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THE GASTROPODS OF THE OLDER TERTIARY OF  
AUSTRALIA. (PART III.)

BY PROFESSOR RALPH TATE, F.G.S., F.L.S.

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## THE GASTROPODS OF THE OLDER TERTIARY OF AUSTRALIA. (PART III.)\*

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[From the Transactions of the Royal Society of South Australia, 1890.]

[Read October 7, 1890.]

### FAMILY TRICHOTROPIDÆ.

The ten species of this family forming part of the Eocene fauna of Australia are all congeneric; but I am uncertain as to their correct location—whether with the type genus or with *Mesostoma*.

*Mesostoma* was defined by Deshayes in 1864, and included in it four species from the Parisian Eocene; the genus was referred to the Family Rissoidæ. In my Appendix to Woodward's Manual of the Mollusca, 1867, I ventured to transfer it to the Family Cerithiidae, in which arrangement I am followed by Tryon in his Systematic Conchology, 1883. In my "Census of the Fauna of the Older Tertiary of Australia," Roy. Soc., N.S. Wales, October 3, 1888, I referred our species to "*Mesostoma* (if distinct from *Trichotropis*)," and was disposed to regard *Trichotropis inornata*, Hutton, recent and fossil in New Zealand, as congeneric therewith. Dall, in his Report of the "Blake" Mollusca, Part II., June, 1889, places *Mesostoma* as a subgenus under *Trichotropis*, without, however, indicating the differential characters; but remarks that "the degree of affinity which *Mesostoma*, *Dolophanes*, &c., bear to the original type of the family yet remains to be determined."

So far as my own investigations permit me to form an opinion, I fail to appreciate any differences of generic value, from a conchological point of view, between *Trichotropis* and *Mesostoma*.

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\* In the natural sequence of the families, Marginellidæ, Columbelloidæ, and Pleurotomidæ should have formed part of this or the preceding fasciculus; but because of the difficulty experienced in correctly illustrating the species of the first two families, which are for the most part small or minute, their inclusion has for the present been abandoned. In respect of the Family Pleurotomidæ, the cause of their temporary exclusion is want of leisure to elaborate the very numerous species (not less than 60) of this perplexing group.

Eleven species of *Marginella* have been described, though not figured; of *Columbella*, represented by about 26 species, very few are diagnostically known; but of Pleurotomidæ about 20 have been described, and about half of them figured.

The plates to illustrate this communication are unavoidably postponed.

The family is represented by 24 living species, two of which antedate to Pliocene times ; by 15 Eocene species, 4 of the Paris-basin, 1 from Alabama, and 10 herein described.

GENUS TRICHOTROPIS.

SYNOPSIS OF SPECIES.

- Spire-whorls medially angulated. 1. *T. angulifera*.  
 Spire-whorls flattened or sloping behind.  
 Costated, liræ crenulated ; outer lip lirate. 2. *T. tabulata*.  
 Transverse and spiral ornament of fine threads. 3. *T. subquadrata*.  
 Spire-whorls rounded.  
 Spirally lirate, transverse ornament not prominent.  
 Liræ 3, pullus lirate ; outer lip sulcate within. 4. *T. triplicata*.  
 Liræ 5, pullus smooth ; outer lip smooth within.  
 Whorls rapidly increasing, liræ equal. 5. *T. accrescens*.  
 Whorls slowly increasing, medium lira prominent. 6. *T. quinquelirata*.  
 Liræ 10 or more, pullus and outer lip lirate.  
 Liræ equal. 7. *T. apicilirata*.  
 Liræ alternately stout and slender. 8. *T. interlineata*.  
 Spirally lirate and conspicuously costate.  
 Liræ many slender, pullus obscurely lirate. 9. *T. costata*.  
 Liræ 4 prominent, pullus lirate. 10. *T. fenestrata*.

The species may be arranged into two sections, according to whether the embryonic whorls be ornamented or not. Section I, in which the embryonic whorls are lirate, contains *tabulata*, *subquadrata*, *triplicata*, *apicilirata*, *interlineata*, *costata*, *fenestrata* ; Section II., with smooth embryonic whorls, includes *angulifera*, *accrescens*, and *quinquelirata*. There are no close alliances with Parisian species, though *T. triplicata* presents some analogy with *Mesostoma grata*, Desh., and *T. angulifera* has a distant resemblance to *M. angulata*, Desh.

1. *Trichotropis angulifera*, *spec. nov.*

Shell minute, thin, slenderly fusiform, imperforate. Whorls six ; spire elevated, ending in a prominent obtuse apex consisting of two smooth whorls, the first of which is relatively small subglobose, with tip centrally immersed.

Spire-whorls three, medially angulated, the periphery defined by a broad flat rib, between which and the anterior suture are

two equal and equidistant narrow flat liræ; the posterior slope is spirally striated, with or without an inconspicuous medial thread; the whole surface is traversed by close-set sigmoid striæ of growth, and at regular distant intervals by raised threads, which produce slight denticulations as they pass over the peripheral angulation.

Last whorl truncatedly carinated at the periphery; its posterior slope is transversely close-striated and feebly costated (costulæ about 12), and further ornamented by one or two slender, more or less medial, spiral threads; the base has about six encircling flat threads, separated by about equally wide sulci, crossed by close-set striæ.

Aperture acutely oval, channelled in front; outer lip thin, smooth within; columella-pillar very prominent, arched; inner lip slightly reflected near the front.

*Dimensions*.—Length, 4·0; greatest breadth, 2·0; height of aperture, 1·75.

*Locality*.—Eocene; glauconitic clayey sands, Adelaide-bore (2 exs.).

## 2. *Trichotropis tabulata*, *spec. nov.*

Shell small, thin, broadly fusiform, imperforate; whorls six and a-half; spire, conical, scalar, ending in a blunt apex of two and a-half liræ whorls, the first of which is relatively very small.

Spire-whorls three, of rather rapidly-increasing width, with a flattish shoulder and angled in the posterior two-thirds, anterior to which they are convex; the suture is deep. The spiral ornamentation consists of two equal and equidistant threads on the posterior area; and of four elevated, equal, equidistant and somewhat undulose threads, crenulated on the edge, which occupy the anterior convex area; the posterior lira forms the peripheral angulation; on the anterior whorls a more or less slender thread is interposed between the third and fourth. The transverse ornamentation consists of broad subacute costa-like folds on the front of each whorl (about 15 on the penultimate), continued very obliquely to the posterior suture as depressed undulations; and of rather distant coincident striæ of growth, which produce crenatures as they pass across the liræ.

The body-whorl is broad and short, rather tumid, with a rounded convex base, which contracts rapidly into a very short triangular beak. The ornamentation is like that of the spire-whorls, except that there are several threads (seven or eight) on the posterior slope, and that the convex medial area has a slender thread alternating with the liræ; the base is ornamented with concentric threads alternately large and small.

Aperture rhomboid-oval, shortly channelled in front; outer lip thin, strongly liræ within; inner lip reflected, nearly covering the umbilical chink.

*Dimensions*.—Length, 7·0; greatest width, 4·0; height of aperture, 3·0.

*Locality*.—Eocene; glauconitic clayey sands, Adelaide-bore (6 exs.).

### 3. *Trichotropis subquadrata*, *spec. nov.*

Shell small, thin, fusiform, subumbilicated; whorls five; spire conical, rather high, scalar, ending in a blunt apex of two lirate whorls, the first one of which is relatively small.

Spire-whorls two, with a sloping shoulder and angled post-medially, anterior to which they are slightly convex. The spiral ornamentation consists of four slender, subacute threads on the posterior area, of four stouter equidistant threads on the anterior area, sometimes with a supplemental one in front of the posterior thread, which is at the peripheral angulation. The transverse ornamentation consists of oblique thread-like costulæ, with two or three finer threads in the interspaces; the intersections of the spiral and transverse threads produce a very conspicuous and regular tessellated ornament.

The body-whorl is broad and short, rather tumid, with an anterior and posterior angulation, between which it is slightly convex; the base is flatly convex, and contracts very rapidly. The spiral ornament consists of four threads above, six stouter ones in the median portion and three on the base; the transverse ornament consists of slender costulæ, which are directed backwards on the posterior area, incurved on the median area and ecurved on the base; the liræ are slightly denticulated at their intersection with the costulæ; the interspaces are traversed by two coincident raised lines.

The aperture is rhomboid-rotund, inconspicuously channelled at the front; the outer lip is thin on the edge and smooth within; the inner lip is medially incurved, slightly reflected, but not concealing the long narrow umbilical chink.

*Dimensions*.—Length, 3·5; greatest width, 2·8; height of aperture, 1·5.

*Locality*.—Lower beds (Eocene) at Muddy Creek (4 exs.).

This species, which is founded on what are probably immature specimens, has a general resemblance to *T. tabulata*, from which it differs conspicuously in its neat tessellated ornament.

### 4. *Trichotropis triplicata*, *spec. nov.*

Shell small, thin, imperforate; whorls four and a-half, convex; spire short, conical, ending in a blunt apex of two lirate whorls.

Spire-whorls convex with three strong, equal, equi-distant, truncated liræ, with a fourth partially concealed at the anterior suture, crossed by arched costulæ which produce slight nodulations on the liræ, and by lamellæ of growth two or three in each

interspace, the lamellæ appear as slight subimbricating squamæ on the liræ.

Body-whorl short and broad, ornamented with four strong liræ and otherwise as the spire-whorls; the base is abruptly contracted, flatly convex and ornamented with four concentric threads, the two outer ones distantly separated, the two inner ones approximate. Aperture quadrately rotund, attenuated in front to a slight channel; outer lip thin, crenulated on the edge and deeply sulcated within corresponding with the external liræ. Columella slightly arcuate, with the inner lip reflected and almost concealing the umbilical chink.

*Dimensions*.—Length, 3·5; greatest width, 2; height of aperture, 1·5.

*Locality*.—Eocene; glauconitic clayey sands, Adelaide-bore (1 ex.).

#### 5. *Trichotropis accrescens*, *spec. nov.*

Shell of moderate size, imperforate, whorls seven, convex, much narrowed at the sutures; spire elevated, ending in a blunt apex of one and a-half smooth inflated whorls.

Spire-whorls convex, rapidly increasing in width, with five strong equal and equidistant elevated truncated liræ, with a sixth partially concealed at the anterior suture; crossed by stout, arched threads, about equal in breadth to the interstitial angular furrows, about 10 in a breadth of 1 mm. on the penultimate whorl.

Last whorl convex, gradually contracted at the base into a very short beak, ornamented with about 10 raised truncated threads and transversely by arcuate striæ. Aperture quadrately rounded; outer lip thin, smooth within; columella nearly straight, inner lip reflected, almost concealing the umbilical chink.

*Dimensions*.—Length, 11·5; greatest breadth, 5·5; height of aperture, 4·5.

*Locality*.—Lower beds (Eocene) at Muddy Creek (2 exs.).

#### 6. *Trichotropis quinquelirata*, *spec. nov.*

Shell of moderate size, rather thick, turruculate, imperforate; whorls seven, convex, of slow increase, medially subangulated, ending in a blunt apex of two smooth convex whorls.

Spire-whorls four; spirally ornamented with five equidistant, raised, truncated liræ, the medial one is stouter than the others and forms a subangulated periphery; transversely ornamented by fine, close-set, regular, slightly oblique striæ.

Body-whorl narrow and long, rapidly but not abruptly narrowed at the base; ornamented with about 12 truncated cingula,

separated by one and a-half to two times wider, flat, transversely striated furrows.

Aperture roundly oval, channelled at the front; outer lip smooth within; columella slightly arched, inner lip reflected, quite concealing the umbilical chink.

*Dimensions.*—Length, 6·5; greatest width, 3·0; height of aperture, 2.

*Locality.*—Eocene; glauconitic calciferous sand-rock, Bird-rock Bluff, Spring Creek, near Geelong (1 ex.).

### 7. *Trichotropis apicilirata*, *spec. nov.*

Shell of moderate size, rather thin, turriculate, imperforate; whorls seven and a-half, of gradual increase, convex or medially subangulated, ending in a subacute apex of two and a-half, small, convex, lirate whorls.

Spire-whorls four; the spiral ornament consists of about ten narrow threads, five on the posterior area are unequal and irregularly disposed, the four on the front are stouter, equal and equidistant, the posterior one of which forms a slight angulation, especially on the posterior whorls; the transverse ornament consists of oblique equidistant threads producing a rhomboidal tessellation by intersection with the spirals which are slightly crenulated.

Body-whorl rounded with six irregular spirals on the posterior slope, five prominent ones on the medial area, and five irregular ones on the short, flattish, subangulated base; the whole surface crossed by sigmoid threads.

Aperture rotund, channelled in front; outer lip thin; columella nearly straight, inner lip reflected.

*Dimensions.*—Length, 9·75; greatest breadth, 4·5; height of aperture, 3·0.

*Localities.*—Bird Rock Bluff, Spring Creek; blue clays Schnapper Point (2 exs.).

### 8. *Trichotropis interlineata*, *spec. nov.*

Shell of moderate size, rather thick, turriculate; whorls convex spirally lirate and transversely closely striated, embryonic whorls lirate.

Spire-whorls three, convex, slightly flattened at the posterior suture: spirally ornamented with about 12 liræ, alternately large and small, which are minutely serrated by regular, close-set, oblique striæ.

Body-whorl convex, rather tumid, with a regularly convex base; ornamented with subacute spiral threads, alternately large and small, crossed by arched striæ.

Aperture rotund, rather broadly channelled at the front; outer

lip lirate within; columella concave behind, a little twisted towards the front, inner lip reflected, almost concealing the umbilical chink.

*Dimensions*.—Length, 7·0; greatest breadth, 4·0; height of last whorl, 2·5 nearly.

*Locality*.—Eocene; glauconitic sands, Adelaide-bore (3 exs.).

### 9. *Trichotropis costata*, *spec. nov.*

Shell of moderate size, thin; whorls of rather rapidly increasing width; spire broadly conical, ending in an obtuse apex of two and a-half obsoletely triliriate whorls.

Spire-whorls two, medially subangulated; spiral ornamentation of three slender rounded threads on the posterior slope, and about six alternately large and small anterior to the peripheral angulation; the transverse ornamentation consists of oblique convex costæ, narrower than the convex interspaces, and of regular striations, which produce the appearance of fine punctations in the spiral furrows.

