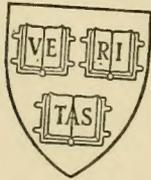


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Geological Survey of Victoria.

PRODROMUS

OF THE

PALÆONTOLOGY OF VICTORIA;

OR,

FIGURES AND DESCRIPTIONS

OF

VICTORIAN ORGANIC REMAINS.

DECADE III.

BY

FREDERICK McCOY,

F.G.S.; HON. F.C.P.S.; C.M.Z.S.L.; HON. F.G.S.E.; HON. M.G.S.M., ETC.

AUTHOR OF "SYNOPSIS OF THE CARBONIFEROUS LIMESTONE FOSSILS OF IRELAND;" "SYNOPSIS OF THE SILURIAN FOSSILS OF IRELAND;" "CONTRIBUTIONS TO BRITISH PALÆONTOLOGY;" "ONE OF THE AUTHORS OF "BRITISH PALÆOZOIC ROCKS AND FOSSILS," ETC.

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P R E F A C E .

As the publications of a Geological Survey cannot properly be limited to the maps and sections, but would be incomplete without figures and descriptions of the fossil organic remains made use of for the determination of the geological ages of the different geological formations of the country,* it has been determined to issue a "Prodrômus" or preliminary publication of the Victorian Organic Remains in Decades, or numbers, of ten plates each, with corresponding letterpress, on the plan of the Decades of the Geological Survey of England, followed by the Geological Surveys of Canada, India, and several other Governments.

The Decades will contain figures and descriptions in the first place of the more characteristic fossils of each formation, of which good specimens may be in the National Collection ; so that observers in the field may make use of them for preliminary or approximate determination of the geological ages of the strata they may meet. A portion of the impression of the plates will be kept back until a complete systematic treatise on the fossils of each formation may be issued when the materials approach completion.

This third Decade contains a number of illustrations of the fossils of the Tertiary formations, a correct knowledge of which is necessary to make sound progress with the classification by age of these

* "Palæontological researches forming so essential a part of geological investigations, such as those now in progress by the Geological Survey of the United Kingdom, the accompanying plates and descriptions of British fossils have been prepared as part of the Geological Memoirs. They constitute a needful portion of the publications of the Geological Survey."—*Sir Henry T. De la Beche, Director-General of the Geological Survey of the United Kingdom, in notice prefixed to the first of the Decades of the English Geological Survey.*

beds ; to which not only great interest attaches as affecting the geology of so large an area of the colony, but from the fact that the valuable leads of drift, or so-called alluvial, gold deposits, are proved by the researches of the Geological Survey to have various geological ages in the great Tertiary period—ages which can only be determined satisfactorily by a study of the palæontology of such of the beds as are fossiliferous.

The first plate illustrates a most important specimen of that singular animal, the Marsupial Lion of Owen (*Thylacoleo carnifex*), which enables us to make important corrections in the most recently published views of the dentition of the anterior part of the skull, in which some of the teeth here figured had not previously been found *in situ*.

The second and third plates are devoted to the illustration of the most interesting of all Palæozoic fossils—the Trilobites. Two of the species of *Phacops* are absolutely identical with forms abounding in the Upper Silurian rocks of Europe—one of them British, and the other common in the Silurian basin of Bohemia. A species of *Homalonotus*, figured on the third plate, collected by Mr. Harrison and presented by him to the public collection, is a remarkable Australian addition to the range of this genus, and the same may be said of the species of *Forbesia* and *Lichas*, figured on the second plate.

The fourth plate is devoted to illustrations of a species of *Aturia* scarcely distinguishable as an Australian variety from the Upper Eocene and Lower Miocene *Aturia zic-zac* of Europe ; and as this genus is not known in the recent state nor in the Newer Pliocene Tertiaries, its presence has an important bearing on the determination of the age of our deposits in which it occurs.

The fifth and sixth plates are devoted to some *Gasteropoda* of certain Tertiary beds, probably of shallow-water origin, illustrating two species of the genus *Haliotis* very unusual in Tertiary forma-

PREFACE.

tions, and one large species of *Pleurotomaria*, a genus abounding in Palæozoic and Mesozoic rocks, but of such excessive rarity in Tertiary and recent times as to form an interesting addition to the history of the distribution of the genus in time and space.

The next plate illustrates a third new species of Tertiary *Trigonia*, which has been collected by Mr. A. W. Howitt, P.M., in Gippsland, a genus unknown in Tertiary rocks until I announced the discovery of the two other species figured in our second Decade. On this plate is also figured a species of *Cucullæa* nearly allied to the recent *C. granulosa* of China, very common in our Tertiary deposits, although this conspicuous genus is not found living on the coast of the colony.

The three last plates continue the illustrations of our curious extinct Tertiary species of *Cypræa*.

The future Decades will continue the illustration of the fossil collections made in the course of the Geological Survey of the Colony, which has now been resumed under the care of the Secretary for Mines, Mr. R. Brough Smyth, the permanent head of the Mining Department.

FREDERICK MCCOY.

10th February 1876.

Platystrophia

12



PLATE XXI., FIG. 1.

THYLACOLEO CARNIFEX (Ow.).

[Genus THYLACOLEO (Ow.). (Sub-kingdom Vertebrata. Class Mammalia. Order Marsupialia. Fam. Paucidentata).

Gen. Char.—Dental formula:— $i, \frac{3-3}{1-1}$; $c, \frac{1-1}{0-0}$; $p.m., \frac{3-3}{3-3}$; $m., \frac{1-1}{2-2}$. *First incisors*, above and below, laniary, long, pointed, slightly arched, backward, compressed; second and third incisors above much smaller and moderately compressed. *Canines* small, conical pointed. *Premolars*, second and third above very small, simple; fourth very large, compressed, carnassial slightly arched, convex outside, concave inside; below second and third very small rudimentary, fourth very large, compressed, carnassial, arched like that above. *Molars*—above one tubercular, set transversely to posterior inner end of the fourth premolar (*p.* 4); below first molar bi-tubercular of moderate size, second molar very small, both in line with the carnassial fourth premolar.]

DESCRIPTION.—Maxillary teeth.—First laniary incisor, with a longitudinally elliptical base, 11 lines in antero-posterior diameter, and 7 lines in transverse diameter (length and form of point imperfect), more convex on outer than on inner side, anterior side convex (not exhibited), posterior side slightly concave; cement reaching about 6 lines above base. Second incisor small, blunt, the outer face divided by an oblique furrow extending backwards from near anterior basal portion to near middle of inner worn edge of crown; antero-posterior diameter 5 lines, lateral diameter 5 lines, vertical length of crown $3\frac{1}{2}$ lines on outer side, $5\frac{1}{2}$ lines on inner side. Third incisor large, compressed to a narrow straight cutting edge 4 lines long, outer face flattened, arched downwards and forwards and usually divided by an impressed groove nearly from base to cutting edge a little in front of the middle; inner face with the anterior fourth forming a definite thickened vertical ridge, the rest converging with slight convexity to a narrow posterior edge; antero-posterior diameter of base $5\frac{1}{2}$ lines, transverse diameter in front 5 lines, depth from base to cutting edge of outer enamelled surface 7 lines. The three incisors form a series on each side arching outwards and backwards from the front laniary one. The next succeeding tooth, or canine, is situated at the inner side of the posterior end of the third incisor, about $2\frac{1}{2}$ lines inside the outer surface of maxillary, and its socket is crossed nearly in the middle by the premaxillo-maxillary suture, the base elliptical, 5 lines long and $3\frac{1}{2}$ lines wide, crown conically pointed, much more convex on the outer than on the inner face, anterior and posterior edges blunt, transverse diameter at base rather less than the height of the apex of the conical crown. On the outer side of the posterior third of the fourth tooth or canine is the 5th from the laniary or the anterior small premolar, length and width of base of which are about $3\frac{1}{2}$ lines, and about three lines behind the hind edge of the third incisor. (The other teeth in the upper jaw absent in our specimen.) From anterior edge of first incisor to posterior edge of fourth tooth 2 inches 3 lines. There is no interval between the second and third incisors owing to the forward inclination of the third tooth, but there is a slight interval between the first and second. Lower jaw or mandible (the single large laniary incisor broken off in this specimen, but its root under front edge of large premolar (*p.* 4) 11 lines in vertical diameter, $6\frac{1}{2}$ lines in transverse diameter); depth of ramus in front of carnassial 1 inch 9 lines, depth at hind edge of second molar (*m.* 2) 2 inches 3 lines; length from front of carnassial to hind edge of second molar (*m.* 2) 2 inches 6 lines. The small functionless premolars (*p.* 2 and *p.* 3) are transversely or obliquely oval, and so approximated that it is difficult to determine whether they form one tooth or two, situated close to the inner side of

the anterior root of the carnassial (*p. 4*), or about one-fourth the length of the tooth from front to back; the length of *p. 3* is 4 lines and its width 3 lines; *p. 2* much smaller than *p. 3*; no distinct trace of *p. 1*. The great carnassial (*p. 4*) is 1 inch 7 lines from front to rear, the vertical height of the enamelled crown is 8 lines in front and 4 lines behind, greatest thickness 7 lines; the cutting edge presents a narrow worn surface inclined downwards and outwards, narrowest in the posterior third, at front of which the cutting edge is lowest, rising much to the front and slightly to the posterior end; it is curved outwards, the greatest convexity being at the lowest point about one-third the length from the posterior end; the outer surface is nearly flat, and slightly convex; the inner surface convex at base, concave near cutting edge, with a slight thickened vertical ridge close to the ridge of the anterior end, from which it is separated by a smaller groove, and with a similar rounded thickening at the posterior end; three or four faint obtuse vertical ridges, more than a line wide, arise from the tumid base for about half the height of the crown, beyond which they disappear on the concave surface approaching the cutting edge. First molar (*m. 1*), with two fangs, crown 7 lines from front to back, and 5 lines wide in front, the anterior two-thirds rising into an anterior lobe a little higher than the carnassial, the worn surface of which is continued on the upper part of its outer side; hind lobe one-third the length and less than half the height of anterior lobe. Base of hind molar (*m. 2*) trigonal, about $3\frac{1}{2}$ lines long and $2\frac{1}{2}$ lines wide in front. The surface of the enamel of the carnassial and molar teeth under the lens has a minute vermicular rugosity.

REFERENCE.—(Owen), Phil. Trans. 1859, p. 318; Phil. Trans. 1866, p. 79.

There is no fossil animal yet described has excited so much interest and given rise to such animated controversies as that named the "Marsupial Lion" by Professor Owen, from the general resemblances, on a greater scale, which the teeth of this marsupial animal show to those of the lion, and indicating, in his opinion, a similar predaceous habit in each. Dr. Falconer, Mr. Flower, and others, have advocated, with singular zeal, the opposite view, that the creature was a harmless vegetable feeder, because a premolar of a sharp-edged compressed form, like the carnassial of *Thylacoleo*, is to be found in the living Rat-Kangaroos (*Hypsiprymnus*), and overlooking the fact that these latter have a series of grinders of the ordinary type of vegetable feeders behind the compressed premolar, while all the teeth are of the carnivorous type in the Marsupial Lion. I now have the pleasure of figuring a specimen showing some of the teeth for the first time *in situ*, and suggesting some modifications of the views published by Professor Owen as to their character and homologies. The genus was first established by Professor Owen in his first Memoir on the subject in the Philosophical Transactions for 1859, in which he figured and described a skull sent to him in 1846, by Mr. Adeney, from Lake Colun-

gulac, 80 miles S.W. of Melbourne, exhibiting the upper great compressed carnassial and small tubercular molar *in situ*, but wanting all the part of the skull anterior to these. A few months ago the same Mr. Adeney brought to me the specimen figured in the upper part of our plate from the same spot, and so entirely completing the anterior part of the skull and teeth absent in the skull he found nearly thirty years ago and sent to Professor Owen, that he supposed it might have belonged to the same individual. He also gave me the portion of the lower jaw found with it, figured at bottom of our plate, and no doubt of the same creature; the corresponding portion of lower jaw in Professor Owen's above quoted paper having been illustrated from a cast of a New South Wales example, possibly of a different species. In the Phil. Trans. for 1866, Professor Owen published a second Memoir on *Thylacoleo carnifex* from New South Wales specimens, of lower jaw and a skull nearly perfect from occiput to front of mouth, containing the sockets of the three anterior teeth on each side; and finally, in the Phil. Trans. for 1871, is a third Memoir, completing his illustrations of the subject from New South Wales specimens of lower jaw and part of upper jaw, having only the second and third teeth absent from the sockets, but describing and figuring these latter from loose teeth. Our present specimen is therefore the only one as yet made known exhibiting all the teeth in front of the carnassial in the upper jaw *in situ*; and as the Victorian animal is the first described type of the species, and I find it now to present so many important differences from the New South Wales examples described in Professor Owen's second and third Memoirs, it is probable the species of the two colonies are really distinct. If so, the Victorian one should bear the name of *Thylacoleo carnifex* (Ow.), and I would propose the name of *T. Oweni* for the subsequently illustrated New South Wales species.

