforate, marked posterior gutter, shouldered.

The anastrophic apex is smooth, showing no varix, succeeded by four adult whorls; the sculpture on these whorls consists of delicate upstanding ridges, the interstices delicately latticed with fine longitudinal threads; six ridges on the penultimate whorl, the concave shoulder only bearing the growth lines of the posterior sinus.

The narrow perforation penetrates to the apex; columella curved; a shallow, scarcely perceptible, anterior canal may be noted, then the inner lip crosses the body whorl as a distinct glaze and meets the outer lip, which projects suddenly forward, forming a deep fairly wide gutter, then after a forward sweep recedes to make the anterior channel. Length 5; breadth 3.5 mm.

From 75-80 fathoms off Narrabeen; a similar specimen from 65 fathoms, 20 miles east of Babel Island, so that it ranges over the whole extent of the continental shelf.

<sup>83</sup> Watson—Challenger Reports, Zool., xv, 1886, p. 643, pl. xlviii, fig. 2.

<sup>84</sup> Cossmann—Trans. Roy. Soc. South Austr., xxi, July, 1897, p. 9, pl. i, figs. 34, 35.

*STILAPEX LACTARIUS* *gen. et sp. nov.*

(Plate xliii, fig. 20.)

A genus of the Strombiformidae, globose, vitreous, apex stiliform, operculate, probably free living, imperforate. Colour lacteous. The apex consists of two or three whorls, succeeded, sometimes irregularly, by six adult whorls, which are convex, with sutures well marked, slightly shouldered, last whorl about two-thirds the length of the shell. Aperture fairly wide, outer lip thin sinuate, columella a little thickened and reflexed, slightly sinuate posteriorly, inner lip continued as a glaze across the body whorl. Operculum thin, horny, paucispiral.

Length 8; breadth 5 mm.

From 70 fathoms 20 miles east of Babel Island.

The presence of an operculum and the sinuate outer lip suggest that this is a free living form, and quite distinct from the parasitic *Stilifer*.

May<sup>85</sup> appears to have figured the present species under the name *Stilifer brazieri* Angas<sup>86</sup>, but the latter species is parasitic and altogether a narrower shell.

The plates accompanying this paper were drawn by Miss Joyce K. Allan, the map by Mr. T. Hodge Smith. To each I wish to express my indebtedness for the valuable and painstaking assistance rendered.

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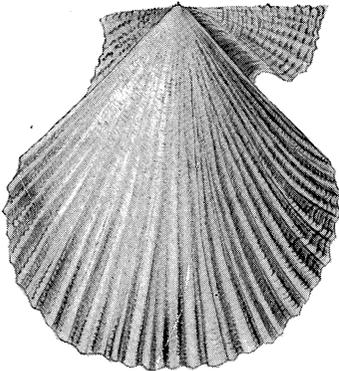
<sup>85</sup> May—Illustr. Index Tasm. Shells, 1923, pl. xlv, fig. 24.

<sup>86</sup> Angas—Proc. Zool. Soc. (Lond.), 1877, p. 173, pl. 26, fig. 12.

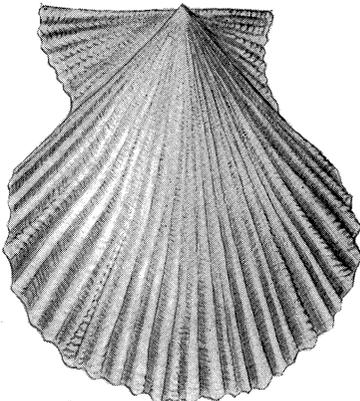
EXPLANATION OF PLATE XLI.

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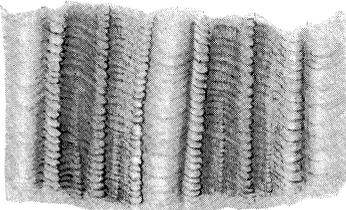
- Fig. 1, 2. *Chlamys famigator* Iredale, type, right and left valve.  
„ 3, 4. *Chlamys perillustris* Iredale, type, left and right valve.  
„ 5, 6, 7. *Chlamys instar* Iredale, type, left valve adult, sculpture  
of adult, right valve juvenile.