Body-whorl convex, a little tumid, subangulated at the base, ornamented with minutely serrated liræ, alternately large and small, about eight on the posterior slope, about twelve above the basal angulation, and about ten on the base. The transverse ornamentation consists of about ten arched costations, which are evanescent at the basal angulation, and of coincident striæ.

Aperture rotund, obliquely channelled at the front; outer lip obscurely lirate within; columella-lip reflected, almost concealing the umbilical chink.

*Dimensions*.—Length, 5·0; greatest breadth, 3·0; height of aperture, 2·0. A fragment has a diameter of last whorl of 4·5.

*Locality*.—Eocene; glauconitic sands, Adelaide-bore (4 exs.).

### 10. *Trichotropis fenestrata*, *spec. nov.*

Shell small, thin, turriculate; whorls five, of slow increase, separated by a channelled suture, terminating in a blunt apex of two convex lirate whorls, the tip relatively very small.

Spire-whorls two, moderately convex, ornamented with four equal, equidistant, very prominent liræ, crossed by equal, equidistant, straight costulæ of about equal strength to the liræ; the rectangular intercostal spaces with about three or four transverse threadlets. The intersections of the liræ and costulæ are more or less denticulated.

Body-whorl regularly convex, high and narrow, encircled with about twelve principal liræ, with an intermediate threadlet between the medial liræ; the costulæ are acute, separated by broad shallowed interspaces, about fifteen in number, the anterior ones of which are continued on to the base; the intercostal spaces with from four to five coincident threadlets.



Aperture roundly-oval, channelled at the front; outer lip smooth within; columella-reflection concealing the umbilical chink.

*Dimensions*—Length, 3.75; greatest breadth, 2; height of aperture, about 1.0.

*Locality*.—Eocene; glauconitic sands, Adelaide-bore (2 exs.).

#### FAMILY SEQUENZIIDÆ.

##### GENUS SEQUENZIA, *Jeffreys* (1876).

The genus includes certain small trochiform shells, thinly nacreous, with an infra-sutural sinus resembling that of some Pleurotomiidæ, a sharp and shallow sinus at the periphery, and a third, more open, at the base; the columella is more or less twisted, with an anterior tooth-like projection; the base is either deeply umbilicated or imperforate. Eight species are known from off Pernambuco, and in tropical and subtropical latitudes on both sides of the North Atlantic at depths ranging from 100 to 1,500 fathoms. One of the living species occurs in the Upper Miocene of Calabria and in the Middle Pliocene of Sicily.

The author of the genus placed it near *Solarium*. Tryon in his Manual of Conchology (1883) includes it among Pleurotomariidæ in the vicinity of *Scissurella*. It forms part of Tryon's Monograph of the Family Trichotropidæ. Prof. Verrill removed it, on anatomical characters, far from its former assigned positions, and made it the type of a distinct family. Watson, Challenger Rep. Gastr. (1886), retains it among the Trochiidæ. Dall, Blake Rep. Gastr. (1890), follows Verrill, and places the family in the neighbourhood of Trichotropidæ.

The presence of the genus in the Older Tertiary deposits of Australia was notified by me in Proc. Roy. Soc. N.S.W., 1888, pp. 243, 249; it is represented by a single species which differs from all others by the crenulated margin to the umbilicus and by the bisinuated base of the aperture, as well as by the strongly developed radial ornamentation.

##### *Sequenzia radialis*, *spec. nov.*

Shell small, thin; broadly conical; flat and sharply angulated at the base, perspectivevely umbilicated; ornamented by radial sigmoidal threads, latticed by spiral ones.

Whorls seven, those of the spire flat, with the peripheral angulation exsert, or varying to biangulated, ornamented by equal, equidistant, sigmoid and radial lamelliform threads, and above the peripheral angulation by about four equal equidistant spiral threads, the intersections producing square- to rhomboid- interspaces. The radial lamellæ are more or less continuous from

whorl to whorl, and the suture is consequently usually concealed ; there are about 10 in 1 millimetre-space on the penultimate whorl.

Body-whorl with about five spiral threads crossed by the radial lamellæ above the periphery ; the peripheral angulation is formed of two approximate large exert threads, with a small thread on the outside of each. The base is flat, with eight encircling threads, the first two or three narrower than the sulci, the others crowded ; the whole surface tessellated by radial threads. The umbilicus is wide and perspective, margined by about sixteen stout granulations, from which proceed the radial threads in twos and threes.

Aperture rhomboid, peristome completed by a thin nacreous growth. Outer lip roundly insinuated near the suture between the first and third spiral threads ; sharply and shortly notched at the posterior carina ; at the exterior of the base roundly insinuated, separated by a similar sinus at the inner angle by a tubercle corresponding with umbilical carina.

Columella oblique, thickly rounded and slightly reverted on the edge, with a broad deep sinus above ; a strong twisted projection tooth at about two-thirds of its length, below which is the inner basal sinus.

*Dimensions.*—Height, 2·75 ; greatest breadth, 3·00 ; height of aperture, 1·25.

*Locality.*—Eocene at Muddy Creek (9 examples).

This species is simulated by an undescribed *Basilissa* of the Family Trochiidæ, obtained from the Eocene sands in the Adelaide-bore ; the latter is generically distinguished by its thick nacreous test, by the absence of the sharp tooth of the columella, and has only a sutural sinus.

## FAMILY CONIDÆ.

### GENUS CONUS.

#### SYNOPSIS OF SPECIES.

Spire flat, or nearly so.

Pullus small.

No spiral ornament ; pullus acute. 1. *C. cuspidatus.*  
Spiral threads, wavy-wrinkled transversely.

2. *C. ptychodermis.*

Spiral rows of flat granules. 3. *C. complicatus.*

Spiral linear-grooved. 6. *C. heterospira, var.*

Pullus large, obtuse ; body-whorl more or less spirally striated. 4. *C. pullulescens.*

Spire short, scalar.

Peripheral angle margined ; posterior slope flat or concave.

5. *C. ligatus*.

Peripheral angle not margined ; shoulder sloping backwards.

6. *C. heterospira*.

Spire moderate, with an uninterrupted slope.

Suture of spire-whorls crenulated ; body-whorl smooth.

7. *C. Ralphii*.

Suture concealed ; body-whorl with spiral rows of granules.

8. *C. acrotholoides*.

Spire moderate, the whorls slightly angulated.

Pullus small, subacute, the tip obliquely immersed.

Body-whorl spirally sulcate ; posterior spire-whorls crenulated at the keel.

9. *C. extenuatus*.

Body-whorl smooth or obsoletely liriate ; anterior whorls nodulose at the keel.

10. *C. Hamiltonensis*.

Pullus subcylindrical, obtuse.

11. *C. Murravianus*.

Spire elongate ; outer lip broadly sinuous, anal sinus deep and oblique (CONORBIS).

12. *C. attractoides*.

#### SPECIES EXCLUDED AND SYNONYMIC.

*C. Traillii*, Hutton. The published occurrences of this species in Australia refer to *C. Murravianus* and *C. ligatus*.

*C. papillosus*, Tate (ms.). The name being preoccupied *cuspidatus* is herein substituted.

*C. scalaris*, Tate (ms.). The name being preoccupied *ligatus* is herein substituted.

#### 1. *Conus cuspidatus*, spec. nov.

Shell conoidal, about twice as long as wide, with a flat or very low spire ; spirally fine-ribbed on the spire and at the base, otherwise usually smooth.

Spire consisting of seven whorls separated by a well-defined, impressed, linear suture with rudely crenate margins ; ornamented spirally by flatly-rounded unequally-sized threads (usually about nine on the penultimate whorl), varying somewhat in thickness, but usually as wide as the interstitial furrows, crossed by incurved growth-lines.

The spire terminates in a slender, pyramidal, acutely-pointed pullus consisting of five smooth moderately convex whorls of slow increase.

Body-whorl obtusely angled at the periphery, regularly tapering to about three-fourths of its height where it is slightly constricted ; ornamented with sigmoid striæ of growth, and in the anterior-fourth by wrinkled threads, narrower than the interspaces. Some young shells have punctated impressed lines on the body-whorl.

*Dimensions*.—Total length, 58 ; greatest diameter, 30 ; length of aperture, 56 ; length and breadth of pullus, 2.

*Localities*.—Rather common in the lower beds at Muddy Creek, and in the blue clays at Schnapper Point. Calciferous sandstones of the River Murray Cliffs near Morgan.

### 2. *Conus ptychodermis*, *spec. nov.*

Shell narrow, conoidal, a little more than twice as long as wide ; spire very low, ending in a small obtuse pullus of two smooth whorls.

Spire consisting of four and a-half narrow flat whorls separated by a narrow channelled suture ; ornamented spirally by a medial, more or less prominent, thread, with or without a few threadlets, crossed by arched prominent growth-ridges and by coincident striae.

Body-whorl obtusely angled at the periphery, regularly tapering to the front ; ornamented by inconspicuous spiral threads, which are wrinkled by the intercrossing of growth-folds, between which the surface is slightly contused.

*Dimensions*.—Length, 30 ; greatest width, 13 ; height of aperture, 28.

*Locality*.—Eocene beds at Muddy Creek.

### 3. *Conus complicatus*, *spec. nov.*

Shell varying from broadish- to narrow-conical, about twice as long as wide, spire very short, ending in a small obtuse pullus of two smooth whorls, the tip centrally immersed.

Spire-whorls four, narrow, the periphery slightly exsert, behind which they are slightly concave ; ornamented by three or four broad depressed liræ, tessellated by regular, deeply arched, growth-ridges.

Body-whorl sharply angled and slightly elevated at the periphery, regularly tapering to the front ; sculptured by somewhat regularly-disposed linear sulci ; separated by broad depressed ridges of which the first and fourth are usually broader, more elevated, and covered with flat granulations which range more or less in lines coincident with the striae of growth.

Growth-lines prominent, moderately eurved, which produce slight crenatures in the spiral furrows. Outer lip slightly eurved medially, deeply arcuately notched behind the peripheral angulation.

*Dimensions*.—Length, 18.5 ; greatest width, 10 ; length of aperture, 16.5 ; of another specimen, they are respectively 21, 10, 18.

*Localities*.—Eocene beds at Muddy Creek and Schnapper Point.

#### 4. *Conus pullulescens*, *T. Woods*.

*Reference*.—Proc. Linnean Soc., New South Wales, vol. IV., p. 3, pl. i., fig. 4 (non. 3), 1880.

The author of the species-name included two different species under it, but both examples represent very young, almost unrecognisable, shells; however in respect of one (fig. 4), I have been able to trace it up to a shell of moderate size (herewith figured), to which the specific designation is very applicable.

The species is conspicuous by its large turbinated pullus of three smooth tumid whorls.

The spire is either flat or very shortly elevated, its whorls narrow, separated by a linear suture; ornamented with four or five spiral threads and rather slender, close, arched growth-lines.

The body-whorl is sharply angled, and is ornamented with flat spiral threads, becoming more or less obsolete with age (except at the front).

*Dimensions*.—Length, 32; greatest width, 15; length of aperture, 27; diameter of pullus, 3.5.

*Localities*.—Eocene beds at Muddy Creek, Schnapper Point, and River Murray Cliffs.

#### 5. *Conus ligatus*, *spec. nov.*

Shell biconic; spire of variable height, but usually moderately low, consisting of about seven gradated whorls, ending in a small naticiform pullus of one and a-half smooth whorls; body-whorl more or less subpyriform.

Spire-whorls with an obtuse thick shoulder, the two slopes inclined approximately at a right angle and of about equal width; the posterior area is usually flat or slightly concave, rarely with a slight upward inclination; it is ornamented with four or five spiral threads, separated by narrower furrows, and rather close-set striæ of growth, conformable with the anal insinuation of the outer lip; the anterior area is provided with one or two threadlets margining the rib-like keel.

Body-whorl varying from pyriform to elongate-ovate, the peripheral keel defined anteriorly by a linear constriction, posterior to which there are one or two threads on the peripheral band. The surface is sculptured at the posterior part with incised linear lines, which towards the front become wider, and are finally replaced by ribs narrower than the shallow interspaces; the whole is crossed by growth-lines, which produce punctations in the linear sulci, and a fenestrated ornament anteriorly. The strength of the encircling lines is variable, and may be obsolete in the posterior half of the body-whorl.

The aperture is narrow, with a short anal sinus corresponding

with the posterior slope of the whorl; the outer lip is conspicuously ecurved medially.

*Dimensions.*—Of a large typical example. Length, 41; greatest width, 22; length of aperture, 34; length of last whorl, 35. Of a pyriform variety, the corresponding measures are—32, 20, 27·5, 28·5.

*Localities.*—Eocene beds at Muddy Creek and Schnapper Point.

*Affinity.*—This species exhibits much individual variation in shape of body-whorl and length of spire, but presents in the cord-like appearance of its peripheral keel a character which readily distinguishes it from other Australian species.

A figured variety so closely resembles *C. deperditus* of the Hampshire and Paris basins, that it is only by comparison of actual specimens possible to separate them. Though in this individual the gradation of the spire and the peripheral rib have lost much of their prominence, yet the defining threads on the keel are present—a character absent in *C. deperditus*; moreover, the latter is further distinguished by having two spiral and distant threads on the posterior area of the whorls. At the same time, the Australian similitude is no more than an extreme variation from a type which is obviously distinct from *C. deperditus*. However, it may be well to note that our Australian Cones are very difficult of specific definition, so much so that it is possible to bring all the species into very close relationship, through extreme individual variability.

### 6. *Conus heterospira*, *spec. nov.*

Shell acutely oval, biconic, with the anterior whorls of the spire gradated, the posterior ones more or less flatly depressed, rarely with a regular gradated spire throughout. The pullus arises abruptly from the spire as a small, smooth, shining papilla of one and a-half naticiform whorls.

Spire-whorls five; the penultimate one medially angulated, its anterior slope perpendicular, the posterior slope slightly inclined, but with a faint medial depression; on the ante-penultimate, the keel is close to the anterior suture, thence to the pullus the whorls are flat with a slight backward inclination whilst the keel appears as a slight rim.