The first point which our specimen establishes is that the third tooth from the front has its longer convex margin behind, and not before as Professor Owen suggested from the loose teeth; and this reversal of position brings its cutting edge into close sequence with the second tooth, so as to resemble one of the ordinary group of three incisors with the more anterior ones, and turned away

from the teeth behind, from which it is thus separated, instead of as formerly supposed inclining from the second tooth (*i. 2*) and having its angle representing an obtuse point of a canine. In his earlier Memoirs Professor Owen, I think correctly, called this tooth the third incisor, and called the next small conical tooth on its inner posterior margin the canine, while in his above quoted third Memoir he states that he considers the third tooth from the front to be the *canine*, chiefly because he says the socket is traversed by the premaxillo-maxillary suture, while the tooth next behind he classes as first premolar, because of its being implanted "in the maxillary at some distance from the suture with the premaxillary" and its internal position. Now seeing in our specimens that the position of the third tooth being really the reverse of its supposed inclination, and that it thus combined more in action and appearance with the second incisor, and sloped away from the conical pointed tooth behind, its general aspect was so much that of a third incisor that after our plate was lithographed, I attempted successfully to expose the surface of the bone with acid, so as to show clearly the course of the premaxillo-maxillary suture. The appearance of the specimen after the removal of the obscuring matrix is represented on a reduced scale in the accompanying woodcut :

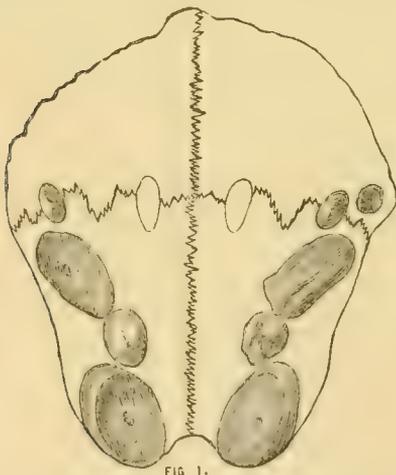


FIG 1.

Reduced view of palate, showing the bone cleared of matrix by acid, exposing the premaxillo-maxillary suture bisecting the base of the canines and incisive foramina, and showing space on right hand side between third incisor and premolar also crossed by it.

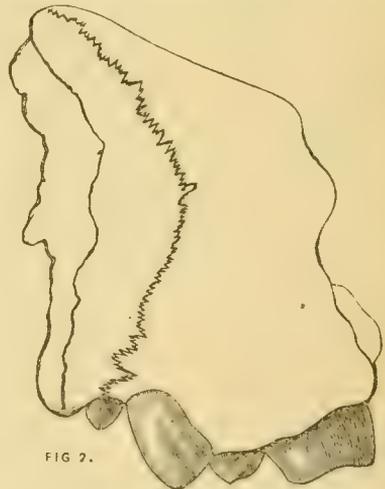


FIG 2.

Reduced side view, showing direction and character of the premaxillo-maxillary suture dividing the socket of the canine.

showing with certainty that in the true Victorian *Thylacoleo carnifex* the premaxillo-maxillary suture crossed the middle of the socket of the fourth tooth, and not, as Professor Owen says of the New South Wales specimen, traversing that of the third tooth. I therefore think there can be no doubt that, for the Victorian animal at all events, the third tooth is an incisor (*i. 3*), far in advance of the premaxillo-maxillary suture, and that the fourth tooth is anatomically the canine. This suture has an irregular minute foliaceous or dentated character, and descends on the outer surface of the side of the face nearly in a line with the posterior edge of the socket of *i. 3*, but before reaching it bends abruptly backwards, and crossing the middle of the vacant space of outer alveolar border between *i. 3* and the fifth tooth, continues across the middle of the conical fourth tooth, or canine; it then extends backwards for 2 or 3 lines, then forward to form an acute angle a little behind the line of the anterior margin of the canine, then backwards and inwards to (on one side a little in front, on the other side a little behind the middle of) the incisive or prepalatal foramina, from behind the middle of the inner edge of which the sutures meet from each side across the middle of the palate.

If the figure of the lower jaws in Plate XII. of Professor Owen's third Memoir be correct, the vertical measurement of the lower jaw from just behind the second molar is much less than its depth from lower edge of anterior end of crown of carnassial in the New South Wales specimen, but is 3 lines more in our Victorian example. A glance at Professor Owen's figure in the Phil. Trans. for 1866, Plate III., will show (if that be correct), on comparison with our figure, that the New South Wales species differs remarkably from the Victorian one in the greater space between the second, third, and fourth teeth measured across the palate; the approximation, especially between the second incisors (the inner edges of the alveoli of the right and left second incisors in the Victorian example in our plate being only 9 lines) being particularly striking, and apparently indicating a specific distinction. The second, and especially the third teeth, here called incisors, are also considerably larger in our example than in Professor Owen's

third Memoir on the New South Wales form in the Phil. Trans. for 1871, Plate II.; and the position of the premaxillo-maxillary suture is described and figured in so much more forward a position, that the conclusion seems inevitable that the species are distinct: the length of the premaxillary part of the bony palate is 1 inch 10 lines in our specimen, but is given as only 1 inch 7 lines in Owen's second Memoir on the New South Wales skull, in consequence of the different position of the suture forming its posterior boundary. The fourth tooth, here called canine, seems larger in ours than in the New South Wales specimen, illustrated in the above quoted second and third Memoirs.

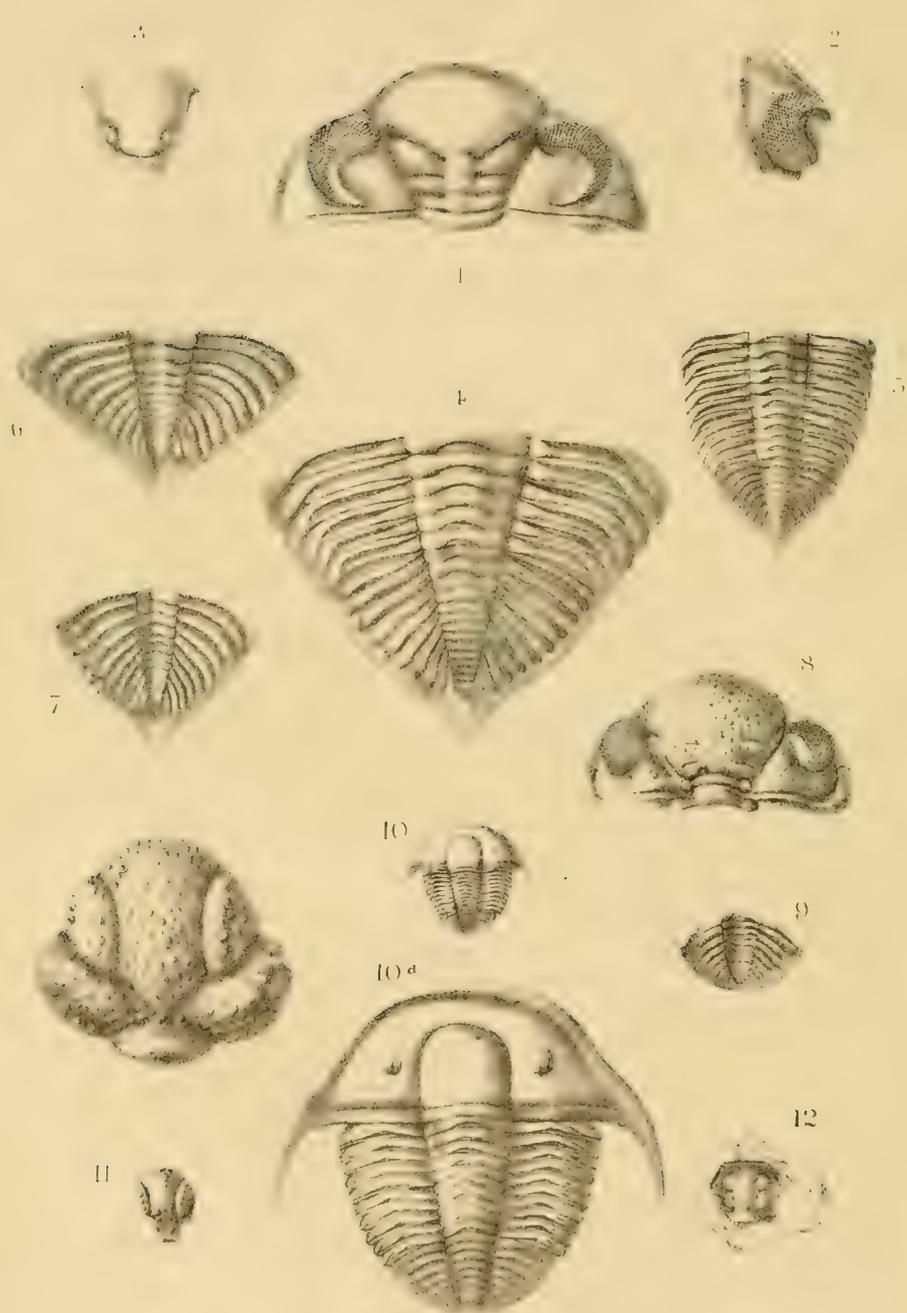
From the Pliocene Tertiary of Lake Colungulac, Hampden.

EXPLANATION OF FIGURES.

Plate XXI.—Fig. 1, view from below, of palate of mouth, showing the broken basal portions of the two anterior great laniary tusks (*i. 1*), with the two following incisors (*i. 2*), with the following large third incisor (*i. 3*) perfect on one side, broken on the other; followed by the small conical pointed canine tooth (*c.*), behind which, on one side, may be seen remains of the alveoli of the two small premolar teeth (*p. 2* and *p. 3*), natural size. (The median and premaxillo-maxillary sutures and incisive foramina in the palate are concealed by hard adhering matrix in this figure, made before those parts were cleared with acid as in the woodcut.) Fig. 1*a*, same specimen viewed in front, showing the sutures of the nasal bones above, with the relative place of the anterior incisors. Fig. 1*b*, same specimen viewed laterally, showing the relation of the three incisors (*i. 1*, *i. 2*, and *i. 3*), and their isolation as a group from the canine (*c.*). (In this figure the premaxillo-maxillary suture is obscured by adhering matrix). Fig. 2, portion of mandible, showing the great carnassial or compressed premolar (*p. 4*), with the dental foramen under its anterior end, followed by the first true molar (*m. 1*), the crown of which is worn (by attrition with the carnassial of the upper jaw) into a surface continuous with that of the preceding carnassial. Behind this is seen the broken base of the small second molar (*m. 2*). The swelling at the right-hand end of the figure indicates the base of the ascending ramus. Lateral view natural size. Fig. 2*a*, same specimen viewed from above, showing in addition to the above the anterior premolar (*p. 3*). (In this figure the incidence of the light does not allow the faint vertical ridges of the basal portion of the inner side of the crown of the carnassial (*p. 4*) to be seen with sufficient distinctness.)