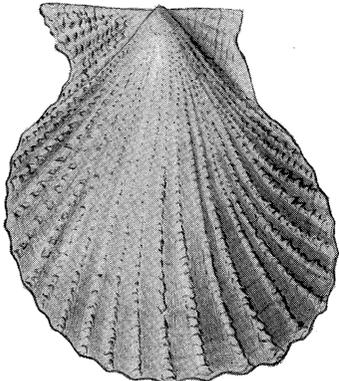
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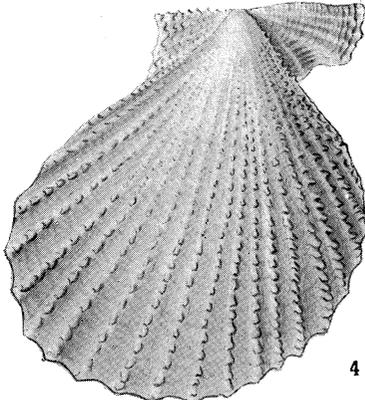
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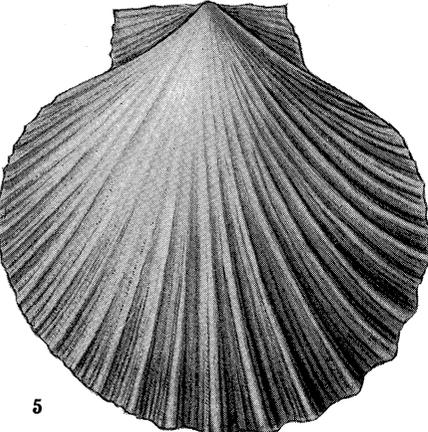
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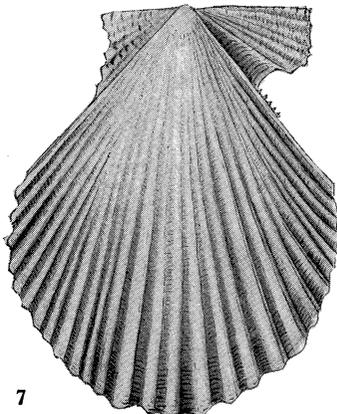
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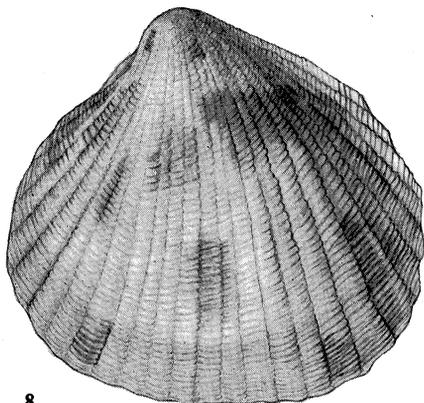


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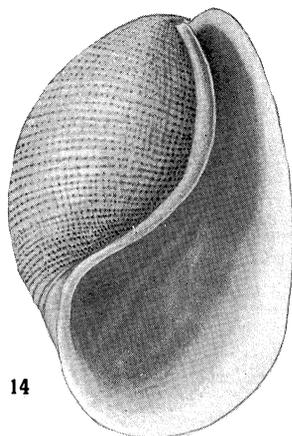
EXPLANATION OF PLATE XLII.

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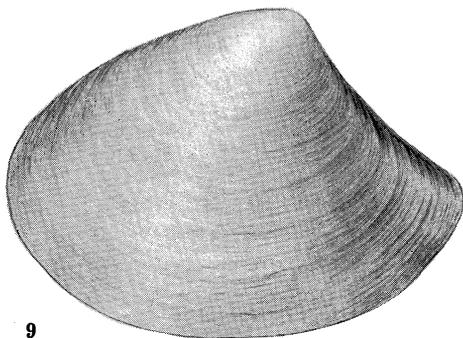
- Fig. 8. *Venericardia (excelsior) semota* Iredale, type.  
„ 9. *Nuculana oculata* Iredale, type.  
„ 10, 11. *Emarginula curvamen* Iredale, type.  
„ 12, 13. *Emarginula amitina* Iredale, type.  
„ 14. *Scaphander illecebrosus* Iredale, type.  
„ 15. *Obrussa bracteata* Iredale, type.



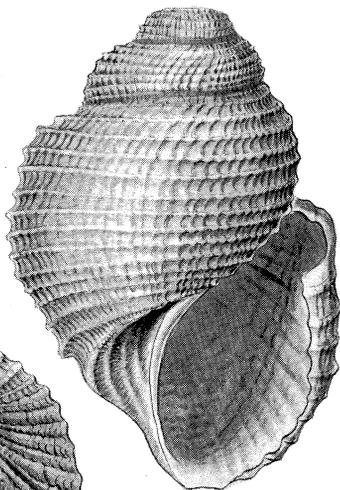
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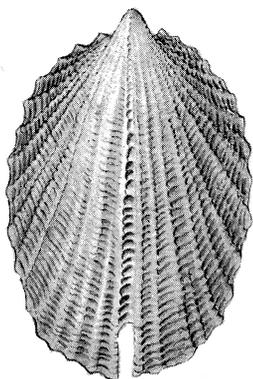
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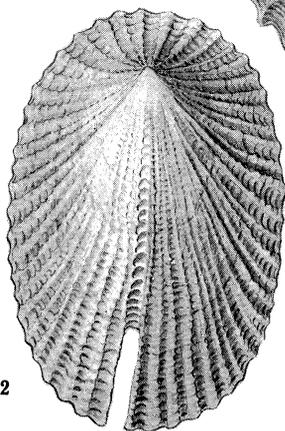
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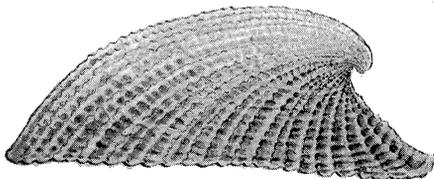
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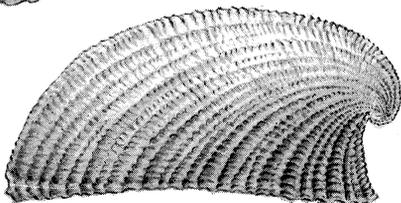
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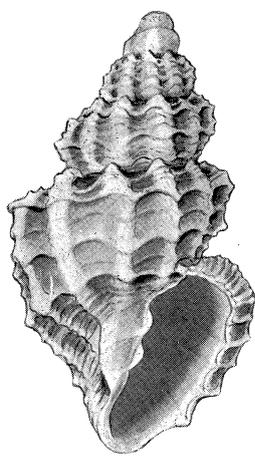