The body-whorl is elongated and tapers to the front; the peripheral keel is sharp; the posterior slope, as also that of the spire-whorls, is ornamented with prominent, much-arched, growth-lines, crossed by a few, usually obscure, spiral threads; the rest of the body-whorl is ornamented with close-set, equidistant, incised lines, punctatedly impressed by the faint growth-lines.

Aperture narrow; outer lip ecurved medially and somewhat deeply arcuately sinuated at the posterior angle.

*Dimensions*.—Length, 34; greatest width, 16; length of aperture, 28; of body-whorl, 30.

*Localities*.—Blue clays at Schnapper Point, not uncommon; calciferous sandstones, Bird Rock Bluff, near Spring Creek.

*Affinities*.—This species has much resemblance to *C. ligatus*, but it is more elongate and has not the rim-like keel of that species. A characteristic feature is the abrupt gradation of the anterior whorls in the adult; in adolescent specimens the regular sloping low spire make it difficult at first sight to attach them to the adult; at this stage it resembles *C. complicatus*, but differs by its ornamentation, and the young of *C. cuspidatus*, from which it differs by its obtuse pullus and by the strongly arched growth-lines on the slightly concave spire-whorls.

The elate variety closely resembles *C. Huttoni*, mihi (*C. Traillii*, Hutton, non Adams), of the Pareora formation, New Zealand, which has a much narrower outline, more elongated spire, and a more inclined posterior slope of the whorls.

#### 7. *Conus Ralpii*, Tenison-Woods.

*Reference*.—Proc. Lin. Soc., N.S.W., vol. III., p. 228, t. 20, fig. 4 (1878).

Shell pyriformly oval, with a moderately elevated broadly conical spire, ending in a small naticiform pullus of one and a-half smooth whorls.

Spire-whorls seven, plane or flatly convex, separated by a slightly channelled suture, which is crenulated, or even nodulated, at the posterior margin of the earlier whorls; ornamented on the posterior-half of each whorl with usually three conspicuous equidistant incised spiral lines.

Body-whorl bluntly rounded, rarely subangulated, at the periphery; ornamented on the posterior slope with a few incised lines, the rest of the surface varying from smooth to faint spirally-linear-grooved, punctately impressed; the base is usually spirally wrinkled, but sometimes inconspicuously so.

Aperture narrow, obliquely incurved at the posterior angle; outer lip slightly ecurved medially.

*Dimensions*.—Length 40; greatest width, 21; length of aperture, 34; height of body-whorl, 35.

*Localities*.—Very common at Muddy Creek; rare in the calciferous sandstones of the River Murray Cliffs, near Morgan.

The species varies slightly in the height of the spire and in the proportion of the width to the length, also the spire-whorls may show a slight convexity and even a perceptible angulation at the posterior margin of the suture; rarely does the nodose crenulation

continue beyond the fourth whorl. *C. Ralphii* was founded on a very young individual, 10 mm. in length, at which stage of growth there are only four spire-whorls, but from an authentic specimen of that size I have traced it, through many intermediate stages, to the adult example which is here figured. The comparisons made by the original describer with certain species of the Viennese Miocene and with *C. Carmeli* of Australian waters are now no longer applicable, as the coronation of the whorls of our fossil is a character restricted to juvenile examples.

#### 8. *Conus acrotholoides*, *spec. nov.*

Shell pyriformly oval, with a low, broadly conical, almost hemispheric spire, ending in a small, obtuse, apiculate pullus of two smooth whorls, the first of which is vertical and its tip immersed.

Spire-whorls four, suture more or less concealed by the overlapping of the posterior edge of the whorls; ornamented by four rounded threads, about as wide as the intervening furrows, and by fine curvilinear transverse striæ, the posterior suture is margined by a broader flat band.

Body-whorl bluntly rounded at the periphery, on which are three spiral threads; anterior to the periphery there are about 14 flat granulose threads, defined by linear lines, the flat interspaces are more or less spirally striated; the granulose liræ become crowded towards the front; the whole surface is marked with fine close-set striæ of growth.

The outer lip is post-medially ecurved, and obliquely and shortly notched at the posterior angle.

*Dimensions*.—Length, 14; greatest width, 7; length of aperture, 11.5.

*Locality*.—Blue clays at Schnapper Point.

#### 9. *Conus extenuatus*, *spec. nov.*

Shell narrowly biconical, two and a-half times as long as wide; the spire subscalar, gradually tapering to the small obtuse pullus of two whorls, the first of which is oblique, with its tip immersed.

Spire-whorls seven, with the periphery slightly exsert, behind which they are slightly concave, separated by a narrow well-defined suture. The earlier whorls are slightly nodulose or crenulate at the keel, but this ornament disappears with the revolution of the spire. The spiral ornamentation consists of three or four unequal flat threads, which is crossed by close-set arched striæ.

Body-whorl bluntly keeled at the periphery, concave behind, slightly contracted in the anterior-third, but otherwise much attenuated towards the front. The surface with distant, regular, punctated, spiral grooves, between which are wider flat ridges.



Outer lip moderately eurved medially; the anal notch is broad and shallow.

*Dimensions*.—Length, 60; greatest width, 24; length of aperture, 50.

*Localities*.—Muddy Creek; River Murray Cliffs; Spring Creek, near Geelong; Cheltenham (doubtful identifications).

#### 10. *Conus Hamiltonensis*, *spec. nov.*

Similar to *C. extenuatus*, and perhaps only a variety, though not yet connected by intermediate forms; it differs by being proportionately broader, by the absence of nodulations and a keel on the earlier whorls, and by the more numerous spiral threads (about eleven) upon the spire-whorls.

The penultimate and body-whorl are obtusely keeled and nodulate. The median area of the body-whorl is smooth or obsoletely spiral-lirate, not sulcate.

*Dimensions*.—Length, 32.5; greatest breadth, 14; length of aperture, 25.

*Locality*.—Lower beds at Muddy Creek.

#### 11. *Conus Murravianus*, *spec. nov.*

Shell narrowly biconical, more than twice as long as wide; spire scalar, gradually tapering to the cylindroid pullus of three and a-half smooth convex whorls.

Spire-whorls six, suture concealed by reflection of their posterior margin, bluntly angled a little in front of the middle, the longer backward-sloping area slightly concave; ornamented with close-set sigmoid striæ and obsolete spiral threads. The posterior-half of the first whorl is slightly costated.

Body-whorl broadly lanceolate in outline and narrowly truncate at the front, roundly angular at the periphery with a concave shoulder, which is obsoletely lirated; whole surface marked with fine sigmoidal growth-lines, and at the front by encircling ridges.

Outer lip with a shallow, obliquely-cut, notch at the posterior angle, thence with a gentle outward curve to the middle, and more rapidly declining to the front.

*Dimensions*.—Length, 61; greatest width, 26; length of aperture, 46.

*Locality*.—Calciferous sandstones of the River Murray Cliffs near Morgan.

This species comes near to *C. gradatulus*, Sow., and differs so far as one can judge by the figure, by the ante-medial position of the blunter keel on the spire-whorls.

#### 12. *Conus (Conorbis) atraetoides*, *spec. nov.*

Shell ovately fusiform, biconic; test moderately thick; surface spirally furrowed, smooth and shining. Spire regularly conical,

about one-third the total length of the shell, consisting of five whorls, ending in a small, blunt, turbinate pullus of two and a-half smooth rounded whorls.

Spire-whorls slightly convex, separated by a well-defined linear suture; ornamented by six flat spiral ribs, the three posterior ones separated by flat shallow sulci of about equal width, the three anterior ones by linear grooves sometimes almost obsolete; the interstitial furrows are punctulatedly impressed.

Body-whorl obtusely angled at the periphery, regularly attenuated anteriorly; ornamented with flat spiral ribs (about 30), separated by narrow furrows, crossed by sigmoidal lines of growth which produce the appearance of punctations in the interstitial furrows.

Aperture narrow, broadly emarginate in front; outer lip thin and sharp on the edge, smooth within, much eurved medially.

*Dimensions*.—Length, 16·5; greatest width, 6·5; length of aperture, 10.

*Locality*.—Clayey greensands, Adelaide-bore.

Compared with actual specimens of *C. dormitor*, from the Eocene of Hampshire, it has a narrower outline and a longer spire, but especially differs by the ornamentation which consists of engraved, punctated, spiral lines, and not of raised threads with elegantly tessellated interspaces.

By its sulcate sculpture and greatly arched outer lip it is more allied with *C. alatus*, F. Edwards, of the Hampshire basin; but it seems to differ by its blunt-pointed apex and rounded shoulder to the whorls, whilst the proportional measurements indicate a narrower shell with a shorter aperture.

## FAMILY CYPRÆIDÆ.

### GENUS CYPRÆA.

I have not been successful in arranging the species in conformity with the sectional subdivision of the genus as employed by recent conchologists. Those sections are largely based on external shape, and as some of our fossil species show extensive-enough variability as to necessitate the inclusion of the same species in two sections, I have been induced to group them in respect to themselves. Some of them are wholly unprovided for in the scheme of recent species, such as *C. gastroplox* with its wing-like base; and the group typified by *C. eximia*, which though having a near ally in *C. umbilicata* of the same geographic region, yet markedly differs by the dental-sulcations of, and widely extending upon, the inner lip, though in one individual-specimen, through extreme age, the normal dentition is acquired.

## SYNOPSIS OF SPECIES.

## I. Base rounded.

1. Aperture notched or extending into a short canal behind.  
Shell cylindroid; teeth small, numerous. 1. *C. parallela*.  
Shell oval-oblong; teeth large.  
Back elevated; spire concealed. 2. *C. scalena*.  
Back depressed; spire prominent. 3. *C. subsidua*.  
Shell elongate-oval; surface contused. 4. *C. ampullacea*.  
Shell oval-subpyriform.  
Spire slightly exsert; tumid; posterior canal distinct. 5. *C. Archeri*.  
Spire nearly concealed; less tumid; posterior canal very short. 6. *C. Jonesiana*.  
Shell globose; spire exsert; surface contused. 7. *C. contusa*.
2. Aperture roundly produced behind on left side, not distinctly notched posteriorly.  
Shell cylindroid, spire exsert. 8. *C. subpyrulata*.  
Shell cylindroid-subpyriform; spire umbilicated. 9. *C. brachypyga*.  
Shell oval-subpyriform.  
Spire concealed, umbilicated; outer lip much arched behind. 10. *C. pyrulata*.  
Shell pyriform.  
Spire concealed, slightly impressed; shell under one inch long. 11. *C. Murraviana*.  
Spire exposed, deeply umbilicated; shell two inches or so long. 12. *C. leptorhyncha*.  
Shell globose; spire convex. 13. *C. ovulatella*.

## II. Base flat, not winged.

1. Inner lip strongly dentate-sulcate.  
Anterior canal much produced, attenuated.  
Beak straight or nearly so.  
Shell oval-pyriform; beak with two dorsal tubercles. 14. *C. eximia*.  
Shell globose-pyriform; beak with or without basal tubercles. 15. *C. sphaerodoma*.  
Beak much upturned, without basal tubercles.  
Shell oval-oblong, very gibbous. 16. *C. toxorhyncha*.  
Anterior canal short, obtuse, without basal tubercles.  
Shell oblong-subpyriform; posterior canal subtruncate with a very wide base. 17. *C. platypyga*.  
Shell more oval; posterior canal narrow, short. 18. *C. consobrina*.

2. Inner lip tuberculate or tooth-ridged, not denticulate  
(also *C. sphaerodoma*, pars), or edentulous.

Anterior canal much produced, depressed.

Shell pyriform ; aperture almost edentulous.

19. *C. platyrhyncha*

Anterior canal short.

Shell broadly oval, with a low convex back ; anterior canal straight ; both lips dentate throughout.

20. *C. amygdalina*.

Shell oval, very large, back very gibbous, anterior canal upturned ; aperture almost edentulous.

21. *C. gigas*.

Shell spheroidal, very large.

22. *C. dorsata*.

III. Base flat, dilated into a horizontal circular disk.

Shell oval, very gibbous.

23. *C. gastroplox*.

#### EXCLUDED SPECIES.

*C. oviformis*, Sow., is attributed to Tenison-Woods as author, and to South Australia for habitat, by Johnston in Geol. Tasmania, 1888 ; but Tenison-Woods refers (Geo. Obs. in S. Aust., p. 83, 1862) to this species as a London Clay fossil, and not as occurring in South Australia.

#### 1. *Cypræa parallela*, *spec. nov.*

Shell cylindrical, twice as long as wide ; the spire exsert, around which the body-whorl is flatly rounded ; the longitudinal curvature of the back is interrupted at intervals, which gives rise to the appearance of spiral threads, usually conspicuous towards the two ends, but is sometimes obsolete.

The aperture is shortly produced into a bluntly-pointed canal at the ends, narrowed at the front. The outer lip is margined at the two extremities, leaving a median unmargined portion of variable length ; the teeth are small and numerous (about thirty). The inner lip is thickened, and slightly projecting posteriorly ; there are about twenty teeth in its whole length ; the columella projects internally towards the front as a broad, concave, ridged plate.

*Dimensions*.—Length, 18 ; width, 9 ; height, 8.

*Locality*.—Eocene ; Muddy Creek.

This species resembles dwarfed examples of *C. Isabella*, Linn., of the Indo-Australian region, but has an exsert spire, and is slightly more narrowed at the front.

#### 2. *Cypræa scalena*, *spec. nov.*

Shell oval-oblong, somewhat gibbous, highest near the middle, with a steep slope anteriorly and rather abruptly narrowed at

the front, subtruncated at both ends; left side swollen; spire incompletely concealed, slightly exsert.

Aperture narrow, margined with elongate teeth; outer lip slightly margined at the two extremities, shortly projecting beyond the spire; inner lip thickened posteriorly and confluent with the outer lip, forming a very short canal; front part of columella much elevated internally, concave and ribbed.

Surface of the shell smooth or marked with faint distant spiral lines and obscure contusions.

*Dimensions*.—Length, 37; width, 24; height, 21.

*Locality*.—Eocene; Muddy Creek.

This fossil comes very near to *C. Reevei*, Gray, recent in S.W. Australia, but is proportionately higher and consequently the slopes from the highest point are more rapid, the front is more narrowed, whilst the swollen left-side gives it a distinctive lopsided profile. The corresponding measures of *C. Reevei* are 37, 22, and 19.