FREDERICK McCoy.

PALÆONTOLOGY OF VICTORIA.
(*Trilobites.*)



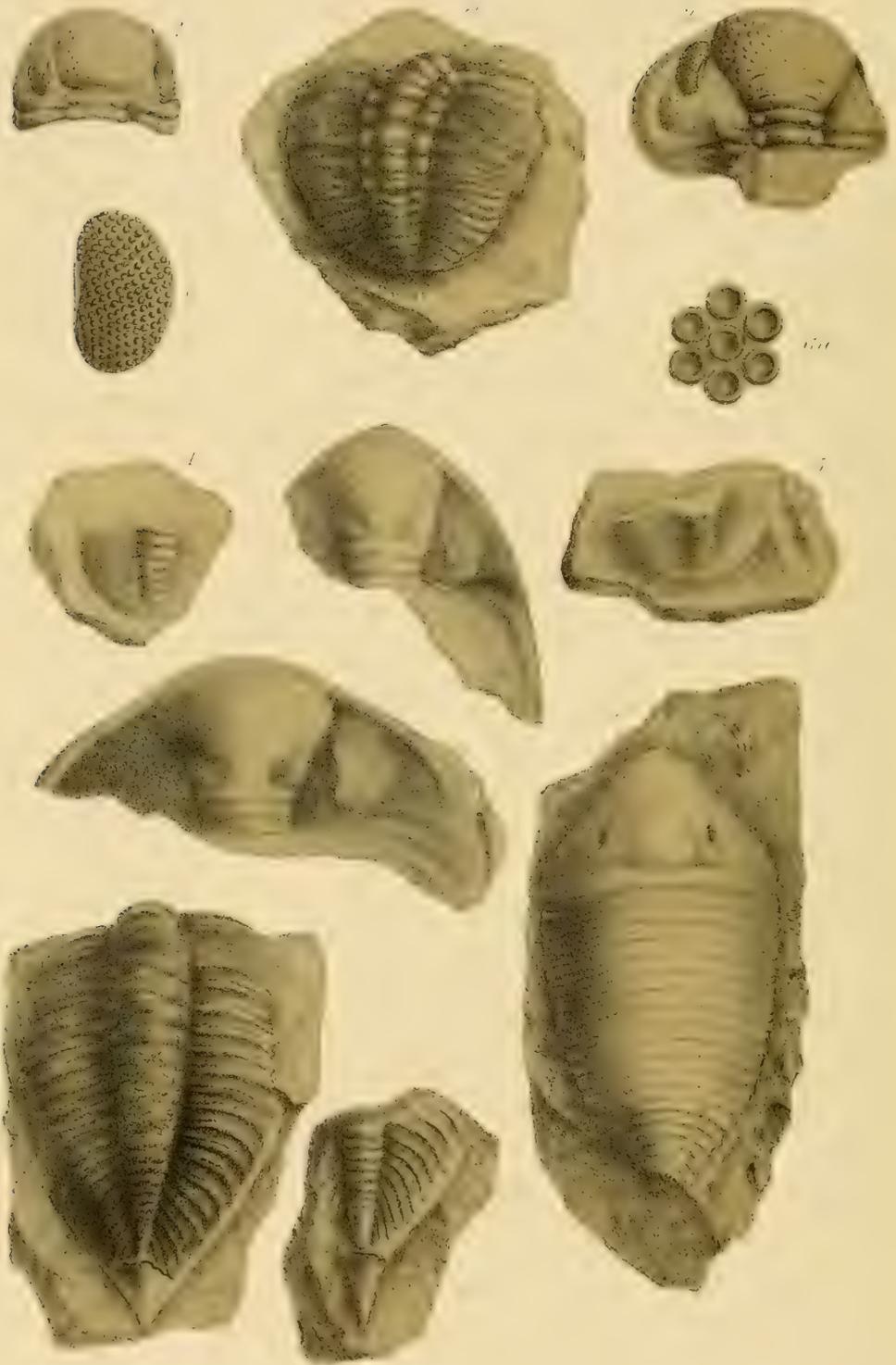


PLATE XXII., FIGS. 1-7, AND PLATE XXIII., FIGS. 7-10.

PHACOPS (ODONTOCHILE) CAUDATUS (BRONG.).

[Genus PHACOPS (EMMERICH EXTENDED). (Sub-kingd. Articulata. Class Crustacea. Order Entomostraca. Fam. Trilobitidæ.)

Gen. Char.—Head large, with the angles prolonged backwards into large spines; *glabella* clavate, wider in front than at the base, and marked with three strong segmental furrows; *eyes* very large, reniform, with a coarsely granular, largely faceted cornea; *thoracic segments* 11; facial sutures cutting the lateral margin of the head in front of the angles.

Sub-genus.—*Odontochile* (Hawle and Corda) = *Dalmannia* (Emmerich) (not of Robineau-Desvoidy).* General form, *buckler*, *glabella*, *eyes* and *eye-lines*, as in *Phacops*, but the lateral lobes of the *glabella* more equal; not contractile; *thorax* of 11 segments; *pleuripedes* curved backwards and generally pointed at their extremities; *facets* very long, narrow rhomboidal, slightly defined; pleural groove strong, slightly sigmoid and oblique (not angulated); *pygidium* elongate, generally pointed; *axis* with from 12 to 22 segmental furrows, sides with fewer (about half the number) strong ribs, usually duplex, confluent at their ends with the thickened entire margin; *hypostoma* with a dentate edge.

Sub-genus.—*Portlockia* (McCoy †)—*Cephalic shield* truncato-orbicular, lateral angles not produced into spines; *glabella* very large, broad in front, sides converging to a narrow base behind and having (on the outer crust) but one small segmental furrow at base; *cheeks* small, triangular; *eyes* large, reniform; *eye-lines* extending from the base of the eye to the outer margin, a little in front of the angles; *abdomen* of 11 segments, resembling those of *Phacops*; *pygidium* small, semi-elliptically rounded, with a simple entire margin; about 5 to 8 segments to the axis, and about 5 to the lateral lobes, each with a very fine mesial divisional line in the distal portion.]

DESCRIPTION.—General form ovate; varying from 2 to 4 inches long. Head depressed, semi-ovate, with a more or less angulated projection of the margin in front, about twice as wide as long, excluding the acutely angular tapering flattened posterior lateral angles which extend backwards and a little outwards as far as the 7th segment of the thorax, confluent at base with the thick outer and posterior margin, the bounding sulci of which do not quite meet. *Glabella* coarsely and irregularly granulated, broadly clavate, rounded in front, moderately convex, sides nearly straight, converging to the narrowed neck; neck furrow and two succeeding segmental furrows strong, nearly equal, transverse, the anterior segmental furrow on each side so oblique that the inner ends are only as far from the 2nd as that is from the basal one, while the outer end is in front of the 2nd by a space equalling the neck furrow and 2 succeeding furrows. *Eye* large, extending from upper end of

* This genus was first noticed by Emmerich under the name *Dalmannia*, which was used fifteen years before for a genus of insects by Robineau-Desvoidy. I therefore use the name of Hawle and Corda, who do not allude to Emmerich's having previously characterised the genus.

† I originally proposed this genus in my Sil. Fos. of Ireland in 1846 for those species of *Phacops* in which the two anterior pairs of great segmental lobes of the sides of the *glabella* were obsolete, and the lateral angles of the cephalic shield were not prolonged; the *Calymene Bufo* of Green, *C. macrophthalma* of Murchison, &c., being the types of the genus.

anterior segmental furrow to basal furrow, conico-reniform very prominent, with coarse lenses about 8 to 13 in a vertical row, usually 10. *Labrum* about 8 lines long, and the same in width, anterior margin of which is arched like the front of the glabella, only slightly convex; a deep furrow within the lateral margins forms a shorter semi-ellipse below than the outer edges, which are nearly straight and parallel at the sides, but form a rounded tongue-shaped lobe extending $1\frac{1}{2}$ lines beyond the inner furrow (edge denticles not visible), an oblique pit on each side a little within the anterior curve of the furrow. *Thorax* mid-lobe convex, outer ends of segments tumid; lateral lobes, about $\frac{1}{2}$ wider than the axis, much curved down at the sides, very finely granulose. *Pygidium* semi-elliptical or sub-trigonal, undivided side margins slightly convex, converging at a little more or less than a right-angle to a flat triangular more or less elongate posterior spine; axis moderate convex, gradually tapering, and composed of 12 distinct ribs (and sometimes 3 or 4 small indistinct additional at tip), often tumid at outer ends; lateral ribs 9, prominent, arched downwards and backwards at the ends, each divided by an impressed groove throughout its length. Surface of thorax and pygidium closely covered with a fine unequal granulation. Average length of head and of pygidium about 1 inch.

REFERENCE.—*Trilobus caudatus* (Brünnich) Kjobenh. Sellsk. Skrifter. Nye. Samml. v. 1, p. 392 = *Asaphus caudatus* (Brong.) Crust. Foss. t. 2, f. 4. Murch. Sil. Syst. t. 7., f. 8.

Of all the fossils of the Palæozoic rocks, the Trilobites are undoubtedly the most characteristic and interesting, and to find the commonest species of the English Ludlow and Wenlock rocks, and most characteristic Upper Silurian fossil equally common in the rocks of the same age in Australia, and to be able to show by the accompanying figures that the Welsh and Victorian individuals present exactly the same range of variations, is a great pleasure to me, as I am sure it will be a surprise to geologists. This is all the more extraordinary as the most abundant Trilobite genus characteristic of the Lower Silurian of every part of Europe and America—*Trinucleus*—has not yet occurred to me in Australia, where I have proved the wide-spread existence of the latter rocks by so many European and American species of Graptolites.

Although the number of axial segments in the pygidium is given above as greater than in the English descriptions of this species, I have counted precisely the same number in British as in the Australian specimens, the difference depending on the distinctness or not, and counting or not, of the last few very small rings represented in the figures in Decade 2, Plate 1, of the English Geological Survey. The same variations in the width or narrowness of the pygidium, and the length or shortness of the posterior spine occur in the Australian as in the English examples, as shown

by our figure, and also the same variation in projection of the front.

Abundant in the olive mudstones of (B^b 18) Broadhurst's Creek, E. of Kilmore.

EXPLANATION OF FIGURES.

Plate XXII.—Fig. 1, head, natural size, shortened by antero-posterior pressure. Fig. 2, eye of second specimen, with eye-line or facial suture, natural size. Fig. 3, labrum or hypostome, natural size (as in the English examples, the denticulation of the lower edge usual in the sub-genus *Odontochile* cannot be distinctly seen). Fig. 4, pygidium and six posterior segments of thorax, natural size. Fig. 5, small perfect specimen of thorax and pygidium normal proportions, natural size. Fig. 6, pygidium, natural size, of the very wide variety. Fig. 7, pygidium, natural size, of the narrow variety. Plate XXIII.—Fig. 7, head, natural size, of narrow variety probably from lateral pressure. Fig. 8, large head abnormally widened by antero-posterior pressure, natural size. Fig. 9, natural size of large specimen of normal shape of pygidium and part of thorax. Fig. 10, pygidium with elongate posterior spine, natural size.

PLATE XXII., FIGS. 8 AND 9, AND PLATE XXIII., FIGS. 1-6.

PHACOPS (PORTLOCKIA) FECUNDUS (BAR.).