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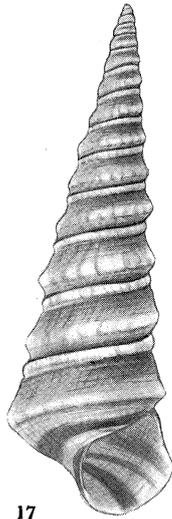
EXPLANATION OF PLATE XLIII.

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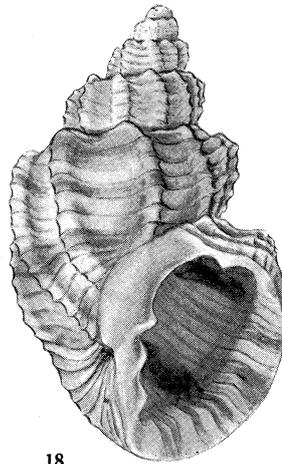
- Fig. 16. *Microsveltia recessa* Iredale, type.  
,, 17. *Otenocolpus australis diffidens* Iredale, type.  
,, 18. *Trigonostoma vinnulum* Iredale, type.  
,, 19. *Fax tabida* Hedley.  
,, 20. *Stilapex lactarius* Iredale, type.  
,, 21. *Fax (tenuicostata) conspicienda* Iredale, type.  
,, 22. *Obex mulveyana* Iredale, type.  
,, 23. *Turritella sophiae* Brazier, type (= *sinuata* Reeve).  
,, 24. *Cancellaria purpuriformis anxifer* Iredale, type.



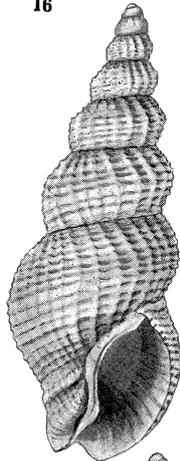
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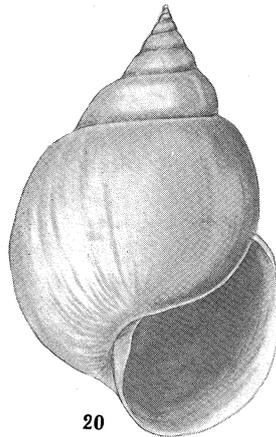
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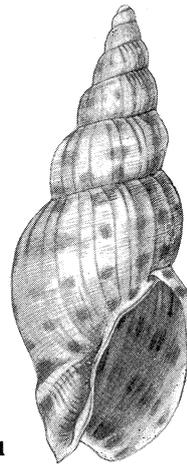
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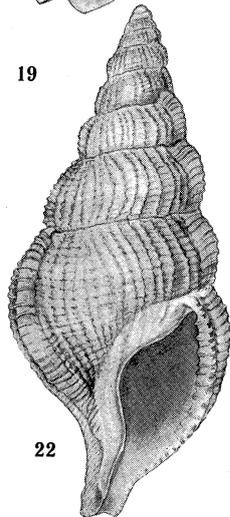
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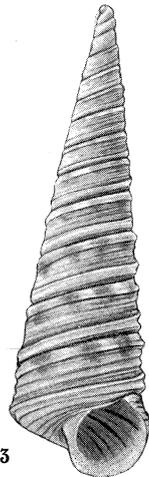
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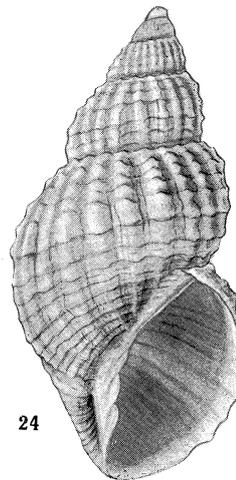
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