### 3. *Cypræa subsidua*, *spec. nov.*

Shell oval-inclined to trapezoidal-oblong, depressedly convex, obtuse at both ends; the right side flatly rounded, the left more arched and rather abruptly contracted to the front; spire exsert.

Aperture narrow, base rather flat; outer lip not margined, broadly subplanulate medially, with about twenty-five stout rounded ridges. Inner lip developed behind into a prominent protuberance margining the short anal canal and posterior part of the aperture, with about twenty acute ridges; it is somewhat flattened towards the front, and runs out into a narrow triangular extension of the base, supporting the very short, truncate, anterior canal. The columella is much elevated internally and very concave.

The surface of the shell is smooth.

*Dimensions* of a large example.—Length, 26; width, 17·5; height, 14. Of a small example, 18, 11·5, and 9.

*Locality*.—Eocene; Muddy Creek.

The squat-form, flattish base and post-ventral protuberance distinguish this species from *C. scalena*, which from its undeveloped appearance might be regarded as an immature state of that species. But the numerous examples under observation prove that the adolescent feature is proper to the adult as it is in the living *C. Reevei* and its fossil analogue *C. scalena*. Without comparison of actual specimens, I am not sure if this be distinct from *C. Bartonensis*, F. Edw., of the English Eocene, though the Australian shell appears different, by its large posterior boss and the less prominent spire.

#### 4. *Cypræa ampullacea*, *spec. nov.*

Shell elliptic-oval, highest and widest a little behind the middle ; obtusely rounded apically with a very narrow, flat, exposed spire ; gradually narrowed to the front ; surface transversely and spirally lineate, the small rectangular interspaces contusedly impressed.

Aperture moderately wide ; slightly curved and obsoletely notched posteriorly ; extended into a short straight beak, which is somewhat effusively expanded at the tip. Outer lip not margined, distantly toothed (about thirty), making a very acute angle at its junction with the inner lip. Inner lip with a short, slight ridge-like thickening at the posterior end, provided throughout with long tooth-ridges (about twenty-five).

*Dimensions*.—Length, 34 ; width, 19 ; height, 18.

*Locality*.—Eocene blue-clay at Schnapper Point ; one example, apparently not quite mature, as the posterior canal and the lips are incompletely developed.

#### 5. *Cypræa Archeri*, *Tenison-Woods*.

*Reference*.—Proc. Roy. Soc., Tasmania, tab. 1, figs., 9-9a, p. 22 (1876).

Shell oval-subpyriform, moderately inflated. Shortly narrowed and truncated at each end ; spire exsert ; surface smooth or spirally lineate.

Outer lip margined externally, thickly inflected, very slightly produced behind, with about 20 rounded dental ridges ; inner lip having a short elevated callosity confluent with the outer lip intervening between which is a slight anal notch ; the inner lip has about 15 subacute dental ridges.

*Dimensions*.—The species varies a little in shape, particularly as to the proportionate length. I give the measures of a short and long example. (1) Length, 20 ; width, 13 ; greatest height, 11, at 9 mm. from the posterior end. (2) Length, 27 ; width, 15.5 ; height, 14.

*Locality*.—Table Cape, Tasmania ! (*R. M. Johnston*).

I cannot attach any of our Continental cowries to this species, though it has a distant resemblance to *C. pyrulata* and *C. Murraviana*. Its inclusion in the published lists of River Murray and Muddy Creek fossils is now withdrawn.

#### 6. *Cypræa Jonesiana*, *spec. nov.*

This is comparable with *C. Archeri* ; from the short variety of which it differs by being less tumid and proportionately narrower, from both varieties it differs by its gentle front slope similar to *C. pyrulata*, but it has not the produced posterior emargination of that species.

The spire is more or less concealed. The outer lip is broadly reflected, prominently margined, and is furnished with 20 prominent teeth; the inner lip has 18 narrow elongate teeth.

*Dimensions*.—Length, 17·5; width, 11; greatest height, 9, at 7 mm. from the posterior end.

*Localities*.—Miocene; Muddy Creek. Older Pliocene; Dry Creek-bore, near Adelaide.

The species-name is a public acknowledgment of the valuable aid rendered to geologic science in South Australia, more particularly in reference to Tertiary Geology, by Mr. W. J. Jones, Conservator for Water.

### 7. *Cypræa contusa*, *McCoy*.

*Reference*.—*C. (Luponia) contusa*, Pal. Vict., Decade V., tab. 49, figs. 3-3c, 4-4a (1877).

Shell globular; spire slightly projecting, consisting of three slightly convex whorls, the apex obtuse and prominent; anterior canal very short. Surface irregularly reticulated with small contusions or irregular polygonal bruise-like depressions.

*Dimensions*.—Length, 30; proportional width,  $\frac{7.5}{100}$ ; height,  $\frac{7.0}{100}$ .

*Localities*.—Eocene. Muddy Creek!; Schnapper Point!; (*McCoy*); River Murray Cliffs, rather common, but usually dwarfed!

### 8. *Cypræa subpyrulata*, *spec. nov.*

Shell cylindroid or narrowly oval-oblong; spire exposed, the rounded periphery of the penultimate whorl exert and constricted above and below; the body-whorl arises abruptly from the suture with a well-rounded curve to the highest point of the low back, which is a little behind the middle; surface smooth.

Aperture rather wide, shortly loop-like behind, without a distinct posterior canal, anteriorly produced into a short straight beak with effuse lips. Outer lip margined, inconspicuously reflected, denticulated (about 25), slightly roundly-extending beyond the spire. Inner lip with a slight ridge-like thickening at the anal insinuation and confluent with outer lip, there are about 20 long narrow tooth-ridges.

*Dimensions*.—Length, 25·5; width, 13; height, 11.

*Locality*.—Eocene; Muddy Creek (common).

This species is somewhat intermediate in outline between *C. parallela* and *C. pyrulata*; from the former it differs by its outer lip more arched and projecting behind, by its less abrupt front-truncation, and its short anterior canal; from the latter by its cylindroid outline.

### 9. *Cypræa brachypyga*, *spec. nov.*

Allied to *C. subpyrulata*, but is much attenuated to the front

and always small ; the spire is exerted. In shape it varies from ellipsoid-cylindrical to cylindroid-subpyriform. The outer lip is narrowly reflected, distinctly margined, emarginate but not canalicate behind, and provided with about 20 transverse teeth ; the inner lip has about 15 teeth.

*Dimensions*.—Length, 15·5 ; width, 8 ; height, 7 (at 5·5 mm. from the posterior end).

*Localities*.—Eocene ; Muddy Creek and Schnapper Point.

#### 10. *Cypræa pyrulata*, *spec. nov.*

Shell cylindroid-pyriform, inflated posteriorly and gradually tapering to the front ; spire more or less concealed, narrowly but deeply umbilicated, from the edge of which the whorl arises abruptly with a well-rounded curve to the highest point of the back, which is at about two-fifths the total length from the posterior end. Surface smooth or spirally lineate.

Aperture rather wide, emarginate but not canalicate behind, extending at the front into a short straight truncated beak. Outer lip narrowly inflected, not distinctly margined, transversely ridged (about 25), much-curved behind and projecting beyond the spire. Inner lip hardly thickened and not at all produced posteriorly, with about 20 dentate ridges.

*Dimensions* of two examples.—Length, 27 and 24 ; width, 16 and 13·5 ; height, 13·5 and 11·5.

*Locality*.—Eocene ; Muddy Creek (very common).

#### 11. *Cypræa Murraviana*, *spec. nov.*

Shell pyriform, back ventricose, abruptly rounded to the concealed faintly-depressed spire, tapering rapidly but not so abruptly to a straight, broadish, very short, truncated beak, which is rounded on the margins.

Aperture narrow, gently curved posteriorly, the outer lip projecting backwards into a short lobe with a thickened quadrate margin ; there is no anal canal. Outer lip broadly inflected, externally margined, with about 20 narrow tooth-ridges ; inner lip convexly rounded, with from 12 to 15 long slender ridges ; columella-plate narrow, ridged, anteriorly running out in an oblique tooth-like ridge to the extremity of the beak.

*Dimensions*.—Length, 20 ; width, 14 ; height, 11·5 (at 8·75mm. from the posterior end).

*Localities*. — Eocene. River Murray Cliffs ! ; near Mount Arapiles, Victoria (*J. Dennant*).

This fossil cowry resembles *C. pyrulata* by its protuberant arched outer lip and the absence of a posterior canal, but differs by being more ventricose in the dorsal profile, more abruptly narrowed at front and by the much incrassated outer lip. From



*C. Archeri* it differs in its globosely pyriform shape and the greater posterior curvature of the aperture. Among extralimital species it makes a near approach, judging by illustrations, to *C. inflata*, Lamarck, of the English and Parisian Eocene, but is more abruptly attenuate to the front, and the aperture not so gradually arched behind.

### 12. *Cypræa leptorhyncha*, McCoy.

*Reference*.—*C. (Luponia) leptorhyncha*, Pal. Vict., Decade V., tab. 49, fig. 1—1c. (1877).

Pyriform, ventricose; spire exposed, deeply depressed; outer lip much arched and protuberant posteriorly, no distinct anal canal; anterior canal straight, short, narrowed and subtruncate at the front.

*Dimensions*.—Length, 58; width, 36; height, 31.

*Localities*.—Eocene. Muddy Creek!; River Murray Cliffs!; Schnapper Point! (McCoy); Cheltenham!

The author of the species compares it with *C. inflata* and *C. globularis*, of the European Eocene, and with *C. Haveri* and *C. Genei*, Michelotti, of the Italian Miocene; but distinguishes it by the greatly inarched posterior end of the outer lip as well as the different form of the anterior beak.

### 13. *Cypræa ovulatella*, spec. nov.

Shell globose, abruptly descending to the broad flatly-convex spire, less abruptly descending to the short truncate anterior canal, which is bevelled on the inner margin and somewhat effusively reflected.

Aperture roundly-narrowed posteriorly, thence widening to the base of the anterior canal, which is almost closed by the approximation of the large basal plications of each lip.

Outer lip narrowly-reflected, flat, but with a sharply rounded exterior margin, furnished on the inner edge with from eight to ten strong tooth-ridges, the anterior one of which is oblique, and margins the left side of the canal. Inner lip with ten to eleven small transverse ridges; the columella-plate is high, abruptly ascending from the inner lip, bluntly crenate on the edge; columella with a strong fold, which runs out to the front of the anterior canal.

*Dimensions*.—Length, 11; width, 8.5; height, 7 (at 4.5 mm. from the posterior end).

*Localities*.—Eocene; Aldinga Cliffs and Adelaide-bore.

This species has a general resemblance to the recent *Trivia ovulata*, Lamarck, but the produced anterior canal separates it generically.

#### 14. *Cypræa eximia*, G. B. Sowerby.

*References.*—Sow. in Strzelecki's "New South Wales," p. 296, tab. 19, figs 1—3 (1845). *C. (Aricia) eximia* (Sow.), McCoy, Pal. Vict., Dec. III., tabs. 28, 29, figs. 2—2b (1876).

Pyriform, ventricose posteriorly, beaked at both ends, abruptly and obtusely subtruncate over the flat almost-concealed spire, tapering gradually into a long convex straight beak, which is supported on each side by a narrow triangular, straight and sharp-edged, plate-like extension of the base. At the base of the beak on each side of its upper aspect is an oblong rounded tubercle. The posterior canal is shorter than the anterior one, supported by a flange-like extension of the base, slightly upturned and bent to the left; its right side is broader, and carries an oblong tubercle. Outer lip inflected, strongly toothed on the inner margin; inner lip with narrow deep sulci, with broad intervening flat ridges. Columella without an internal plate-like extension.

*Dimensions.*—Length varying from about 100 to 65 mm.; the proportional width,  $\frac{5.0}{10.0}$ ; height,  $\frac{3.0}{10.0}$ ; length of snout,  $\frac{2.2}{10.0}$ ; of anal canal,  $\frac{8.0}{10.0}$ , but variable.

*Localities.*—Eocene. Muddy Creek!; Schnapper Point!; Fyansford, and three miles west of Gellibrand River (*McCoy*). Well-sinking at Franklin, near Launceston (*Strzelecki*), at a depth of 140 feet; Table Cape (*Hobart Mus.*).

This species is the type of a section not represented in living creation, though having a general resemblance to *C. umbilicata*, Sow., constituting Josseaume's Section *Umbilia*, which may be characterised by the dentate-sulcated inner lip, not denticulate-ridged, as pointed out by G. B. Sowerby in his description of it. Sowerby's comparison was with *C. Scottii*, *C. umbilicata* being at that time yet unknown.

Both Sowerby's and McCoy's figures show the anal canal bent to the right, whereas all of several specimens which I have had under examination have it twisted in the opposite direction.

#### 15. *Cypræa sphærodoma*, *spec. nov.*

A near alliance of *C. eximia*, but differs by its globose body-whorl, also by the abrupt sinistral curvature of the posterior-third of the aperture and the strong torsion of the posterior canal. In other particulars there is a close agreement.

*Dimensions.*—Total length, 84; length, excluding canals, 46; width, 48; height, 40.

The proportional measures of these two closely-related species are—

	Length (excl. canals).	Width.	Height.
<i>C. eximia</i> ...	100	82	70
<i>C. sphærodoma</i> ...	100	104	87

*Localities*.—Eocene. River Murray Cliffs, near Morgan!; Muddy Creek! (*J. Dennant*).

VAR. ? The example from Muddy Creek is of the length of about five and a-quarter inches and has the inflated back of the type, but otherwise it presents differential characters, which might from an extreme point of view be regarded as of sectional value, though I am inclined to consider them as the result of individual variation of an extreme senile growth.

The anterior canal is longer and slightly curved upwards, but the basal flanges are broad and acutely rounded on the edge; there are no basal tubercles. The posterior canal is the same, except that the basal flanges are flatly, broadly, and thinly expanded. But the chief differences belong to the aperture; on the columella-side the base is broad and flatly-rounded to the inner margin, which carries about thirty short, convex, dental ridges, about equal in width to the interspace; the outer lip, instead of being convexedly inflected, is flat or slightly concavely-declinous from the exterior to the inner margin, on the latter of which there are about thirty sharply-rounded narrow dental ridges becoming effaced at from one-half to one-third the width from the inner margin. Thus the chief exceptional characters are the short teeth and flat inner lip, replacing the dental-sulcations on a steeply-inclined area, in which regard this variety makes a connecting link between *C. eximia* and *C. umbilicata*.