DESCRIPTION.—*Cephalic shield*, nearly semicircular, greatest width at about $\frac{1}{3}$ of its length from the front; *glabella* moderately convex, blunt, and only slightly projecting beyond the margin in front; *sides* concave outwardly, converging at about 55° to the neck-furrow, which is very strongly marked, with the ends forming marked tubercles; first pair of maxillary furrows short, but very deeply impressed, forming a strong tubercle on each side; 2 anterior pairs of cephalic furrows scarcely perceptible, short, fine, impressed lines; *cheeks* with bluntly rounded angles, and bordered by a very strongly defined thick limb or margin; *eyes* very large, not as prominent as the glabella, extending from anterior angle of cheeks to a variable point, always considerably in front of the posterior marginal sulcus (usually about equal to the depth of the eye), usually about 18 vertical rows of coarse lenses in each eye, and about 8 in each row (both numbers variable). *Thorax* with the axis or mid-lobe nearly as wide as the pleuræ, each segment having a large strongly marked tubercle at each side; pleuræ broad, much bent down at the blunt outer end, and divided by a very strong deep diagonal pleural groove from the upper inner corner. *Pygidium* nearly semicircular, convex, with a very strongly defined convex axis of 10 distinctly marked segmental furrows, the anterior ones of which are tumid at the outer ends, continuing the appearance of tubercles at sides of axis of thoracic segments; each side lobe bears 8 flat segmental ridges, marked by strong segmental furrows, extending rather more than $\frac{2}{3}$ of the way to the margin, each costal ridge divided along the middle by a distinct shallow impressed line or pleural groove; anterior margin with a strongly marked articular facet on each side. Surface covered with a close fine granulation, with larger coarser conical grains or small tubercles irregularly scattered through the smaller ones; the granulation is strongest on the glabella, about the same size but less distinctly seen on the cheeks, and scarcely perceptible on the pygidium or elsewhere, and in only a few examples. Average

length of head, 9 lines; width, 1 inch 6 lines; length of head in large perfect specimen figured, $10\frac{1}{2}$ lines; width, 1 inch 10 lines; greatest width of glabella, $10\frac{1}{2}$ lines; length of eye, 4 lines; length of pygidium, 8 lines; width, 1 inch 5 lines.

REFERENCE.—*P. fecundus* (Barrande), *Système Sil. de la Bohém.* p. 514, t. 21, figs. 1–27.

The *Phacops fecundus* of Barrande, belonging to my sub-genus *Portlockia*, occurs in the utmost profusion from the bottom to the top of all the stages of the Upper Silurian rocks of the basin of Bohemia, not occurring at all in the Lower Silurian below, but in numerous localities in the Bohemian basin suddenly appearing in myriads in the Upper Silurian strata as their most abundant Trilobite. It is not, however, found to my knowledge in Great Britain or any other part of Europe or America* where those rocks occur, so that my recognition of it as one of the most abundant of the Upper Silurian Trilobites of Victoria is of the highest interest in connection with the distribution of species in space.

As M. Barrande has pointed out, this Trilobite may be easily distinguished from the very similar *P. latifrons* (Bronn) of the Devonian rocks, by the eye being always considerably in advance of the posterior furrow of the cheeks, and by the impressed line along the middle of each of the flatter lateral ridges of the pygidium.

Common in the Upper Silurian sandy, yellow, and red, beds (probably identical with the May Hill sandstone) at Section 12, parish of Yering.

EXPLANATION OF FIGURES.

Plate XXII.—Fig. 8, cephalic shield of ordinary size and proportion showing the eyes and granulation and direction of eye-line, natural size. Fig. 9, small pygidium, natural size. (The duplicating furrow on lateral ridges has become too indistinct in the lithograph.) Plate XXIII.—Fig. 1, cephalic shield compressed laterally so as to be less than the normal width, natural size. Fig. 2, cephalic shield of large perfect inrolled specimen slightly extended laterally, eye-line indistinct, natural size. Fig. 3, perfect thorax and pygidium (the inrolled head of which is represented by fig. 2) showing the large tubercular ends of the segments of the axial lobe of thorax (in this figure also the faint duplicating furrow on each lateral rib of the pygidium has become too indistinct in the lithographing), natural size. Fig. 4, pygidium slightly compressed laterally, so as to seem narrower than the normal form, natural size. Fig. 5, pygidium slightly widened by pressure, natural size. (On figures 4 and 5 the faint dividing furrow of each lateral ridge has too nearly disappeared in the printing.) Fig. 6, eye, magnified, showing the number and arrangement of the lenses. Fig. 6a, portion of ditto more highly magnified, showing the cups from which spherical lenses of each division of the compound eye have fallen out.

* The *Phacops Logani* of Professor Hall (*Pal. N. Y.*, v. 3, pt. 1, p. 353, t. 73, f. 15–25), from the Lower Helderberg group, is supposed to be distinguished from this species by the smaller eyes, with fewer lenses; but M. Barrande gives from 4 to 9 lenses in each row, and the total lenses in each eye from 64 to 136 in the Bohemian species, so it is difficult to realize the distinction suggested by Prof. Hall.

PLATE XXII., FIGS. 10, 10a.

FORBESIA EURYCEPS (McCoy).

[Genus FORBESIA (McCoy). (Sub-kingd. Articulata. Class Crustacea. Order Entomostraca. Fam. Trilobitidæ).

Gen. Char.—*Head* semi-elliptical, with distinctly defined glabella; *eyes* finely reticulated; *eye-lines* nearly parallel, cutting the middle of the posterior margin; *body-rings* 10, facets large, pleural furrow slightly oblique, not reaching the margin; *pygidium* smaller than the head, with duplicate lateral furrows and a distinct conical articulate axis. Two sub-genera: 1st *Forbesia*; 2nd *Proetus*.

Sub-genus.—*Forbesia* (McCoy) = *Æonia* (Burmeister). *Cephalic shield* semi-elliptical, the lateral angles produced backwards into long spines; *glabella* oblong, contracted in the middle, with three small transverse segmental furrows on each side, the basal one largest and curved downwards; *neck-furrow* usually terminating in a large oblique tubercle at each end; *eye-line* nearly vertical, cutting the anterior and posterior margins in a line with the eyes, which are lunate and smooth; *thorax* of 10 joints, pleuræ with distinct facets and obtuse ends, pleural furrow slightly oblique; *pygidium* semi-elliptical, with a smooth margin, both the axis and side lobes with distinct segmental furrows, the latter duplicate at their ends.

This genus differs from *Proetus* in the lateral angles of the buckler being produced into long spines, in the lateral segmental furrows to the glabella, the large oblique tubercles terminating the neck-furrow, and the distinct segmental furrows of the lateral lobes of the pygidium.*]

DESCRIPTION.—*Head* transversely oblong, length about $\frac{3}{4}$ of width in line with base of glabella, slightly concave in front; abruptly rounded at the sides to the posterior lateral angle, from whence the wings or prolonged spine diverge abruptly with an outward and backward curve, the apex opposite 6th ring of thorax, from which it is separated by a space nearly equalling the distance to posterior margin of head; glabella not reaching front margin, moderately convex, obtusely rounded and slightly narrower in front than at base; length, including narrow neck-segment, slightly less than width at base; cheeks moderately convex, eye-lines sub-parallel in front of the eyes, cutting the front in about a line with middle of eye, and cutting the posterior margin a little outside of the middle behind them; limb or thickened margin of the head strong, prominent, rounded. *Thorax* as long as the head, axial segments about as wide as the pleuræ, and only slightly tumid (with the neck-segment) at the outer ends. *Pygidium* nearly semicircular, rather more than twice as wide as long, length equalling 5 posterior thoracic segments; axis convex, narrow, not reaching the margin, of 7 narrow segments; sides with 6 broad strong ribs, each divided by a strong sulcus, outer undivided margin moderately broad. Length of head, 3 lines; width of head at middle, $6\frac{1}{4}$ lines; from tip to tip of wings, 8 lines; total length, including head, thorax, and pygidium, $7\frac{1}{2}$ lines.

The great width of the head and diverging widely arched wings easily distinguish this species from all others with which I am acquainted. The surface is indistinctly preserved, but I think it

* Subsequently to the publication of this genus under the above name in my Synopsis of the Silurian Fossils of Ireland, Burmeister, in the second edition of his work on Trilobites, p. 100, characterised it similarly, and pointed out particularly its distinctions from *Proetus*.

is minutely granular. Owing to the abrasion of the surface of the glabella, I cannot be certain whether segmental furrows occur or not.

Only one British species of this genus (my *F. latifrons*) has ever been quoted from Lower Silurian strata, and I cannot help thinking there may be some error in the age assigned to the Irish locality, Egool, Mayo, as I have found the same species in England only in Upper Silurian rocks. The 36 species of *Proetus* given by Barrande are all Upper Silurian, and so few forms, and these abnormal, have been found in older rocks, that the present species must be taken to support the reference of the bed in which this species is found to the Upper Silurian.

Rare in Wenlock shale of Broadhurst's Creek, east of Kilmore, B^b 18.

EXPLANATION OF FIGURES.

Plate XXII.—Fig. 10, entire trilobite, natural size. Fig. 10a, ditto, magnified.

PLATE XXII., FIG. 11.

LICHAS AUSTRALIS (McCoy).

[Genus LICHAS (DALMANN). (Sub-kingd. Articulata. Class Crustacea. Order Entomostraca. Tribe Phyllopoda. Fam. Trilobitidæ.)

Gen. Char.—*Body* ovate, very flat; *surface* granulated; *head* semicircular; *glabella* large, semi-oval, with one long segmental furrow curving inwards and downwards from the upper third of the glabella on each side, nearly to the neck-furrow, partially enclosing two large oval spaces, and close to the ends of the neck-furrow, one or two posterior pairs of furrows enclose one or two small trigonal lobes on each side; *neck-segment* broader than the base of the glabella; *checks* small; *eyes* moderately large, reniform; *eye-line* cutting the outer margin in front of the angles; *thorax* of 10 segments; *pleurae* flat, falcate, each with a fine slightly sigmoid pleural furrow, not reaching the margin; *pygidium* semi-oval, axis usually undefined below, the lateral furrows instead of encircling the end, converge about the middle, and diverge again towards the posterior margin, which they do not reach; two short segments at the anterior convex part; *side-lobes* flat, of two broad falcate ribs on each side, projecting beyond the margin, each with a fine mesial duplicating groove; *middle-lobe* semi-elliptical, pointed, a small divisional line coming off from the middle of the dorsal furrow on each side, curving outwards and downwards towards its extremity, so as partially to include an oval space on each side.]

DESCRIPTION.—Width across glabella and middle of anterior lateral lobes, $\frac{5}{8}$ ths of the length of the head, including neck-segment; middle portion of glabella tumid, broadly rounded in front, rather narrowed in the middle by the regular inward curvature of the anterior segmental furrows; anterior segmental lobes ovate, tumid;

cheeks very tumid in an oblique line from the small eyes to the neck-segment, which is strongly marked and separated from base of glabella by a wide sulcus; surface covered by coarse unequal granulation of conical spinose tubercles; three conspicuous tubercles in sulcus at base of glabella. Length of head, 5 lines.

This species belongs to that very restricted section of *Lichas* named *Acanthopyge* by Hawle and Corda, in which the head seems greatly simplified from the absence of the middle and posterior segmental furrows, leaving only one segmental lobe on each side of the glabella. In this, and all other respects, our Australian species most nearly resembles the *Lichas Haueri* (Bar.) of the Upper Silurian limestone of the basin of Bohemia. It is rather smaller, and, on comparison, has the head rather longer in proportion to the width; the segmental lobes are narrower, and the anterior segmental furrows are not so straight and parallel, but seem to narrow the middle portion of the glabella more by a regular curve, the convexity of which is inward.

Not uncommon in the Olive Schists of junction of Woori-Yallock and Yarra (Stewart's station).

EXPLANATION OF FIGURES.

Plate XXII.—Fig. 11, specimen of head without the cheeks, natural size. The larger figure over this is a magnified view of another specimen showing the glabella perfect, and the cheeks within the eye-line showing the place of the eyes.

PLATE XXIII., FIG. 11.

HOMALONOTUS HARRISONI (McCoy).

[Genus HOMALONOTUS (KÖNIG). (Sub-kingd. Articulata. Class Crustacea. Order Entomostraca. Tribe Phyllopoda. Fam. Trilobitidæ.)

Gen. Char.—*Buckler* semi-elliptical, convex in the middle, obtusely pointed in front, lateral angles not produced; *glabella* indistinct, simple, subquadrate, with concave sides, narrower in front than behind, not reaching to the front margin; *eyes* small, hiant, reniform, in the midst of the cheeks, opposite about the middle of the glabella; *eye-line* continuous from one side to the other, all anterior to the eyes being nearly parallel with the margin of the buckler, pointed in front, forming the usual small outward lobes over each eye, and from thence to the lateral angles or a little in front of them; *thorax* moderately arched, not distinctly trilobed, of 13 segments; *axis* wider (if visible) than the lateral lobes, which have sub-truncate ends with large distinct facets; *pleural sulcus*, as in *Calymene*, arising from the posterior margin near the undefined axis, and at half its length abruptly bent down again to it; *pygidium* subtrigonal, pointed, usually trilobed, with a distinct axis or none, the lateral ribs undivided.]

DESCRIPTION.—Head semi-elliptical, pointed, with a slightly upturned edge in front, deflexed at the sides to the rounded posterior lateral angles, leaving the cheeks moderately convex; glabella scarcely defined, slightly convex at base, surface slightly concave between it and front margin; eyes moderate. Thoracic rings continuously arched across the back, rather abruptly deflected near outer ends, each divided by a fine impressed sulcus midway between the anterior and posterior edges. Pygidium very distinctly trilobate; axis convex, defined by sharp longitudinal sulci on each side. Segments distinctly marked (number uncertain, and the shape of apex, from imperfection of specimen). Length of head, 10 lines; width at base, 1 inch 4 lines; length of thorax, 1 inch 3 lines; width of front of pygidium, $11\frac{1}{2}$ lines; width of axis, 6 lines.

This highly typical species of *Homalonotus* was first discovered by one of our valued scientific men, whose retiring disposition will scarcely permit me the pleasure of naming after him the most remarkable trilobite yet found in Australia. Mr. T. Harrison was so kind as to present the specimen to the Museum directly he knocked it out from the sandy beds in the Royal Park, near Melbourne, to which, from other fossils, I had assigned an Upper Silurian age on first landing in the colony. It is to be distinguished from the *Homalonotus delphinocephalus* (Green) of the Upper Silurian rocks of North America, to which it is most nearly allied, by the total absence of even the slightest trace of trilobation of the rings of the thorax, and by the sulcus which divides each of them being in the middle so as to divide each thoracic ring into two nearly equal portions; while in the *H. delphinocephalus* there is a slight depression on each side where the axial furrows are in ordinary trilobites, and in it the anterior portion of each segment is very much narrower than the posterior division, from the sulcus being close to the anterior edge. The apex of the pygidium is unfortunately broken in our specimen, so that the precise form of that part is as yet unknown.

Rare in sandy Upper Silurian (May Hill Sandstone) strata near Flemington, north of Melbourne.

EXPLANATION OF FIGURES.

Plate XXIII.—Fig. 11, natural size of nearly perfect specimen, the posterior part of the pygidium only being absent.

FREDERICK MCCOY.



PLATE XXIV., FIGS. 1-5.

ATURIA ZIC-ZAC (SOW. SP.) VAR. AUSTRALIS (MCCOY).

[Genus ATURIA (BRONN). (Sub-kingd. Mollusca. Class Cephalopoda. Order Tetra-branchiata. Fam. Nautilidæ.)

Gen. Char.—*Shell*, discoid, moderately compressed, periphery rounded, whorls embracing, involute in one plane; *septa* convex outwardly at inner half, concave at outer half, bent on each side at the margin into a long narrow lancet-shaped lobe extending backwards to the preceding septum; *siphuncle* at inner margin very large, shelly, formed of a funnel-shaped extension backwards of the septum, the narrow hinder end entering within the similar funnels of the two preceding septa.]

DESCRIPTION.—Sides flattened; periphery narrow, rounded; surface with fine arched stria, the convexity forwards on the sides, backwards on the periphery. Diameter, from 1 to $4\frac{1}{2}$ inches; proportional greatest width, $\frac{4.5}{100}$; length of aperture at side, $\frac{6.5}{100}$; at middle, $\frac{4.8}{100}$.

The great shelly invaginated siphuncle easily distinguishes *Aturia* from *Nautilus* as well as the position of the siphon at the inner margin; and as *Nautilus* extends from Palæozoic times to our present seas, while *Aturia* is only found in the Eocene and Miocene strata of other parts of the world, a recognition of the structural difference between the genera is of great geological interest, as supporting the suggestion of the Oligocene age of the Tertiary strata in Victoria, in which it is so surprising to find this rare type of *Cephalopod*, peculiar to the Middle and Lower Tertiaries of the old world and of America.

It is with the compressed Miocene variety found at Dax, named *N. Aturia* by Basterot, rather than with the more ventricose original types of the *N. zic-zac* of Sowerby, proper to the Eocene London clay, that our Australian fossil more completely agrees; and I can only doubtfully suggest the separation of it as a local variety, from the somewhat greater compression indicated by the slightly greater length of the aperture in proportion to its width; and also a slightly greater curvature of the septa on the sides as shown by a line from the apex of the lancet-shaped lobe to the inner end of same septum, encroaching rather more on the 3rd chamber behind.

Fragments have been found indicating a diameter of about 6 inches, but the majority of specimens found are under 2 inches.

Not uncommon in the Oligocene Tertiary clays of Mornington, near Mount Eliza and Mount Martha. In similar deposits at Point Addis. In similar strata at A^v 9, 3 miles west of the mouth of the Gellibrand River. Common, of large size, at A^d 22, in Miocene junction beds at Bird-Rock Point, near mouth of Spring Creek, 15 miles S. of Geelong. Excessively rare in Lower Pliocene iron-stones of Flemington, and equally rare in yellow sandy beds at Mordialloc.

EXPLANATION OF FIGURES.

Plate XXIV.—Fig. 1, internal cast showing chambers of only specimen found in the hard ferruginous Lower Pliocene beds of Flemington, natural size. Fig. 2, small perfect specimen from the Oligocene Tertiary beds near Mount Martha, natural size, front view of variety with rather wider periphery than usual. Fig. 2*a*, side view of same specimen. Fig. 3, larger specimen of ordinary compression of sides, from near mouth of Gellibrand River; the siphon is seen touching the inner edge; the two lateral pits are produced by the two lateral lobes of the septa. Fig. 3*a*, side view of same specimen. Fig. 4, portion of larger specimen from Oligocene Tertiary near Mount Martha. Fig. 4*a*, front view of same specimen, showing with fractured edges of the septa, the very large shelly funnel-shaped invaginated siphon, natural size. Fig. 5, still larger specimen, natural size, from the Junction Miocene beds of Bird Rock, south of Geelong.

FREDERICK McCoy.

PLATE XXV., FIGS. 1-1b.

PLEUROTOMARIA TERTIARIA (McCoy).

[Genus PLEUROTOMARIA (DEF.). (Sub-kingd. Mollusca. Class Gasteropoda. Order Scutibranchiata. Fam. Haliotidæ.)

Gen. Char.—Usually pyramidal, trochiform, more rarely globose, or depressed; *aperture* usually wider than long, with a deep narrow respiratory slit in the outer lip, leaving a defined, linear, spiral band, marked by retroflexed striæ along each whorl of the spire; *surface* usually marked by striæ arching backwards towards the band; *columella* simple, a little thickened in front, with or without umbilicus.

The trochiform species differ from *Trochus* by the sinus and band.]

DESCRIPTION.—Shell large, trochiform, apical angle 67° ; whorls flat, or very slightly convex; base moderately convex, with (?) a small umbilicus; band of moderate width in the middle of each whorl, slightly depressed. Surface with sub-equal prominent thread-like spiral striæ, rather less than their thickness apart (about 10 or 11 above, and the same number below the band), about 3 slightly smaller on the band, reticulated by arched striæ, narrower, but nearly as prominent as the spiral striæ, and slightly further apart. Length about 2 inches 9 lines; proportional width, $\frac{9.5}{100}$; length of last whorl, $\frac{3.3}{100}$.

If this fossil had been found alone, or if the other fossils found with it had not proved the Upper Miocene Tertiary age of the stratum, it would in all probability deceive any geologist into the belief of its affording evidence of Oolitic strata.

The genus *Pleurotomaria*, like *Trigonia*, is a most abundant one in all the Mesozoic marine formations, but, like *Trigonia*, also has hitherto been remarkable for its sudden, almost complete, disappearance at the close of the Cretaceous period, and being so nearly absent in the well-searched Tertiary formations of Europe, Asia, and America, that only two examples of Tertiary age seem to have occurred to any observers, viz., the *P. Sismondai*, found by Goldfuss at Bünde, and the *P. concava* found by Deshayes in the Paris basin. So rare are these occurrences, however, that neither myself nor I believe any living palæontologist has seen a trace of them. The genus reappears in our recent seas, where it is represented by two such excessively rare species that only one or two examples have been found. Our Victorian fossil is almost intermediate in character between the two living ones, having the large size, more elevated spire, and more numerous and flatter whorls of

the living *Pleurotomaria Adansoniana*, but the more nearly central band of the *P. Quoyana*, and having the close spiral threads crossed by nearly equal prominent equidistant lines of growth. It differs from both in its more elevated acute spire, a much smaller apical angle, and more equal striæ.

From the Miocene *P. Sismondai* it differs in the whorls not being angulated and in the more equal striæ. From the Eocene *P. concava* it differs in its much finer and more numerous striæ.

Rare in a hard pink and yellowish limestone (T^m 4), like lithographic stone, about two feet thick, interstratified with the upper part of a bed of basalt, about 100 feet thick, on east bank of Moorabool River, near Maude.

EXPLANATION OF FIGURES.

Plate XXV.—Fig. 1, side view, natural size. Fig. 1a, opposite side of same specimen, showing in fractured section the character of the umbilicus. Fig. 1b, portion of surface, magnified, showing the decussated spiral striæ and the band.

PLATE XXV., FIGS 2-2b.

HALIOTIS OVINOIDES (McCoy).

[Genus HALIOTIS (LINN.). (Sub-kingd. Mollusca. Class Gasteropoda. Order Scuti-branchiata. Fam. Haliotidæ.)

Gen. Char.—*Shell* very much depressed, with an ovate or ear-shaped outline formed entirely of the last whorl; *spire* extremely small, depressed, close to the posterior of left lateral margin; external surface usually rough, with radiating wrinkles and spiral ridges; a sub-angulated row of short tubular perforations extends from the anterior part of the outer lip close to the left margin of the shell on the upper side; *outer lip* thin, simple; aperture extremely large, the inner lip forming a flattened inflexed boundary to it on the left side.]

DESCRIPTION.—Orbicularly ovate, flattened above; spire equalling in diameter half the diameter of the shell in the same line, of 2 prominent whorls; apertures large, prominent, tubular; upper surface with thick nearly straight radiating ridges, like wrinkles, extending from the suture to within about their own distances apart from the row of tubular apertures, each ridge most prominent at its outer obtusely rounded subtubercular extremity, about 3 strong spiral ridges between the ends of the radiating ridges and the tubuli; spiral ridges of same size, but less prominent between the ridges, and about 6 stronger ones outside the row of tubuli. Average length, $1\frac{1}{2}$ inches; comparative diameter of spire, $\frac{5.0}{100}$; height, $\frac{3.3}{100}$; at edge of specimen $1\frac{1}{2}$ inch in diameter, there are five apertures in nine lines (little more than three in the same space of *H. ovina* at the same diameter).