*Dimensions*.—Length, 135; width, 75; height, 55; length of anterior canal, 35; of posterior canal, 25.

#### 16. *Cypræa toxorhyncha*, *spec. nov.*

Resembles *C. eximia*, but differs by its high steep-sided back and bent canals.

The back is very ventricose, abruptly rounded to the flat almost-concealed spire, abruptly tapering to the anterior canal; the left side is very steep, but the right is less abrupt. The posterior canal, viewed from above, is very broad at the base, with thick rounded margins, the beaked-portion is broadly convex, not upturned though slightly bent; its margins are much thickened, the inner side extends beyond the other; there is no basal tubercle. The anterior canal is supported by a thick rounded extension of the base, and has no basal tubercles; the canal is cylindroid, almost closed, much upturned and slightly bent to the left.

*Dimensions*.—Total length, 94; length from spire to base of anterior canal, 55; width, 47; height, 43. The relative proportions to the length of the shell, exclusive of the canals, of the two species are as follows:—

*C. eximia*—Length, 100; width, 82; height, 70.

*C. toxorhyncha*—Length, 100; width, 85; height, 78.

Though these proportionals indicate a wider and higher shell for *C. toxorhyncha*, yet they fail to express the striking differences in the profiles of the two species.

*Locality*.—Eocene; Muddy Creek (*J. Dennant*).

### 17. *Cypræa platypyga*, *McCoy*.

*Reference*.—*C. (Aricia) platypyga*, Pal. Vict., Decade III., tab. 30, figs. 1—1c (1876).

This somewhat oblong-pyriform shell is remarkable for its short, extremely wide, subtruncate, posterior beak; the right side of which is much wider than the more-pointed left side.

*Dimensions*.—Length, 75; width, 45; height, 39.

*Localities*.—Eocene. Schnapper Point! (*McCoy*); Muddy Creek!; Table Cape (*R. M. Johnston*).

### 18. *Cypræa consobrina*, *McCoy*.

*Reference*.—*C. (Aricia) consobrina*, Pal. Vict., Dec. V., tab. 49, figs. 2—2c (1877).

“Related to *C. platypyga*, but is more oval, much shorter canals and concealed spire. Length, 2 inches 8 lines; width,  $\frac{6.5}{100}$ ; height,  $\frac{5.6}{100}$ . Very rare at the Moorabool River.”—*McCoy*.

Erroneously quoted as occurring in the River Murray Cliffs.

### 19. *Cypræa platyrhyncha*, *McCoy*.

*Reference*.—*C. (Aricia) platyrhyncha*, Pal. Vict., Dec. III., tab. 30, figs. 2—20 (1876).

Pyriform, gradually tapering to a broad, flat, elongate truncated beak; posterior canal short and abruptly reflexed; spire concealed; anterior part of aperture with a few small obtuse teeth, the rest edentulous.

*Dimensions*.—Length, 100; width, 47; height, 43; length of anterior canal, 25.

*Localities*.—Eocene. Bird-Rock Bluff, Spring Creek (*McCoy*); Table Cape (*R. M. Johnston*).

### 20. *Cypræa amygdalina*, *spec. nov.*

Shell broadly oval, with a moderately low convex back, highest at about three-sevenths from the posterior end, thence flatly convex to the abrupt margin of the slightly-sunken concealed spire; the anterior portion tapers gradually to the short, straight, broad, subtruncated canal. The posterior canal is short, though prominent, obtuse, slightly upturned, and bent to the left.

Aperture rather wide, the hinder part gently arched to the left. Outer lip flatly rounded, broadly inflected, with about twenty short rounded teeth on the inner margin, which are somewhat evanescent posteriorly. The base on the right side is very broad in the middle, concavely sloping at the aperture, which is fur-

nished in the anterior-half with about eight obtuse tubercles, sometimes shortly prolonged on to the base, and towards the posterior end with four or five elongated teeth, the rest of the inner lip obsoletely denticulate. The columella is rounded, not internally extending in the form of an erect plate.

*Dimensions.*—Length, 57; width, 36; height, 28.

*Locality.*—Well-sinking in the Murray Desert.

This species is not much unlike *C. Mappa*, but it has a different dorsal and transverse outline.

### 21. *Cypræa gigas*, McCoy.

*References.*—Ann. Mag. Nat. Hist., p. 438 (1867); *C. (Aricia) gigas*, Pal. Vict., Decade II., tab. 15, tab. 16, fig. 2, tabs. 17 and 18, fig. 1 (1875); Dec. III., tabs. 28 and 29, fig. 1 (1876).

Shell very large, oval, back very gibbous, roundly sloping at both ends; anterior canal deep, narrow, elongate, projecting upwards; posterior canal obliquely truncate, reflexed upwards, and adherent to the spire. Base flattened, oval, much thickened; inner lip rounded, smooth within, flattened near the anterior canal; outer lip inflected, tumid, broad, with nine or ten obsolete obtuse teeth near the anterior end and a few near the posterior end.

*Dimensions.*—Length, 8 inches; proportional width,  $\frac{67}{100}$ ; height,  $\frac{55}{100}$ .

*Localities.*—Muddy Creek, Schnapper Point, and near the mouth of the Gelibrand River (*McCoy*). Casts probably of this species, River Murray Cliffs.

This is the largest known Cowry, living or fossil.

### 22. *Cypræa dorsata*, *spec. nov.*

Shell very large, spheroidal; abruptly rounded at both ends, inflatedly rounded at the sides; spire concealed. Anterior canal deep, narrow, short, upturned, obliquely truncate; posterior canal rather broad, deep, short, confluent with the spire. Base as in *C. gigas*.

*Dimensions.*—Length, 95; width, 75; height, 65.

*Localities.*—Eocene. Muddy Creek (*J. Dennant*); Schnapper Point (*R. T.*).

This rival, in point of size, to *C. gigas* (as it attains to considerably larger dimensions than those of the type-specimen) is separable from it by its spheroidal form and very short anterior canal; it stands to that species in much the same way that *C. decipiens* does to *C. Thersites*.

### 23. *Cypræa gastroplax*, McCoy.

*Reference.*—*C. (Aricia) gastroplax*, Pal. Vict., Decade II., tab. 16, fig. 1; tabs. 17 and 18, fig. 2; 1875.

"The enormously extended circular thin flange into which the base is extended renders this cowry totally unlike any previously known living or fossil species. Length and width of body-whorl  $2\frac{1}{2}$  and 2 inches; with disc length and width  $4\frac{1}{4}$  inches. Spire small, blunt, of two volutions. Rather rare at Mornington, Hobson's Bay."—*McCoy*.

## GENUS TRIVIA.

## SYNOPSIS OF SPECIES.

Shell cross-ribbed.

Shell globose, with linear dorsal furrow.

1. *T. avellanoides*.

Shell oblong, with large dorsal smooth area.

2. *T. erugata*.

Shell smooth, without cross-ribs, globose. 3. *T. pompholugota*.

1. *Trivia avellanoides*, *McCoy*.

1876. *Cypræa* (*Trivia*) *avellanoides*, *McCoy*, Pal. Vict., Decade III., tabs. 28, 29, figs. 3—3c.

1877. *Trivia Europæa* (*Montfort*), *Tenison-Woods*, Proc. Roy. Soc., Tasmania, p. 91.

1879. *Trivia minima*, *Tenison-Woods*, Proc. Lin. Soc., N.S. Wales, vol. IV., p. 4, tab. 1, fig. 8.

1884. *Trivia avellanoides* (*McCoy*), *Tate*, Proc. Roy. Soc., Tasm., p. 209; id., *Johnston*, p. 222.

Shell thin, oval-globose; surface ornamented with very narrow, sharply defined, thread-like ridges, which are usually interrupted by a narrow smooth space along the middle line of the back.

As pointed out by *McCoy*, it is much more globose and has much fewer and more distant cross-ribs than *T. australis*; but it is the counterpart of *T. avellana*, Sow., of the English Crags (hence its specific name), distinguishable especially by its uniformly shorter and more spheroidal form.

*Tenison-Woods* referred dwarfed examples of this species to *T. Europæa*, from which it is separable by much the same characters as it is from *T. australis*.

*Tenison-Woods* figures and describes an early stage of growth of this species as *T. minima*, relying for a differential character on the absence of a dorsal division between the ridges; he judged, moreover, the shell to be an adult because of the thickened lips, overlooking the fact that *Trivia*, unlike *Cypræa*, exhibits no shell-metamorphosis. An examination of many small examples of *T. avellanoides* permits me to state that the smooth dorsal area does not begin to develop until the shell has reached a length of about eight millimetres.

*Dimensions*.—Length of a large specimen, 31; the average

proportional width is  $\frac{7.8}{100}$ , height,  $\frac{7.0}{100}$ ; but dwarfed examples of from 10 to 15 mm. are more common.

*Localities.*—This is one of the commonest and most widely diffused species of the Australian Eocene-beds. SOUTH AUSTRALIA.—River Murray Cliffs; Turritella-clays, Aldinga-cliffs; bore at Adelaide. VICTORIA.—Schnapper Point!, Muddy Creek! and Corio Bay! (*McCoy*); Spring Creek! TASMANIA.—Table Cape!; and Turritella-limestones, Flinders' Island (*Johnston*).

### 2. *Trivia erugata*, *spec. nov.*

Shell thin, narrowly oblong, spire concealed. The back is broadest and highest near the posterior end, is depressedly convex in a longitudinal direction, abruptly sloping to the posterior end, but more gently to the front; the right side is rather steep, medially slightly depressed, the left side is more convex. In young shells the median constriction is very pronounced, and the spire is prominently exsert.

The aperture is narrow; the outer lip narrowly thickened and indistinctly margined, it is slightly incurved medially, rounded at the extremities, and ornamented with about 25 teeth.

The cross-ribs are evanescent at about half the length of the sides, being thus interrupted by a large oval smooth dorsal area.

*Dimensions.*—Length, 5.5; greatest width, 3; and height, 2.5.

*Locality.*—Lowermost horizon of the Muddy Creek-section.

*T. erugata* differs from known, recent and fossil, species by the combination of an oblong shape with a large smooth dorsal area.

### 3. *Trivia pompholugota*, *spec. nov.*

Shell globose, smooth and shining, abruptly descending to the excessively short anterior canal and to the slightly-projecting spire.

Aperture moderately wide, rounded behind. Outer lip slightly projecting behind, narrowly thickened and inflected, minutely wavy-wrinkled, margined externally, provided with sixteen stout elevated ridges; inner lip with a keel-like margin, which is tuberculate-dentate (eight tubercles in the anterior-half and sixteen in two rows in the posterior-half); the columella-plate is high, flatly-concave, smooth, and reaches to the front.

*Dimensions.*—Length, 7.5; width, 5.5; height, 5.

*Locality.*—Adelaide-bore.

The apertural characters, which, however, indicate a somewhat adolescent shell, are those rather of *Trivia* than *Cypræa*.

### GENUS ERATO.

The affinities of this genus are considered by some conchologists to be with *Marginella*, but I revert to its location in the Family Cypræidæ.

## SYNOPSIS OF SPECIES.

- Back without a longitudinal furrow [ERATO, *sensu stricto*].  
 Columella spirally ridged at the front; aperture narrow.  
 Pyriform-oval; spire very short. 1. *E. minor*.  
 Fusiform-oval; spire elevated. 2. *E. australis*.  
 Columella ending in a strong spiral plait; aperture moderately wide.  
 Pyriform-oval.  
 Outer lip squarely shouldered behind. 3. *E. pyrulata*.  
 Outer lip roundly sloping behind, more attenuated to the front. 4. *E. Morningtonensis*.  
 Cylindric-oblong. 5. *E. duplicata*.  
 Back with a longitudinal sulcus [ERATOPSIS].  
 Columella tooth-ridged at the front; shell pyriform-oval. 6. *E. illota*.

## SPECIES EXCLUDED.

- E. ? octoplicata* (Woods), Tate, is a true *Marginella* as originally placed.

1. *Erato minor*, Tate.

*Reference*.—Trans. Roy. Soc. S. Aust., vol. I., p. 96, 1878.

Shell minute, shining, triangularly pear-shaped, rather tumid, abruptly narrowed in front; spire short, obtusely pointed, the terminal whorls narrow and flat. Aperture narrow, straight, emarginate behind. Outer lip roundly inflected with about fifteen denticles, broadly and varicosely reflected on the body-whorl, callously spreading behind on the penultimate whorl; the varicose reflection is minutely granulate or pustulate. The outer lip is squarely curved behind, and ascends to about the middle of the penultimate whorl.

The columella has five crowded, slender, oblique ridges at the front, which are succeeded by denticles for the greater part of the rest of the lip.

*Dimensions*.—Length, 4; width, 2.5; height, 2.25 (at 1.25 from the posterior end).

*Localities*.—Eocene. Muddy Creek; River Murray Cliffs, near Morgan; probably Table Cape and Schnapper Point (the single specimen from each locality not satisfactorily determined).

Worn specimens are similar to *E. Sandwicensis*, Pease, but are broader, and more inflated posteriorly with a shorter and more abrupt spire; the resemblance to *E. nana* is greater, but the broader squared-shoulder distinguishes the fossil. Unworn examples are like to a dwarfed *E. lachyrma*, except for the conspicuous posterior angulation of the outer lip.



*Marginella micula*, mihi, a cohabitant species, very closely simulates this *Erato*.

## 2. *Erato australis*, Tate.

*Reference*.—Op. cit., p. 96, 1878.

Shell elongate-oval, fusiform, acute at both ends; spire acutely conical, rather elevated.

Whorls five, body-whorl rotundately angled in front of the suture and constrictedly attenuated at the front. Spire-whorls slightly convex, ending abruptly in a small flattened pullus of one and a-half exceedingly narrow whorls.

Aperture rather narrow, slightly insinuated behind, narrowed at the front. Outer lip moderately thickened and inflected, ascending to the middle of the penultimate whorl, with about 20 tooth-ridges. Columella with four (usually), slender, oblique rounded thread-like ridges succeeded behind by a few denticles (not always developed).

*Dimensions*.—Length, 8; width, 4.25; height, 4 (at 4 mm. from the posterior end).