This very beautiful species most nearly resembles the living *H. ovina* of North Australia and the Philippines, which has a nearly similar arrangement of radiating rounded ridges, stopping short of the tubular openings; but the fossil is easily distinguished by the strong spiral sulcation and the greater proportion of the diameter which is occupied by the spiræ. It is nearly related to the *H. Flemingtonensis*, from which it is easily distinguished by its comparatively regular, prominent, strong, straight, rounded, radiating ridges, and the rather larger spire.

Abundant in the Upper Miocene yellow and pink limestone of (T^m 4) east bank of Moorabool River, near Maude.

EXPLANATION OF FIGURES.

Plate XXV.—Fig. 2, average specimen, natural size, view from above. Fig. 2a, side view of same specimen. Fig. 2b, tubular apertures, radiating ridges, and spiral sulci, magnified.

PLATE XXV., FIGS. 3-3b.

HALIOTIS MOORABOOLENSIS (McCoy).

DESCRIPTION.—Broad, ovate, depressed, greatly and evenly convex; spire close to posterior edge, small, of $1\frac{1}{2}$ turns, not raised above the general surface; apertures small, oval, numerous, about their own length apart, a nearly concave vertical space intervenes between them and the left margin; entire surface covered with coarse subequal slightly irregular ridges, separated by narrower sulci, and crossed by lines of growth. Length of average specimen, $4\frac{1}{2}$ inches; in proportion thereto, diameter of spire from posterior edge, $\frac{2.3}{100}$; greatest width, $\frac{7.8}{100}$; depth, $\frac{2.8}{100}$; about 5 sulci in $\frac{1}{2}$ an inch near margin.

In form this most nearly resembles the recent *H. Cracherodi* of California, but is much more coarsely and distinctly ribbed or sulcated, and has the very small close numerous apertures of the living *H. Californiensis*; it is also allied to the living *H. splendens* of California, but has smaller apertures, is more depressed, and has smaller sulci. Two living Australian species, the *H. scabricosta* and *H. Roei*, approach most nearly in sulcation, but are distinguished by their far larger spires.

Not uncommon in hard pinkish and yellow Upper Miocene Tertiary limestone of (T^m 4) on the east bank of the Moorabool River, near Maude.

EXPLANATION OF FIGURES.

Plate XXV.—Fig. 3, specimen, natural size, viewed from above. Fig. 3*a*, same specimen, viewed in profile, natural size. Fig. 3*b*, apertures and sulcation crossed by lines of growth, magnified.

NOTE.—The species of the two genera figured on this plate, especially *Haliotis*, are exclusively inhabitants of shallow water, and this circumstance must be taken into consideration by geologists in correlating the strata in which they occur with those probably synchronous but deposited in deeper water in other localities.

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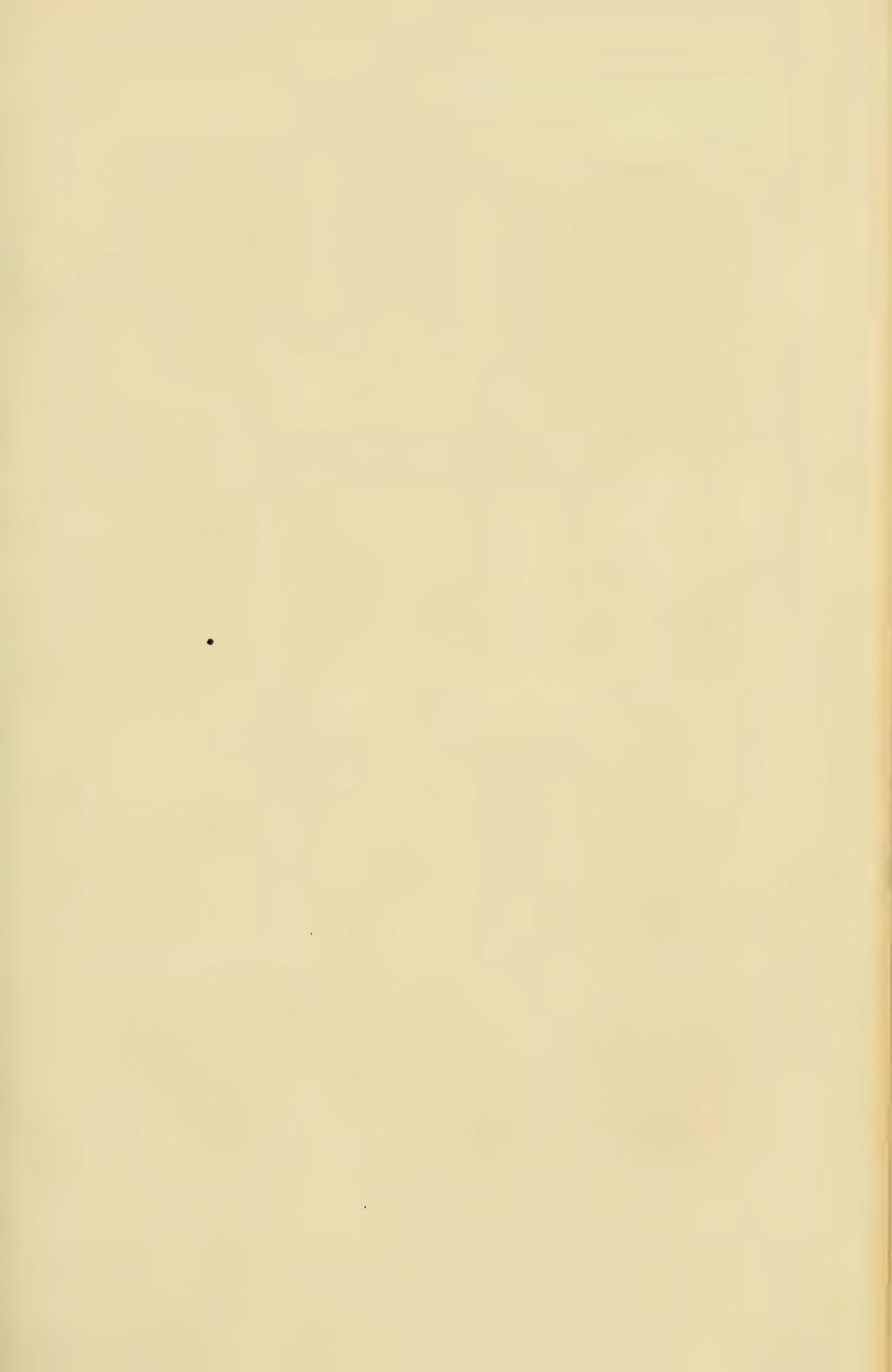




PLATE XXVI., FIGS. 1-2a.

HALIOTIS NÆVOSOIDES (McCoy).

[Genus HALIOTIS (LINN.). Sub-kingd. Mollusca. Class Gasteropoda. Order Scuti-branchiata. Fam. Haliotidæ.]

Gen. Char.—Shell very much depressed, with an ovate or ear-shaped outline formed entirely of the last whorl; *spire* extremely small, depressed, close to the posterior left lateral margin; external surface usually rough, with radiating wrinkles and spiral ridges; a sub-angulated row of short tubular perforations extends from the anterior part of the outer lip, close to the left margin of the shell on the upper side; *outer lip* thin, simple; aperture extremely large, the inner lip forming a flattened inflexed boundary to it on the left side.]

DESCRIPTION.—Sub-orbicular, depressed; spire of $2\frac{1}{2}$ turns, moderately prominent; upper surface with numerous short irregularly interrupted fluctuating wave-like ridges in radiating series arched forward from the suture, and not regularly more prominent at the distal end; spiral striæ, thick, sub-equal, rounded, about 12 in the space between the suture and the perforations; perforations moderately produced, oval, about 4 in 9 lines at $1\frac{1}{2}$ inches in diameter, obliquely crossed by fine close striæ of growth. Average diameter, 2 inches; proportional width, $\frac{80}{100}$; diameter of spire, $\frac{45}{100}$; height, $\frac{20}{100}$.

At first sight this might be mistaken for that most abundant living species in Australian seas the *H. nævosa* (Mart.), and the imperfect preservation of most specimens helps to give an erroneously Recent or Newer Pliocene aspect to the deposits in which it occurs from this apparent identity. The numerous examples I have seen, and the character of the surface as given by impressions in gutta-percha which I had taken of the cavities from which the casts of the shell had disappeared, enable me to distinguish it with certainty by its less elongate or more orbicular form, larger spire, and much thicker and fewer spiral striæ; these, in about one inch from suture to perforations, being about 60, and much more unequal in the living *H. nævosa*, but only about 13 in the fossil *H. nævosoides*. The living species is longer in proportion to the width, or less orbicular in outline, but agrees in the irregular ripple-like interrupted character of the arched radiating undulations, not more prominent in the distal end than in the middle, which separate it easily from the *H. ovinoides* of the Moorabool limestone near Maud.

Very abundant in the ferruginous Lower Pliocene Tertiary strata of Flemington, north of Melbourne. One unusually large specimen presented by Mr. Brough Smyth is $3\frac{1}{2}$ inches in length.

EXPLANATION OF FIGURES.

Plate XXVI.—Fig. 1, large specimen, with ordinary character of radiation, natural size. Fig. 2, smaller specimen, with a few of the undulations presenting an unusual appearance of a ridge-like continuity. Fig. 2a, portion of surface magnified to show the striation.

PLATE XXVI., FIGS. 3-9.

CERITHIUM FLEMINGTONENSIS (McCoy).

[Genus CERITHIUM (BRUG). (Sub-kingd. Mollusca. Class Gasteropoda. Ord. Pectinibranchiata. Fam. Cerithiidae.)

Gen. Char.—Shell of very numerous gradually-enlarging whorls; *spire* longer than the body whorl; the *outer lip* usually dilated; *aperture* oblique ovate, terminating in front in a short canal slightly recurved and bent to the left; *inner lip* usually with a faint spiral ridge above and below defining two internal canals; external surface usually sulcated spirally, and with more or less distinct varices.]

DESCRIPTION.—Spire acute, apical angle about 25° of upwards of 10 flattened whorls; body whorl with the outer lip slightly ascending and dilated; surface with fine nearly equal spiral striae (about 30 between the sutures), crossed by close obtuse and slightly sigmoid rounded ribs (about 20 in a whorl), most prominent at the lower or anterior end next the suture, becoming generally indistinct at less than half-way to the suture above, but a few here and there extending singly across the whole space from one suture to the next, like a varix. Spiral striae on base or anterior half of body whorl coarser than on spire, and every third or fourth larger than the rest. Internal casts rounded, smooth on turns of spire, frequently showing a few longitudinal obtuse ribs on body whorl, the dilated outer lip of which is sometimes faintly marked with spiral ridges. Length from 2 to 5 inches; proportional width of body whorl, $\frac{3}{10}$; length of body whorl, including canal, $\frac{27}{10}$; length of penultimate whorl, $\frac{3}{10}$.

The genus *Cerithium* abounds in shallow waters near the mouths of great rivers in tropical countries at the present day, and in the Older Tertiary deposits it has its maximum of local development.

The present species obviously varies a little in apical angle and consequent relation of length to width, although I have never yet seen a sufficiently perfect specimen to enable me to be certain of the number of the whorls; and this is a point which any amateur

geologist working in the Flemington beds might by vigilance enable me to clear up.

Excessively abundant in the hard ferruginous Lower Pliocene sandstone of Flemington, north of Melbourne.

EXPLANATION OF FIGURES.

Plate XXVI.—Fig. 3, gutta-percha cast showing spiral striation and longitudinal ridges near lower or anterior part of whorls, natural size. Fig. 3a, portion of ditto, magnified, showing the usual obliteration of the longitudinal ridges on the upper portion of whorls, with a few extending from one suture to the other, like varices, all crossed by the fine spiral striæ. Fig. 4, gutta-percha cast, natural size, of another specimen, showing an unusually large number of the vertical ridges traversing the whole of the whorls between the sutures. (Both these figures show the flatness of the whorls.) Fig. 5, instructive specimen, showing the striation and a few of the varix-like ridges on external surface of apical portion, and showing the corresponding internal cast with rounded smooth whorls and the form of the cast of body whorl, with the obscure longitudinal ridges and the short anterior canal in lower part, natural size. (The want of parallelism of the last suture is produced by the ascending dilated edge of the outer lip.) Fig. 6, gutta-percha cast of portion of surface of larger specimen, showing the longitudinal and spiral markings and general flatness of the whorls on the surface, with the inconspicuous suture. Fig. 7, ordinary appearance of the majority of specimens, showing internal casts, with smooth very convex whorls, separated by deep divisions, and the form of the aperture with the slight concavity below suture of body whorl indicative of a corresponding ridge on the interior of the posterior part of the outer lip of the shell, and the spiral ridge on the anterior part indicative of a corresponding canal on the interior of the anterior portion of the mouth of the shell. Fig. 8, portion of largest specimen seen, internal cast, natural size. Fig. 8a, another view of same specimen, showing the greatest length observed of the anterior canal. Fig. 9, portion of specimen, with unusually large prominent few longitudinal ridges.

FREDERICK McCoy.

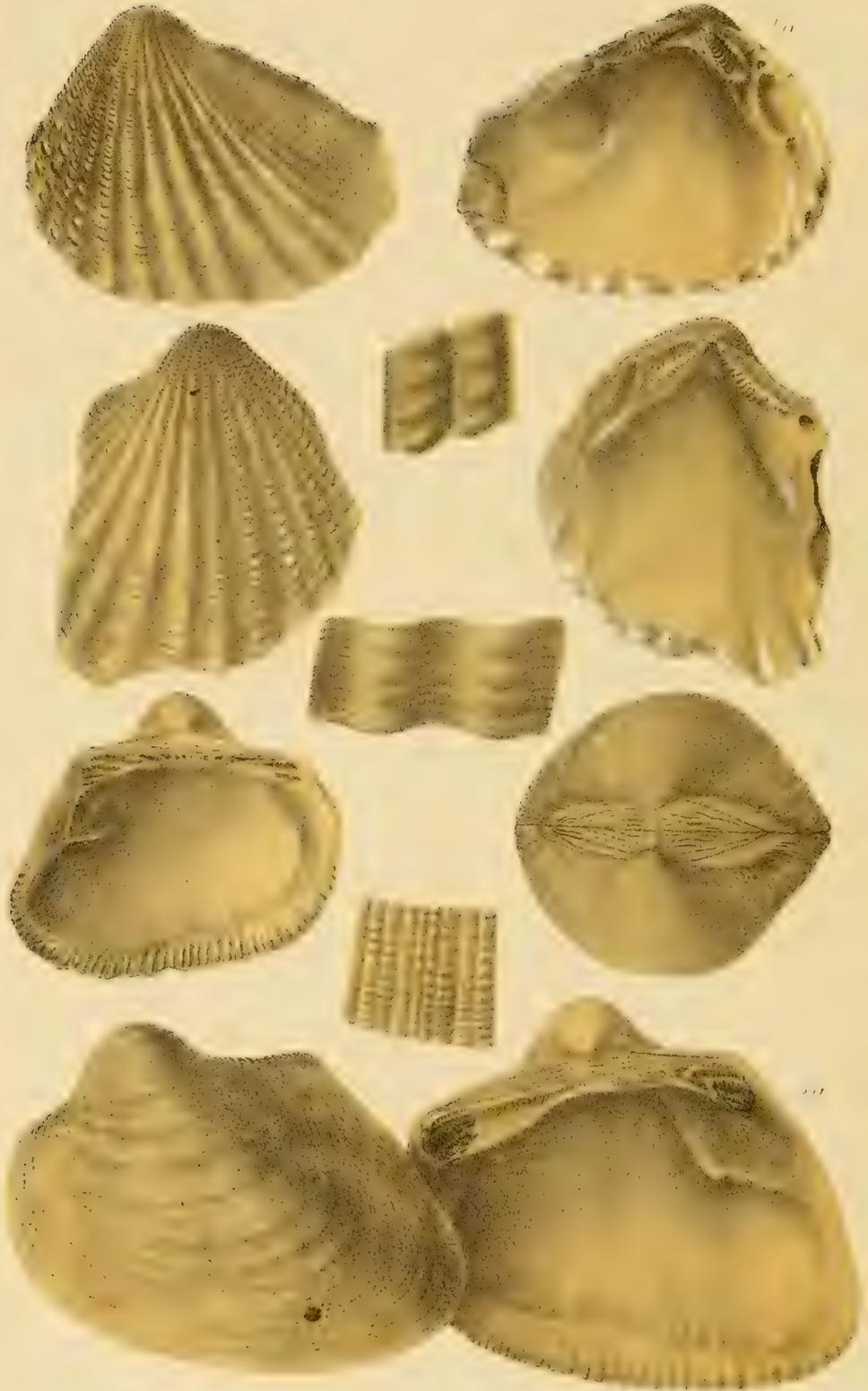


PLATE XXVII., FIGS. 1-2c.

TRIGONIA HOWITTI (McCoy).

[Genus TRIGONIA (BRUG.). (Sub-kingd. Mollusca. Class Dithyra. Order Pectinacea. Fam. Trigonidæ.)

Gen. Char.—Shell equivalve, inequilateral, subtrigonal; outside ridged, inside pearly; right valve with a V-shaped pair of large diverging teeth, transversely sulcated on each side, received between 4 teeth similarly sulcated on one side, in the left valve.]

DESCRIPTION.—Rotundate rhombic, substance of shell thick, tumid towards the beak; anterior side rounded, posterior slope moderately flattened in two planes, divided by a very obtuse angle marking the margin; ventral margin moderately convex, posterior edge nearly quadrangular, with ventral edge slightly rounded in respiratory portion, forming an angle of about 150° , with hinge line in anal portion, about 4 narrow quadrate radiating ridges on each division of the posterior slope, sharply separated by deep flattened spaces equal to about their own width; about fourteen thick, prominent, rounded, radiating ridges from the beak to the ventral margin, separated by slightly narrower deep concave spaces; near the beak (for about $\frac{1}{2}$ an inch) all the ribs set with strong, blunt, transverse tubercles, about their own thickness apart (about 5 in 3 lines), but on the adults the middle and lower ends of the ribs are marked with irregular lines of growth, like the intervening hollows, except the 7 or 8 anterior ones, on which the large blunt tuberculation is continued to the ventral margin (about 3 in 2 lines); length from anterior to posterior end 2 inches 3 lines; proportional width from beak to opposite margin, $\frac{90}{100}$; depth of one valve, $\frac{124}{100}$; hinge line, $\frac{55}{100}$.

This species is much larger, thicker, and stronger than the living or the other two Tertiary species, and is readily distinguished by the tuberculation (except near the beak) being confined to the anterior ribs, leaving the middle and posterior ones only slightly wrinkled by lines of growth. The inner edge is strongly toothed by the projecting ends of the channels between the radiating ribs. Sometimes the two small most posterior ridges bear tubercles.

This species was collected by Mr. Howitt from the beds of sandy marl at Jemmy's Point, near the entrance of the Gippsland Lakes, containing *Struthiolaria* and other forms which I have observed in the Pliocene Tertiaries of New Zealand, but not of any other locality in Victoria. I have great pleasure in naming so interesting a fossil after so excellent and zealous a geologist as Mr. Howitt has proved himself in the Gippsland District.

EXPLANATION OF FIGURES.

Plate XXVII.—Fig. 1., exterior of left valve, natural size. Fig. 1a, interior of ditto. Fig. 2, exterior of right valve, natural size. Fig. 2a, interior of ditto. Fig. 2b, magnified distinct tubercles of anterior ribs. Fig. 2c, magnified more posterior ribs, with obsolete tubercles.

PLATE XXVII., FIGS. 3-5b.

CUCULLÆA CORIOENSIS (McCoy).

[Genus CUCULLÆA (LAM.). (Sub-kingd. Mollusca. Class Dithyra. Ord. Pectinacea. Fam. Arcidæ.)

Gen. Char.—Shell equivalve or nearly so, inequilateral, trapeziform, ventricose, margins closed all round; surface radiated; beaks large, nearly median; hinge line straight, long, with a triangular flat cartilage area in each valve intervening between it and the beaks; hinge teeth numerous, small, and perpendicular in the middle, with a few much larger ones diverging towards each end, sometimes crenulated on the sides; posterior adductor impression bounded anteriorly by a prominent shelly hood-like plate extending from the hollow of the beak.]

DESCRIPTION.—Obliquely trapezoidal, very gibbous, beaks very large, incurved usually nearer to the anterior than the posterior end of hinge line; hood-plate of posterior adductor small; 4 or 5 anterior and 3 or 4 posterior oblique teeth; small middle transverse hinge teeth variable in size and number; the ridge from beak to posterior abdominal or respiratory angle very obtusely rounded, and angle or junction of posterior margin with hinge line a little more than a right angle; posterior slope moderately flattened, rest of surface moderately convex; anterior margin rounded; ventral margin nearly straight, oblique to hinge line; posterior margin slightly undulating, joining in the ventral margin by an obtusely rounded angle; surface radiated with fine flat ridges, separated by narrow impressed sulci, and each usually divided by a finer one, and granulated by close transverse lines of growth (at 1 inch from beak, about 11 of the larger striæ, each divided by a smaller one, in 6 lines); inner margin coarsely toothed. Greatest length from anterior end to posterior angle, 3 inches; proportional depth from beak to ventral margin, $\frac{8.3}{100}$; thickness of one valve at right angles to plane of margin, $\frac{4.0}{100}$; length of hinge line, $\frac{6.5}{100}$; length of posterior margin, $\frac{7.0}{100}$.

The two living species of *Cucullæa* (*C. concamerata* and *C. granulosa*) of China, Nicobar, and Mauritius, do not occur in our Victorian seas, and yet this fine fossil species is one of the commonest shells of the Miocene Tertiary beds near Geelong. The fossil is distinguished from the recent species by its much greater gibbosity, thicker shell, more obtusely rounded diagonal angle defining the posterior slope (which is narrow in the recent species and sharply angular near the beak), and the posterior inferior angle is more extended obliquely, the ventral margin being more oblique to the hinge line, and in the beak being rather nearer the anterior end. I find the thickness (that is the measure at right angles to the plane of the margins) varies considerably in different specimens, as well as the number of the hinge teeth. It is only when the surface is well preserved that the transverse striæ of growth

and the fine duplicating sulcus of the ridging is well seen, so that at an inch from the beak, in a space of half an inch, 18 to 21 of the smaller striæ are to be counted in specimens with well preserved surface, but not more than half that number when the outer layer is absent. The nearest analogues of our species are the *C. ponderosa* (Hutt) of the New Zealand Tertiary beds of Awatere, and the *C. crassatina* (Lam.) from the French Upper Eocene, which, however, are much more coarsely ribbed.

Very common in the Miocene Tertiary sandy beds of Corio Bay (A^d 15); very common in similar beds (A^d 22 and A^d 23) of Bird-Rock Point, 15 miles south of Geelong, near mouth of Spring Creek; also common at Point Addis (A^d 24). Rare east of Gellibrand River (very thick variety); not uncommon at Muddy Creek, near Grange Burn, 5 miles from Hamilton; of large size in Tertiary clays of Mordialloc. Common in Tertiary clays and sands in face of cliff, Dog Island, Leigh River. Rare in Tertiary beds at Bairnsdale, Mitchell River; presented by A. W. Howitt, Esq. Not uncommon, of large size, in brown sandstone, at the entrance to the Gippsland Lakes. Thin small specimens in Oligocene clays near Mount Martha.