*Localities*.—Eocene. Aldinga Cliffs and Adelaide-bore (very common); rare at Spring Creek!

## 3. *Erato pyrulata*, spec. nov.

Shell pyriformly ovate, tumid, the right side steeply sloping, the left somewhat inflated; highest near the posterior end, steeply rounded to the very short spire of three depressed whorls (in senile examples, callously covered), rapidly attenuated to the front.

Aperture moderately wide, nearly straight, but widest and emarginate behind, narrowed to the short anterior canal. Outer lip thickened and reflected, its inner margin with from 14 to 16 short prominent tooth-ridges; bent at right angles to meet the spire on which it extends or projects beyond it, thence it is straight to the front.

Inner lip angulated, with small denticles on the keel behind the twisted columella-plait which runs out on the short beak as an elevated margin.

*Dimensions*.—Length, 7.5; width, 5; height, 4 (at 2.5 mm. from posterior end).

*Localities*.—Aldinga Cliffs and Adelaide-bore.

*E. pyrulata* is not well placed generically, its terminal spiral plait on the columella, running out to form the left margin of a slightly effuse canal, recalls *Marginella* and *Cypræa*, and to some extent *Ovulum*; but as it presents, in the adult, the characteristic angulated and denticulated inner lip of *Erato*, I am unwilling to establish a new genus for it and the two following species

possibly on a more extended knowledge of the recent and fossil species of *Erato*, this may prove a desirable course.

The denticles on the two lips appear when the adult stage is reached, but the columella-plait belongs to all ages. In its adolescent stage this species resembles *Marginella edentula*, mihi, a more inflated shell with a convex pillar. The present species differs in shape, being broader and more truncated behind, from all living forms.

#### 4. *Erato Morningtonensis*, spec. nov.

Similar to *E. pyrulata*, but is not so tumid, has a longer and more gradually attenuated body-whorl, is more pointed behind, the outer lip with a broadly-rounded shoulder and slightly incurved towards the front.

The columella has only two or three denticles behind the terminal plait.

*Dimensions*.—Length, 6; width, 3·5; height, 3 (at 2·5 mm. from the posterior end).

The proportional measures of the two species are :—

*E. Morningtonensis*—Length, 100; width, 58·3; height 50.

*E. pyrulata*—Length, 100; width, 71·4; height, 57·1.

*Locality*.—Eocene clays; Schnapper Point, near Mornington.

#### 5. *Erato duplicata*, Johnston.

*Reference*.—Geol. Tasmania, tab. 31, fig. 14; no description (1888).

Shell minute, cylindrical-oblong, bluntly pointed at both ends; dorsal profile, flatly convex on the right, rounded and narrower on the left; spire very short and blunt.

Aperture moderately wide, nearly straight. Outer lip narrowly inflected, somewhat abruptly arched behind, spreading callously on the spire; denticulate ridges narrow, about 14. Inner lip slightly angled, with a row of small denticles on the keel, exterior to which are a few scattered denticles and ridges forming an irregular outer row. Columella extending internally as a high, slightly concave, smooth plate, the anterior edge of which runs out into an oblique plait, sulcate at the tip, margining the anterior canal.

The high columella-plate with its anterior plait-like margin recalls *Cypræa*; but as the unique example seems somewhat immature it may be unsafe to speculate on its probable generic position, and so I leave it as originally placed.

*Dimensions*.—Length, 5·5; width, 3·5; height, 3.

*Locality*.—Eocene; Table Cape (*R. M. Johnston!*).

#### 6. *Erato (Eratopsis) illota*, spec. nov.

Shell minute, pyriform-ovate; spire short, obtusely pointed;

whole shell, except a broad dorsal sulcus, covered with a smooth enamel. Outer lip broadly inflected, not margined, smooth, with eighteen to twenty narrow tooth-ridges; inner lip with three stout oblique ridges at the front, which are succeeded by denticles.

*Dimensions*.—Length, 4; width, 3; height, 2.5.

*Locality*.—Miocene; Muddy Creek.

The few specimens under observation are slightly worn, and may be mistaken for rolled examples of *E. minor*. In *Eratopsis* it comes nearest in shape to *E. nana*, but it is broader, shorter, and not granulated.

#### FAMILY OVULIDÆ.

#### GENUS SIMNIA, *Rissoa* (1826).

#### *Simnia* (*Neosimnia*) *exigua*, *spec. nov.*

Shell narrow-elongate, a little more than four times at long as wide, shortly rostrate, and straight at both ends; tapering regularly towards the bluntly-rounded posterior end from a point between a third and a fourth of the whole length from the front; obliquely subtruncated anteriorly. Viewed from above, the left profile is slightly arched, being almost straight; on the right it is nearly straight in the medial-third, thence gently curving to the extremities, but more rapidly behind than to the front. The surface is smooth, and beautifully spirally wavy-striate.

The aperture is very narrow behind, gradually widening from about the middle to near the front, where it again narrows, though somewhat dilated.

Columella distinct, sharply truncate in front, with a wide canal; posteriorly with a strong oblique callous fold.

Outer lip thickened, margined externally, edentulous, medially straightish, gently curved to the very short effusively dilated posterior canal, abruptly curved to the short anterior canal.

*Dimensions*.—Total length, 11.5; greatest width, 2.75; height, 2.

*Locality*.—Eocene; Muddy Creek.

By its narrow outline and short rostral prolongations the present species comes nearest to *S. acicularis*, Lamarck, of the West Indies, but apart from the posterior fold it appears to be a narrower shell; *S. lanceolata*, Sow., is narrower, but the extremities are longer in proportion to the enrolled portion of the shell, and it lacks the posterior fold. Not one of the recent species included in the Section *Neosimnia* has the narrow profile of this fossil-species; Dall\* remarks of *Neosimnia* that "it is a convenient section of *Simnia*, but the distinction between the two is very

\* Blake-Mollusca, vol. II., p. 234.

slight in some species, and it sometimes happens that one might easily assign the same species to one or the other, according to the stage of growth which it has attained." Having regard to the opinion of this distinguished conchologist, I have made my comparisons among species of the genus in its widest acceptation.

#### FAMILY SCALARIIDÆ.

The Australian Tertiary species of this family belong to two well-defined genera, *Crossea* and *Scalaria*.

*Crossea* contains the turbate species with an entire peristome, the columella slightly produced and infolded to form a short canal, the umbilicus more or less concealed or margined by a funicular rib; the genus has certain affinities conchologically with *Ethalia*, and some species of *Rissoina* and *Lacuna* simulate it in their apertural characters.

*Scalaria*, used in its widest sense, contains the more or less pyramidal species, without the canaliculate aperture; it numbers about 400 species, recent and fossil, and there is great need for the dismemberment of the genus to facilitate specific reference. The Eocene-species of France have been arranged by MM. De Boury and Cossmann into several genera and numerous subgenera; and though the subdivision is perhaps rather strained, yet I have largely availed myself of their classification in the elaboration of our Tertiary species. I do not altogether appreciate the relative values of their genera and subgenera; and find it convenient to admit only *Scalaria* as of generic value, though its species seem to fall naturally into two chief groups—*Scalaria* (sensu stricto) with an entire aperture and *Acirsa* with its incomplete peristome.

#### GENUS CROSSEA A. Adams (1865).

##### SYNOPSIS OF SPECIES.

- Outer lip plain; shell depressed turbate; spire-whorls punctate.  
 1. *C. princeps*.
- Outer lip variced.  
 Conic-turbinate, lirate. 2. *C. sublabiata*.  
 Globose-turbinate, smooth or obsoletely linear-sulcate at the base. 3. *C. lauta*.

##### EXCLUDED SPECIES.

*Crossea parvula*, *Tenison-Woods*, is transferred to *Collonia*.

The genus has hitherto been unknown in a fossil state, being represented by six species, two inhabiting Japanese and four the Australian seas. These species fall into three sections, to two of which the fossil-species belong; all are briefly indicated in the following synopsis:—

## I. Shell with several varices.

*C. miranda*, A. Adams. Recent; Japan.

## II. Shell with a variced lip.

*C. labiata*, Tenison-Woods. Recent; Tasmania, S. Australia.

*C. sublabiata*, Tate. Eocene; Australia.

*C. lauta*, Tate. Miocene; Australia.

## III. Shell with a simple lip.

## 1. Whorls punctate (at the least the posterior ones).

*C. concinna*, Angas. Recent; N.S. Wales.

*C. princeps*, Tate. Eocene; Australia.

## 2. Whorls cancellate.

*C. bellula*, A. Adams. Recent; Japan.

*C. cancellata*, Tenison-Woods. Recent; Tasmania.

*C. striata*, Watson. Recent; N.E. Australia.

1. *Crossea princeps*, *spec. nov.*

Shell depressedly conoidal, rather solid, polished, of five rounded whorls.

Apex of one and a half smooth narrow depressed concave whorls; the next whorl is flattened in the posterior-half and ornamented with a few spiral rows of large punctations. With the revolution of the spire the rapidly increasing whorls become convex, the lines of punctations increase, and the punctures become smaller and numerous; finally at about the half-turn of the penultimate whorl the punctated ornament disappears.

The last whorl is smooth, convex, finely transversely striated, and faintly spirally lined; whilst the anterior suture is bordered by a narrow, somewhat ascending ligatural band, which continues on to the penultimate for about a half-turn; a few spiral punctate striæ appear on the base.

Aperture circular, outer lip simple, inner lip double. Columella with a narrow triangular excavation on its inner face, extending from about the middle position to the front, where it is interrupted by an oblique tooth-like plait, which defines the outer margin of a very short canal, supported by the basal funicular rib.

The narrow umbilical chink is bordered by a rounded stout, elevated funicular rib, which ends at the inner basal angle of the aperture, and on which the apertural canaliculation is formed.

*Dimensions*.—Length, 4.25; width, 4.25; height of aperture, 2.5; width of aperture, 2.25.

*Localities*.—Eocene. Adelaide-bore!; River Murray Cliffs near Morgan!; Muddy Creek!

This neat species is the fossil analogue of *C. concinna*, Angas, but in that species the posterior whorls are strongly lirated and

cancellate, whilst the ordinary spire-whorls are conspicuously and broadly flattened behind, but are without an infra-sutural ligature.

**2. *Crossea sublabiata*, spec. nov.**

*Synonym.*—*Crossea labiata*, Tenison-Woods, Proc. Roy. Soc., Tasmania, for 1876 (name only); *id.*, Johnston, P. R. S., Tasm., for 1884, p. 221.

Shell conoidal-turbinate, somewhat solid; spire elevated; whorls five, rounded, and distantly, irregularly and coarsely spirally-lirate; suture distinct.

Body-whorl relatively very large; aperture oval, posteriorly angulate, obtusely angled and obsoletely channelled at the columella-margin; outer lip varicosely dilated. Umbilical chink narrow and deep, bordered by a rounded not very prominent funicular rib.

*Dimensions.*—Length, 4; width, 2·5; height of aperture, 2·5; width of aperture, 1·5; unusually large specimens have a length of 5 mm.

*Localities.*—Eocene. Muddy Creek!; Table Cape (*Hobart Mus.*).

The Table Cape-specimens of this fossil species were originally referred by Tenison-Woods to his *C. labiata*; and were subsequently carefully compared by Mr. Johnston with an extensive collection of the living forms, who remarks, "That although the fossil representatives are decidedly larger than the living ones, there are no characteristic differences between them so far as the tests are concerned, if we except the fact that in the living form the varix is generally sharper and more decidedly reflexed. In the fossil representatives the striæ upon the varix are almost obsolete and consequently the latter has not that appearance which Mr. Woods describes as 'fringe-like.' So far as the trifling differences go, I must admit that they are sufficiently constant to enable a careful classifier to recognise the living form among the fossil representatives with a considerable degree of confidence."

After a minute comparison of an extensive suite of specimens of *C. labiata*, including authentic examples from Tasmania, with many examples from Muddy Creek; I can confidently endorse the opinions of Mr. Johnston, touching the differential characters of the two, though at the same time I fail to recognise the "fringe-like" varix described by Mr. Woods, probably his type is only an extreme individual development. In addition to the angular outer margin of the broader varix of the living species, I have recognised that the lirate ornament is very fine and close, whilst it is coarse and distant in the fossil. With these two characters one cannot fail to separate the living from its fossil representative—characters which I regard as of specific value.

I have not seen examples from Table Cape, but there cannot be any doubt that they are conspecific with the Muddy Creek types of *C. sublabiata*.

### 3. *Crossea lauta*, *spec. nov.*

Shell globosely turbinated, with a large tumid body-whorl and very low broad conical spire.

Whorls four, convex, smooth and shining. Body-whorl with a narrow infrasutural band and a few obsolete linear-sulcations at the base. Aperture broadly oval; outer lip stoutly variceally thickened, sharply margined behind; columella much arched; umbilical chink wide and deep, bordered by a stout, rather sharply elevated, funicular rib.

*Dimensions*.—Length, 3; width, 3; height of aperture, 2; width of aperture, 1.5.

*Locality*.—Miocene. Muddy Creek!

*C. lauta* somewhat resembles in shape *C. princeps*, but has a variced outer lip; in which latter character it agrees with *C. labiata* and *C. sublabiata*, but is readily distinguished from them by its globose profile.

## GENUS SCALARIA.

### SYNOPSIS OF SPECIES.

#### I. *Peristome entire; no basal rib.*

1. Shell costated, with or without varices; aperture circular [CLATHRUS].

No varices; costæ lamellar; spirally lineate,

1. *S. interstriata*.

2. Shell variced; spirally linear-punctate-grooved; peristome thick [NODISCALA].

Whorls subangular; costæ thick, evanescent behind.

2. *S. basinodosa*.

Whorls rounded.

Suture crenate-dentate; coarsely punctured.

3. *S. prionota*.

Suture plain; finely punctated.

3. Shell lamellate-costated; with or without varices; umbilical chink margined by a funicular rib adherent to the pillar [CRISPOSCALA].

Lamellæ distant, pointed behind; spirally lirate and striate.

5. *S. echinophora*.

#### II. *Peristome entire; base with a concentric rib.*

4. Shell lamellate-costated, with or without varices; impunctate; basal keel ending at inner angle of aperture adjacent to the funicular rib [CIRCULOSCALA].

- Costæ lamellose, near together. 6. *S. foliosa*.  
 Costæ filiform, varices prominent; fenestrated; whorls almost disjointed. 7. *S. orycta*.
5. Shell costated and variced, *punctate*; basal keel ending at inner angle or middle position of aperture [PUNCTISCALA]. Whorls medially angulated; shell turritid; spirally finely-lirate. 8. *S. lozopleura*.  
 Whorls not angulated.  
 Shell elongate-turritid.  
 Whorls convex, spirally lirate. 9. *S. bulbulifera*.  
 Whorls flattish, spirally linear-sulcate. 10. *S. eritima*.  
 Shell pyramidal; whorls slightly convex, spirally wavy-striated, costæ dentate at posterior suture. 11. *S. microrhysa*.
6. Shell costated and variced, impunctate; basal keel ending at outer angle of aperture [CIRSOTREMA]. Costæ filiform; coarsely lirate, subgranose at intersections. 12. *S. transenna*.  
 Costæ lamellose; spirally lirate and striated.  
 Lamellæ lamellose, straight-edged. 13. *S. Mariae*.  
 Lamellæ crowded, frilled. 14. *S. pleiophylla*.
- III. *Peristome incomplete*.
7. Periphery angulated, aperture subquadrate, columella flattened and angulated in front, base lirate; shell thick, tessellated, without varices [EGLISIA]. 15. *S. triplicata*.
8. Periphery angulated, aperture oval; shell thin, cancellated, with or without varices [ACRILLA].  
 Base disk-like.  
 Shell smooth, minutely umbilicated. 16. *S. inornata*.  
 Shell costated, imperfectly variced. 17. *S. pachypleura*.  
 Base subangulated and lirate.  
 Costæ filiform and distant.  
 Whorls convex.  
 Tessellated by equal liræ and costæ. 18. *S. escharioides*.  
 Costæ stout, liræ slender; apical whorls angulated. 19. *S. glyphospira*.  
 Costæ thick; spirally linear-sulcate; apical whorls bulbiform. 20. *S. mutica*.



- Costæ stout, liræ feeble; pullus pyramidal,  
whorls convex. 21. *S. cylindracea*.  
Whorls shouldered, triliriate in front, smooth  
behind; pullus subcylindrical.  
22. *S. gonioides*.  
Costæ lamelliform and crowded.  
23. *S. crebrelamellata*.  
9. Periphery rounded; aperture oval; shell stout, costated,  
lirate and variced [HEMIACIRSA].  
Costæ and liræ few and stout. 24. *S. lampra*.  
Costæ and liræ more numerous, slender.  
25. *S. polynema*.

**1. *Scalaria (Clathrus) interstriata*, *sp. nov.***

Shell turrated, small, slender, acute, thin, translucent, imperforate; ordinary whorls eight, convex, separated by a deep suture; nuclear whorls three, smooth, gradually attenuate to the tip.

The transverse ornament consists of thin, moderately elevated, oblique lamellæ which are continuous from whorl to whorl; there are 17 to each of the anterior whorls. Varices absent. The spiral sculpture consists of intercostal incised lines.

Aperture circular; peristome entire; outer lip thin, reflected, formed by the last costal-lamella. Base convex, traversed by the costæ, without a basal keel or funicular rib.

*Dimensions*.—Length, 11; width, 3; diameter of aperture, 2.

*Locality*.—Eocene; Muddy Creek (*J. Dennant*; very rare).

This is the oldest-known species of the subgenus, which according to M. de Boury did not appear till the Miocene; from the Italian Miocene and Pliocene species, it is distinguished by its more numerous and thin costæ. If we admit the subgenus *Hyaloscala*, De Boury (1890), which includes the thin and transparent species of *Clathrus*, then our fossil has few alliances, it most resembles the elate variety of *S. Jukesiana*, which has, however, no intercostal spiral striations.

**2. *Scalaria (Nodiscala) basinodosa*, *spec. nov.***

Shell very small, slender, acute, solid, imperforate, with six ordinary whorls and two and a half smooth shining rounded nuclear whorls.

Spire-whorls slightly convex, with an angulated profile by reason of the medial enlargement of the costæ. The spiral ornament consists of crowded punctated engraved lines, and a narrow band, crenated on the margin, at the anterior edge of the suture to which it is closely appressed. The transverse ornament consists of slightly angular and medially thickened ribs (12 on the penultimate whorl), which do not reach the posterior suture; on

the anterior-half of the body-whorl, the ribs are reduced to stout nodosities. There are three stout varices on the spire.

Aperture nearly circular; peristome complete with a groove around its inner margin, the exterior of the outer lip formed by the very thick varix; base rounded.

*Dimensions*.—Length, 4·5; width, 1; height of aperture, 1.

*Locality*.—Eocene; Muddy Creek (*one ex.*).

This species is separable from *S. Hamiltonensis*, by its smaller size, slenderness, and discontinuity of the costæ, &c.

This and the next two species I have referred to De Boury's genus *Nodiscala*, despite the absence of a basal disk, though some of De Boury's species which have the disk feebly developed may be regarded as connecting these extreme forms with the typical species.

### 3. *Scalaria (Nodiscala) prionota*, *spec. nov.*

Shell turritid, slender, acute, stout, imperforate; ordinary whorls eight, slightly convex, costated and sparsely variced; nuclear whorls unknown.

The transverse ornament consists of stout rounded nearly straight costæ, which are a little produced upon and adpressed to the preceding whorl, so that the sutural line is conspicuously sinuate-dentate; on the body-whorl they extend on to the base, are a little angulated and nodosely enlarged at the periphery. There is only one varix on the spire. The spiral ornament consists of very narrow flat threads, with linear punctated interspaces (about 20 on penultimate whorl), which are continuous across the costæ.

Aperture obliquely oval; peristome entire, grooved around; the exterior lip formed by the very thick varix. Base rounded, without carina or special sculpture.

*Dimensions*.—Length, 8; width, 2·5; length of aperture, 2.

*Locality*.—Eocene. Muddy Creek (*one ex.*).

*S. prionota* differs from *S. Hamiltonensis* in being less slender, coarsely punctated, and by its crenate-dentate suture.

### 4. *Scalaria (Nodiscala) Hamiltonensis*, *spec. nov.*

Shell elongate-turritid, acute, stout, imperforate; ordinary whorls seven; flatly convex, costated and sparsely variced, suture linear; nuclear whorls two, smooth, rounded. The transverse ornament consists of thick, filiform, nearly straight costæ, slightly attenuated at the posterior suture, but continuous from whorl to whorl; on the anterior-half of the body-whorl, they are slightly nodosely elevated in the middle, but are evanescent at the base; there are about 10 on the body-whorl, but about 12 on the penultimate-whorl. Varices very irregularly disposed rarely more than two or three on the spire.

The spiral ornament consists of crowded regular linear punctated grooves.

Aperture oval, oblique, almost lunate; peristome entire, with a groove around its inner margin, outside of which is the punctated face of the very thick varix. Base convex or slightly depressed, without a distinct basal keel.

*Dimensions*.—Length, 8; width, 2·25; length of aperture, 2.

*Locality*.—Eocene. Muddy Creek (not rare).

**6. *Scalaria (Crisposcala) echinophora*, spec. nov.**

Shell broadly turritid, thin, acute, imperforate, with eleven normal whorls and three smooth shining tumid nuclear whorls.

Spire-whorls very convex, but by reason of the posterior truncation of the costæ the profile is gradated.

The transverse ornament consists of numerous (about 20 on the anterior whorls) oblique, elevated, frilled, lamelliform costæ, usually composed of two or three connate lamellæ; the costæ are roundly shouldered at the posterior two-thirds, and are extended there into an erect short-lanceolate plate; there are no proper varices.

The spiral ornament consists of broad, subacute, prominent liræ; the angular and narrow interstitial furrows are sculptured by a few distant linear spiral grooves.

Aperture circular; peristome complete; columella margined externally by a narrow funicular rib which runs-out to the tip of the slightly flattened and expanded columella; the base is rounded.

*Dimensions*.—Length, 20 (estimated); width, including costæ, 6; width of aperture, 3.

*Localities*.—Eocene. River Murray Cliffs!; Corio Bay, near Geelong!

*S. echinophora* has some analogy with *Crisposcala junctilamella* of the Paris-basin, but it is more elongated, and is further distinguished by its frilled lamellæ and spiral liræ. It might be mistaken for *S. foliosa*, *S. Mariae*, or *S. pleiophylla*; but the absence of a basal keel at once separates it.

**6. *Scalaria (Circuloscala) foliosa*, spec. nov.**

Shell rather large, somewhat thin, imperforate. Similar to *S. echinophora*, but the lamellæ are more numerous (25 and two thick varices on the body-whorl), less apiculate at the rounder shoulder.

Aperture nearly circular, a little higher than wide; peristome complete; outer lip broadly and varicosely expanded, crenated on the sharp margin. Columella margined by a funicular rib, in close contiguity to which is a revolving rib which terminates at the inner angle of the aperture.

This species is intermediate between *Crisposcala* and *Circuloscala*, the basal rib which is in an alignment with the posterior angle of the aperture terminates a little in front of the umbilical funiculus, and not at the outer angle of the aperture, as in *Circuloscala*. It has very distinctive characters, though simulating *Crisposcala echinophora* and *Cirsotrema pleiophylla*.

*Dimensions*.—Length, unknown; height of body-whorl, 8; width of body-whorl, 6; of aperture, 2.25.

*Locality*.—Blue clays at Schnapper Point!

### 7. *Scalaria (Circuloscala) orycta*, *spec. nov.*

Shell rather thin, elongate, imperforate; whorls very convex, almost disunited, variced, tessellated by thick spiral liræ and filiform costæ.

The spiral ornament consists of broad flat equidistant liræ alternating with smooth and somewhat-wider interspaces; on the penultimate whorl, there are five medial threads, succeeded anteriorly by four narrower ones, and on the posterior area there are about eight threads.

The transverse ornament consists of slightly-arched filiform costæ which by intersection with the liræ produce rectangular interspaces on the medial and anterior areas; there are two thick filiform varices to each whorl.

Aperture circular; peristome entire; base rounded, interrupted by a raised convex anti-peripheral rib, dentate-serrated by the costæ passing across it; columella margined by an adherent funicular rib.

The species has very distinctive characteristics.

*Dimensions*.—Length, unknown; width of body-whorl, 3.5; height of body-whorl, 5.5; of aperture, 2.5.

*Locality*.—Eocene; Muddy Creek!

### 8. *Scalaria (Punctiscula) loxopleura*, *spec. nov.*

Shell stout, rather slender, imperforate; ordinary whorls six, medially subangulated, separated by a well-defined linear suture; apical whorls unknown.

The spiral ornament consists of numerous (about 20 on the penultimate whorl) crowded undulose threadlets, separated by slightly-narrower punctated linear grooves.

The transverse ornament consists of stout-filiform, oblique and slightly-bent costæ (about 20 on the penultimate whorl), which are crenulated by the spiral liræ; there are about three very prominent oblique varices on the spire.

Base angulated by a broadish depressed keel which is nodosely-crenulated by the costæ; the area in front of the basal keel is slightly concave and concentrically lirate. Aperture circular;

peristome entire, the outer margin of which is bordered by the punctate-lirate face of an elevated varix.

*Dimensions*.—Length, 5 ; width, 1.5.

*Locality*.—Eocene ; Adelaide-bore (4 exs.).

**9. *Scalaria (Punctiscala) bulbulifera*, *spec. nov.***

Shell small, slender, acute, solid, imperforate ; ordinary whorls seven and a-half, moderately convex ; nuclear whorls two, smooth, very tumid, disproportionately large, the last one and a-half forming an obtuse bulbiform apex to the spire.

The spiral sculpture consists of linear sulcations or flattened crowded threads (about 15 on the penultimate whorl) ; the extremely narrow interspaces are punctate, at least those on the last and penultimate whorls.

The transverse ornament consists of rather stout, subacute medially thickened, slightly oblique costæ, about 10 on each of the anterior whorls ; and of elevated, narrow rounded varices, two on each whorl. The spiral threads pass across the costæ but are interrupted by the varices.

Aperture circular, with a groove around its inner margin, outside of which is the punctate-striated anterior face of the elevated varix. Base slightly concave, defined by a strong keel, concentrically finely striated.

*Dimensions*.—Length, 6 ; breadth, 2 ; aperture, 1.

*Locality*.—Eocene ; not rare at Muddy Creek ; worn and probably derived in Miocene-beds at the same place.

**10. *Scalaria (Punctiscala) eritima*, *spec. nov.***

Shell stout, elongate, acute, imperforate ; ordinary whorls 11, flatly convex, suture partially concealed by the crenatedly-extended margin of the preceding whorl ; apical whorls three, very convex, of gradual increase.

The spiral ornament consists of punctated linear sulcations (about 20 on the penultimate whorl), rather crowded in front of the suture, but about twice the width of the linear furrows on the rest of the whorl.

The transverse ornament consists of nearly straight, rather thick and elevated, convex costæ, slightly denticulatedly-produced at the posterior suture, but are in an alignment from whorl to whorl ; there are about 12 costæ to a whorl, and five or six prominent varices on the spire ; both costæ and varices are crossed by the spiral grooves.

Base angulated by a prominent keel, widely crenulated by the costæ ; the anti-peripheral area is narrow and abruptly concave, somewhat undulose transversely, concentrically punctatedly-grooved.

Aperture circular ; peristome entire, with a groove around its

inner margin, outside of which is the punctated-sulcated and transversely striated anterior face of the elevated varix.

*Dimensions*.—Length, 13 ; width, 3 ; diameter of aperture, 1.

*Locality*.—Eocene ; Muddy Creek !

### 11. *Scalaria (Punctiscala) microrhysa*, *spec. nov.*

Shell stout, pyramidal, obtuse, imperforate ; ordinary whorls five and a-half, flatly convex ; suture deep, partially concealed by the protuberant costæ of the preceding whorl ; apical whorls two and a-half, the median portion of the pullus very tumid and excentric, the tip is relatively very small and immersed.

The spiral ornament consists of very slender, crowded, undulose threadlets ; the slightly-wider linear interspaces punctatedly-impressed.

The transverse ornament consists of slightly-oblique, broad, convex costæ, extending beyond the posterior suture of the anterior whorls in the form of blunt denticulations ; there are about 14 costæ on the penultimate whorl. The concave intercostal spaces, which are a little wider than the costæ, and the costæ are transversely microscopically striated. There are no varices on the spire.

Base angulated by a broad convex keel ; the anti-peripheral area flat or very slightly concave, concentrically striate, and faintly radially-ribbed. Aperture oval ; peristome completed by a callous growth, but not double ; outer lip formed by a costa.

*Dimensions*.—Length, 9.5 ; width, 3.25.

*Locality*.—Eocene. Bird-rock Bluff, Spring Creek, near Geelong (*J. Dennant*, very rare).

The subgeneric position assigned to this species is not satisfactory, though the incompleteness of the aperture may merely indicate an adolescent stage of growth.

### 12. *Scalaria (Cirsotrema) transenna*, *spec. nov.*

Shell large, elongate, stout, acute, imperforate, with 11 ordinary moderately convex whorls ; the nuclear whorls not known.

The spiral ornament consists of four or five stout filiform liræ, one median and one on each side of it are about equidistant, the fourth is close to the third, whilst the exsert basal keel forms a fifth, margining the anterior suture, there are a few smaller threads on the posterior area ; the interliral spaces have three or four linear sulcations separated by broad flat threads.

The transverse ornament consists of filiform costæ, not so stout as the stronger liræ, which produce slight nodulations at the intersections with the liræ ; there are 25 costæ on the penultimate whorl, they are slightly oblique, equal, and equidistant. The posterior slope is transversely striated. There are two stout

filiform varices on the spire, they are longitudinally striated and crossed by the liræ.

The base is defined by a rounded peripheral keel; ornamented by irregular-disposed, flat, concentric threads, which are more or less wrinkled, and radially striated and obsoletely costated.

Aperture roundly oblong; peristome complete; columella slightly reflected and projecting, margined externally by a funicular rib; outer lip margined by a very stout varix, lirate and longitudinally striated.

*Dimensions*.—Length, 21; width, 6; height of aperture, 4; width of aperture, 3.

*Locality*.—Blue clays at Schnapper Point.

### *Scalaria (Cirsotrema) Mariæ*, Tate.

*References*.—*Caloscala Mariæ*, Tate, Southern Science Record, January, 1885, p. 3; *Cirsotrema Mariæ*, De Boury, Etude sur les Sous Genres de Scalidæ, p. 40, 1887.

Shell turritid, about three times as long as wide, imperforate; whorls numerous, convex, suture deep; transversely laminate-costated, variced, and spirally lirate. Costæ lamellar, thin, equidistant, increasing from about 12 to 20 in a whorl with the revolution of the spire.

Varices conspicuous, more elevated than the costæ, subacute on the edge, about one in a whorl, usually two, sometimes three on the body-whorl. Liræ subacute, prominent, equidistant, about 10; the flattish interstitial furrows (a little wider than the liræ) and the liræ are sculptured with a few distant linear spiral grooves alternating with wider depressed threads.

Body-whorl regularly convex to the peripheral rib; base concave, traversed by the costæ and spirally striated.

Aperture circular; peristome entire, varicosely thickened and reflected, with a groove around its inner margin; columella flatly expanded and slightly projecting at the front, where it is supported by an umbilical funiculus which is limited behind by the penultimate varix.

The posterior whorls are occasionally slightly angular, and their ribs and varices are usually subspinously produced behind near the suture.

*Dimensions*.—Length, about 35; breadth, 10.5; height of last whorl, 15; diameter of peristome 8, of aperture 5.

*Locality*.—Eocene; glauconitic limestones of Aldinga Bay.

This species is the type of my subgenus *Caloscala*, which through inadequate appreciation of the characters of *Cirsotrema* I had thought to be different from it; M. de Boury says it is incontestably a *Cirsotrema*, and that it has much affinity with *Scalaria acuta*, Sowerby, of the Hampshire and Parisian Eocene. *S. acuta*

has the whorls flatter behind and is (usually ?) without varices ; but *S. Mariæ* has nearer allies in *S. Zelebori*, Frauenfeld, and *S. lyrata*, Zittel. From the former it is easily separable by its fewer costæ, distinct varices and more elevated and thinner liræ ; from the latter by its more numerous and lamellated costæ.

**14. *Scalaria (Cirsotrema) pleiophylla*, spec. nov.**

Shell like *Circuloscala foliosa*, but with a distinct basal keel. Its numerous frilled lamellæ separate it from *Cirsotrema Mariæ*.

There are two rounded apical whorls, the first of which is somewhat depressed, and about ten ordinary whorls ; there are 20 to 25 costæ to a whorl.

*Dimensions*.—Length, 20 ; width, 5·5.

*Localities*.—Eocene. Adelaide bore ; Corio Bay and Spring Creek, near Geelong.

**15. *Scalaria (Eglisia) triplicata*, spec. nov.**

Shell moderately stout, turritid, about four times as long as wide, imperforate ; whorls about 15, of which the two nuclear ones are roundly angled and obscurely liræte, apex acute ; the earlier spire-whorls medially angulate, the convexity becoming more and more tricarinate with the slow revolution of the spire, more contracted in front than behind. Suture distinct.

The spiral ornament consists of three prominent elevated rounded liræ, which are equidistant and approximate, the middle one is the stouter and is slightly in front of the middle line of the whorl ; a small thread is interposed between the posterior carination and the suture.

The transverse or axial ornament consists of thin slightly elevated lamelliform costæ, equal and equidistant, about 25 to a whorl, are continuous from whorl to whorl and become wider apart with the revolution of the spire ; the lamellæ are oblique, but curved forward at and decurrent with the posterior suture. There are no varices.

Body-whorl with four strong liræ, the anterior one in an alignment with the suture (though there concealed) forms a basal keel ; base flatly convex, with about 10 concentric threads, crossed by radiating threads continuous with the lamelliform costæ.

Aperture squarely rounded, peristome incomplete ; outer lip thin ; columella reflected and slightly effusedly dilated at the front.

*Dimensions*.—Length, 28 ; width, 7 ; height and width of aperture, 5.

*Localities*.—Not uncommon in the Miocene-strata at Muddy Creek ; and at Red Bluff, Gippsland Lakes. Also Older Pliocene ; Croydon-bore, near Adelaide.

I have attached this species to *Eglisia*, because of the close



resemblance, judging by figures, it bears to the recent *E. tricarinata*, and in a less degree to the extinct *S. (Eglisia) impar*, Deshayes; from the first it is distinguished by the absence of a slight shoulder to the whorls and by its conspicuous tessellated ornament, whilst the latter species is quadrilirate and very small.

Our Australian fossil presents many points of resemblance to *Acrilla*, but is devoid of the disk-like base; and as a whole the characters are rather those of *Scalaria* than of *Turritella*.

**16. *Scalaria (Acrilla) inornata*, spec. nov.**

Shell minute, thin, very slender; with eleven, smooth, rather tumid, slowly-increasing whorls.

Base disk-like, spirally lineate, margined exteriorly by a thread-like rib; slightly perforated. Aperture quadrately rounded.

*Dimensions*.—Length, 3·75; width, 0·75.

*Locality*.—Eocene; Table Cape, Tasmania (2 exs.).

**17. *Scalaria (Acrilla) pachypleura*, spec. nov.**

Shell thin, elongate-turriculate, imperforate; ordinary whorls eight, convex, separated by a moderately deep suture; pullus of two smooth rounded whorls, the first slightly angulated and depressed.

The ornament consists of flat spiral threads crossed by slightly more-distant, thicker, and rounder costæ; the rectangular inter-liral spaces, which are a little longer in a spiral direction than wide, have a double row of three to four punctures; there are about 30 costæ and 15 liræ on the penultimate whorl, and five or six varices on the spire.

Base flattened, smooth, margined externally by an acute thread. Aperture roundly oblong, peristome incomplete, outer lip thin.

*Dimensions*.—Length, 11·5; width, 3; height of aperture, 2·25.

*Locality*.—Eocene at Muddy Creek.

This species has a close resemblance to *Scalaria reticulata*, Solander (*S. decussata*, Lamk.); but on a comparison of actual specimens, our fossil differs from the Hampshire and Parisian one by its thicker costæ, finer and more numerous spiral threads, by its varices and more slender form, and particularly by the punctures.

**18. *Scalaria (Acrilla) escharoides*, spec. nov.**

Shell thin, slender, imperforate; ordinary whorls seven, rather flat, tessellated; pullus rather large, consisting of two smooth rounded corrugated whorls.

The spiral ornament consists of stout flat threads, increasing from six in the posterior whorls to ten in the penultimate whorl; the spirals are crossed by slightly-oblique costal threads, usually not so stout as the liræ, somewhat granosely thickened at the intersections; there are about 25 costæ on the penultimate whorl.

Body-whorl convex, with a flattish base defined by the anterior spiral; anterior to the peripheral angulation, there are three or four encircling threadlets. Aperture oval, outer lip thin.

*Dimensions*.—Length, 7; width, 1.75; height of aperture, 1.5; an incomplete example has a greatest width of 2.5.

*Locality*.—Eocene; Muddy Creek!

**19. *Scalaria (Acrilla) glyphospira*, *spec. nov.***

Shell minute, thin, slender, imperforate; ordinary whorls five, moderately convex, strongly costate and slenderly lirate; the apex is obtuse, and consists of two and a-half smooth large angulated turns.

The costæ are filiform, prominent, and slightly arched, equal and equidistant, about 12 on the body-whorl. The spiral ornament consists of narrow subacute threads, separated by wider intervals, about 9 on the penultimate whorl; the liræ do not cross the costæ.

Body-whorl convex with a flattish spirally-lineate base, which is margined by the anterior spiral-thread. Aperture oval, outer lip thin.

*Dimensions*.—Length, 4; width, 1.

*Locality*.—Eocene; Muddy Creek.

**20. *Scalaria (Acrilla) mutica*, *spec. nov.***

Shell small, elongate-turriculate, imperforate; ordinary whorls six, moderately convex, costated and spirally lineate-sulcate; apex obtuse, consisting of two smooth convex whorls.

The costæ are moderately stout, distant, ten on the body-whorl; the intercostal spaces with about four to six engraved spiral lines. Base of body-whorl flatly-rounded, obscurely lirate, and subangulated on the periphery; aperture oval.

*Dimensions*.—Length, 5; width, 1.25.

*Locality*.—Eocene; Muddy Creek! (not uncommon).

**21. *Scalaria (Acrilla) cylindracea*, *spec. nov.***

Shell small, rather stout, turriculate, imperforate; ordinary whorls eight, almost flat, costated, and obscurely lirate; nuclear whorls four, gradually tapering to an acute apex.

The costæ are stout, nearly straight, about ten to a whorl; the intercostal spaces with about five slender spiral threadlets. Base subangulated, obsolete spirally-lirate; aperture oval.

*Dimensions*.—Length, 5.5; width, 1.75.

*Locality*.—Eocene; Muddy Creek.

**22. *Scalaria (Acrilla) gonioides*, *spec. nov.***

Shell minute, thin, elongate-turriculate, imperforate; ordinary whorls angulated post-medially, costated, and lirate; nuclear whorls two, smooth, shining, somewhat-tumid.

The costæ are subacute, moderately elevated, slightly angulated post-medially. The median area of each whorl with three flattish equidistant liræ; there is a slender threadlet at the anterior suture, but the posterior slope is smooth. There are four stout liræ on the median portion of the body-whorl, the anterior one of which forms a basal keel; the base is ornamented with three distant, encircling, filiform liræ. Aperture quadrately oval, outer lip thin.

*Dimensions*.—Length, 4; width, 1,

*Locality*.—Eocene; Muddy Creek! (very rare).

### 23. *Scalaria (Aerilla) crebrelamellata*, *spec. nov.*

Shell rather thin, very slender, imperforate; ordinary whorls nine, flat, with a slightly channelled suture; nuclear whorls two and a-half, the anterior one much contracted and ornamented with crowded oblique threadlets, the next is inflated and smooth ending in a bulbiform tip.

The transverse ornament of oblique, crowded, short, erect lamellæ, which are usually so dense as to conceal the suture and the spiral ornament; the latter consists of five, equi-distant, equal, narrow, elevated, flat-edged liræ.

Body whorl with six spiral liræ, the anterior one interrupting the convexity of the base; base with a strong spiral thread and radially striate.

*Dimensions*.—Length, 9; width, 2.

*Locality*.—Eocene; Muddy Creek (very rare).

### 24. *Scalaria (Hemiacirsa) lampra*, *spec. nov.*

Shell *Turbonilla*-like, subulate-turritid, stout, smooth and shining; ordinary whorls about 10, nearly flat, costated, variced and spirally linear-grooved; apex pointed of about two small convex whorls.

The costæ are straight, slightly oblique, subacute and moderately raised, separated by much wider concave interspaces; from about 12 to 15 in each whorl. The varices are broad and rather depressed.

The spiral ornament consists of flat grooves, with wider flat interspaces, somewhat irregularly disposed and varying from about five to eight in number.

Base convex, concentrically wrinkled-grooved; aperture oval, well-rounded at the front; outer lip thin, margined behind by a varix; columella slightly thickened internally.

*Dimensions*.—Length, 12; breadth, 3; diameters of aperture, 2.25 and 1.75.

*Locality*.—Eocene; not uncommon in the *Turritella*-bands, Blanche Point, Aldinga Cliffs

25. *Scalaria (Hemiacirsa) polynema*, *spec. nov.*

Shell subulate-turritid, stout, smooth, shining, imperforate; ordinary whorls about nine, nearly flat, feebly costated and variced, spirally striate; apex unknown.

The costæ are slightly arched, subacute, slender, separated by as wide concave interspaces, about 18 on the anterior whorls; varices broad, depressed, about six on the spire.

The spiral ornament consists of slender subacute threads, separated by equally-wide incised furrows, about 12 to 15 on the anterior whorls. The suture is concealed by a narrow ante-sutural band, most conspicuous on the anterior whorls.

Base convex, concentrically lirate; aperture oval, well-rounded at the front; outer lip rather thin, margined-behind by a varix; columella slightly-thickened internally.

*Dimensions*.—Length, 9; width, 2; an imperfect example width, 3; height of aperture, 2; width, 1.5.

*Locality*.—Eocene; Bird-rock Bluff, Spring Creek near Geelong.

This species is closely related to the last, differing by its more slender and numerous costæ and liræ.