EXPLANATION OF FIGURES.

Plate XXVII.—Fig. 3, inner view of small specimen, natural size. Fig. 4, end view of rather small specimen with the two valves in contact showing the great thickness from one valve to the other, and the form and sulcation of the cartilage area, natural size. Fig. 5, large specimen showing the normal type with the oblique form, obtusely rounded posterior diagonal ridge, and the size and character of the striation, natural size.—(The round hole in the lower part of this specimen was the cause of its death, having been bored by the rasp-like tongue of a carnivorous gasteropod of the period.) Fig. 5a, interior of similar specimen, showing the hood-plate slightly broken at the lower end. Fig. 5b, striation magnified.

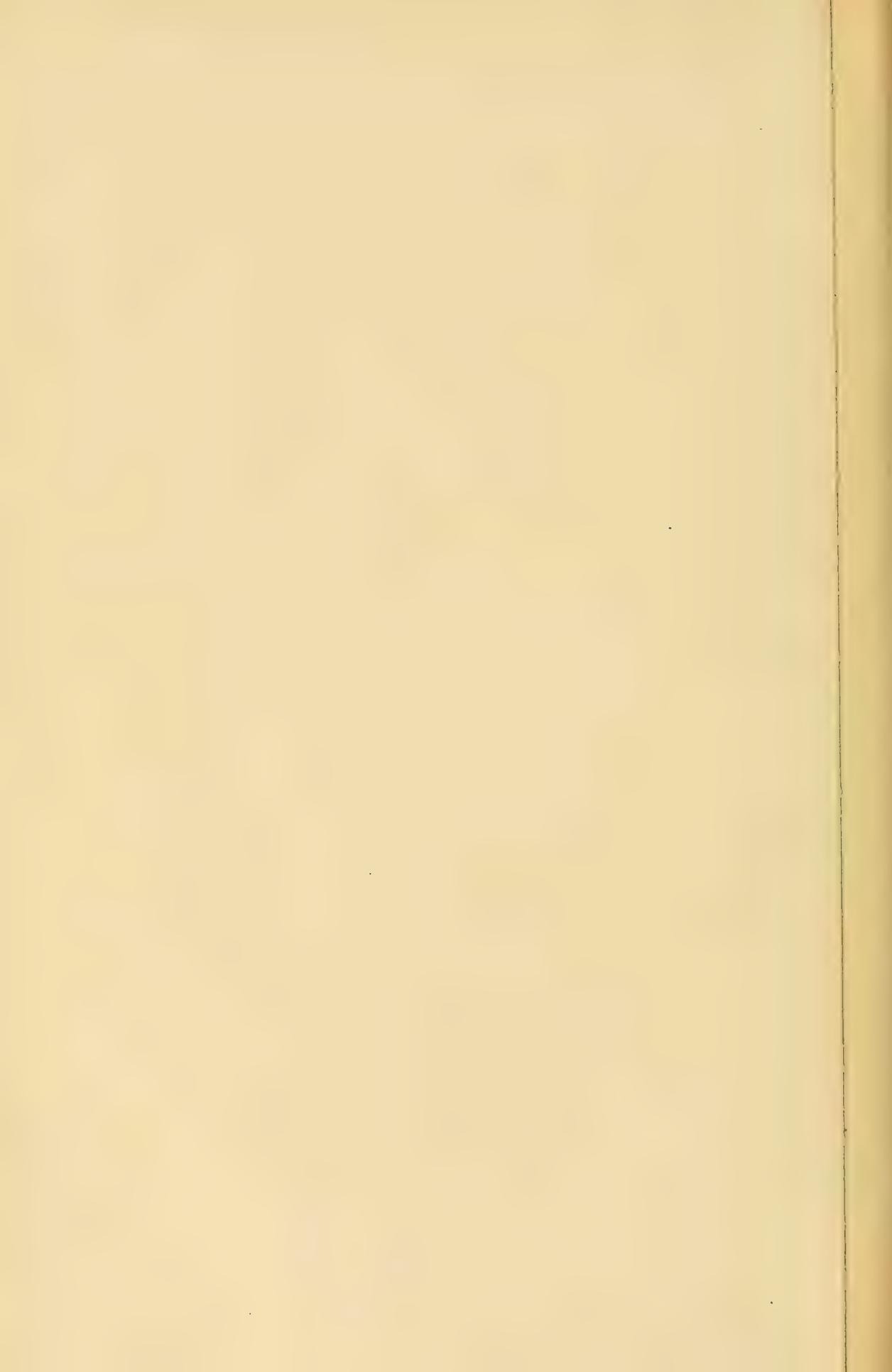
FREDERICK McCoy.



A. Bartholomew Del.
F. Schmidt Lith.

Prof. M. G. Dyer

J. M. Ferguson Inv.



PLATES XXVIII. AND XXIX., FIG. 1.

CYPRÆA (ARICIA) GIGAS (McCoy).

[Genus CYPRÆA (LIN.) (Sub-kingd. Mollusca. Class Gasteropoda. Order Pectinibranchiata. Fam. Cypræidæ.)

Gen. Char.—Shell ovato-oblong; spire very short, or entirely covered by the body whorl; back rounded; inner and outer lips inrolled; aperture narrow, as long as the shell, reflected at both ends, transversely toothed and ridged on each side.

Sub-genus.—*Aricia* (Gray). Surface highly polished; gibbous above; flattened, thickened, and dilated at the sides below; spire covered; aperture straight, narrow; outer and inner lips callous, thickened, wide, denticated.

Sub-genus.—*Trivia* (Gray). Small, globose; surface tuberculated or covered with narrow, prominent transverse ridges; spire concealed; aperture narrow, both lips denticulated.]

DESCRIPTION.—(See second Decade.)

Additional locality—In Oligocene Tertiary clays near mouth of Gellibrand River.

EXPLANATION OF FIGURE.

Plates XXVIII. and XXIX.—Fig. 1, ventral view of large specimen, natural size.

PLATES XXVIII. AND XXIX., FIGS. 2-2b.

CYPRÆA (ARICIA) EXIMIA (Sow).

DESCRIPTION.—Pyriform; back ventricose towards the posterior side, and abruptly and obtusely subtruncate to slightly depressed spire of two convex turns, partially exposed; gradually tapering to the anterior end into a long narrow slightly raised canal supported by a triangular straight-edged extension of the base; two large compressed obtusely rounded tubercles separated by a deep depression, one on each side of the dorsal aspect of the base of the anterior canal; posterior canal shorter than the anterior one, more or less reflexed, supported below by a depressed extension of the flange or base with an outwardly convex outline. Under side rounded in the middle, thickened with a narrow flattened extension at sides of anterior and posterior canals. Outer lip inflexed, strongly toothed within, teeth largest and extending slightly over base for $\frac{1}{3}$ the length of mouth in front of the middle; teeth behind the middle smaller. Base from inner lip with a broad band of deep sulci, with broad intervening ridges extending from teeth. Length of large typical specimen about 4 inches; proportional width, $\frac{50}{100}$; height, $\frac{30}{100}$; diameter of spire, $\frac{14}{100}$; length of anterior canal, $\frac{22}{100}$; length of posterior canal, $\frac{18}{100}$.

REFERENCE.—Sow. in Strzel., N. S. W., p. 296, t. 19, figs. 1-3.

I find this species varies considerably in the length of the anterior canal—in one extreme specimen almost a monstrosity, its proportion to the length is only $\frac{1.6}{100}$; but between this and the normal type are so many intervening specimens as to indicate a variety *brevis*, not having any geological significance, however, as these irregularly shortened specimens occur with the others.

Common in the Oligocene Tertiary clays between Mount Martha and Mount Eliza in Hobson's Bay; less common in similar clays at Fyansford.

Common in similar clays (A^w 9) 3 miles west of mouth of Gellibrand River.

EXPLANATION OF FIGURES.

Plates XXVIII. and XXIX.—Fig. 2, normal specimen, dorsal view, natural size. Fig. 2a, same specimen, ventral view. Fig. 2b, same specimen, profile view.

PLATES XXVIII. AND XXIX., FIGS. 3-3c.

.CYPRÆA (TRIVIA) AVELLANOIDES (McCoy).

DESCRIPTION.—Very thin ovato-globose, transverse section nearly three-fourths of a circle from the outer lip, the remainder of the inner lip curving more rapidly, obtusely rounded behind, slightly tapering in front to the short scarcely-notched canal; aperture narrow, of nearly equal width throughout (about 7 times longer than wide), the outer and inner lips nearly parallel, terminating in a very short straight channel in front, but abruptly curved to the right with the thicker outer lip behind; spire not prominent, of $3\frac{1}{2}$ turns. Surface crossed by very narrow sharply defined very prominent thread-like ridges, varying from 35 at 1 inch long to 23 at 4 lines long, on the right side, rarely dichotomising irregularly, or stopping short, more often turning abruptly out of their course with a branch-like bend to one side, so as to intercalate short ridges between a longer pair, separated by sharply-defined broad flat spaces, usually three or four times wider than the ridges, faintly indented with broad transverse scarcely visible marks. The ridges are usually interrupted by a narrow shallow longitudinal depressed smooth space along the middle of the back; 5, 6, or 7 pass vertically over the spiral whorls, and on the inner lip they are inflected angularly at the edge of the aperture to form a concave inner lip as wide as the mouth, and terminate in tubercles on its inner edge; the dorsal end not swollen, sometimes, though rarely, joining from each side, effacing the dorsal sulcus, which when present varies irregularly from half a line to a line in width in a specimen of the ordinary size of 10 lines. Greatest length of very large specimen from anterior canal to most posterior part of outer lip, 1 inch 2 lines; in proportion thereto, to end of spire, $\frac{9.5}{100}$; width, $\frac{8.5}{100}$; height, $\frac{7.5}{100}$; width of mouth, $\frac{1.0}{100}$; a

very small specimen $4\frac{1}{2}$ lines long has length to end of spire, $\frac{9.5}{100}$; width, $\frac{9.0}{100}$; height, $\frac{8.0}{100}$; width of mouth, $\frac{1.5}{100}$; showing the great uniformity of the proportions through all sizes—the very young being slightly more globose.

The greater number of specimens have a very distinctly marked smooth longitudinal dorsal scar half the length of the shell interrupting the transverse ridging; one specimen, however, having the scar as distinct as usual in great part of its length has it obliterated at one point by the alternate extensions of a few ridges from each side a little beyond the midline; and one large specimen has it entirely absent from some of the ridges, alternating with each other and stretching beyond the middle, and others of them joining continuously from side to side. When the outer layer of shell bearing the ridges is absent the surface is faintly cancellated by narrow obtuse obsolete lines, the spiral or transverse ones about as far apart as the ridges of the surface, the longitudinal ones finer, less regular, and rather closer.

This species is so much more globose and has so much fewer and more distant ridges than the *Trivia Australis* living on the Victorian shores that it is not necessary to make any further comparison. It is an exact representative of the *Trivia avellana* of the European Tertiary beds of the same age as those containing the present species, but is clearly distinguished by its uniformly shorter and more spheroidal form, the nearer identity of length and width, the shorter and wider dorsal sulcus almost always interrupting the transverse ridges, and the greater curvature of the mouth, which is nearly straight in the middle of *T. avellana*, but much arched in the present species, in which the margin of the outer lip is consequently less inflected; the sulcus is also characteristically shorter than in the European *C. avellana*, or *C. affinis* of the Suffolk Coralline Crag, and Tourain beds, with which latter it agrees better in its usually naked sulcus, but the ends of the ridges are never dilated, and in addition to the same differences of the more arched mouth and less inflected outer lip of the Australian species, the shell in it is larger, thinner, and the ridges more elevated, thinner, and farther apart.

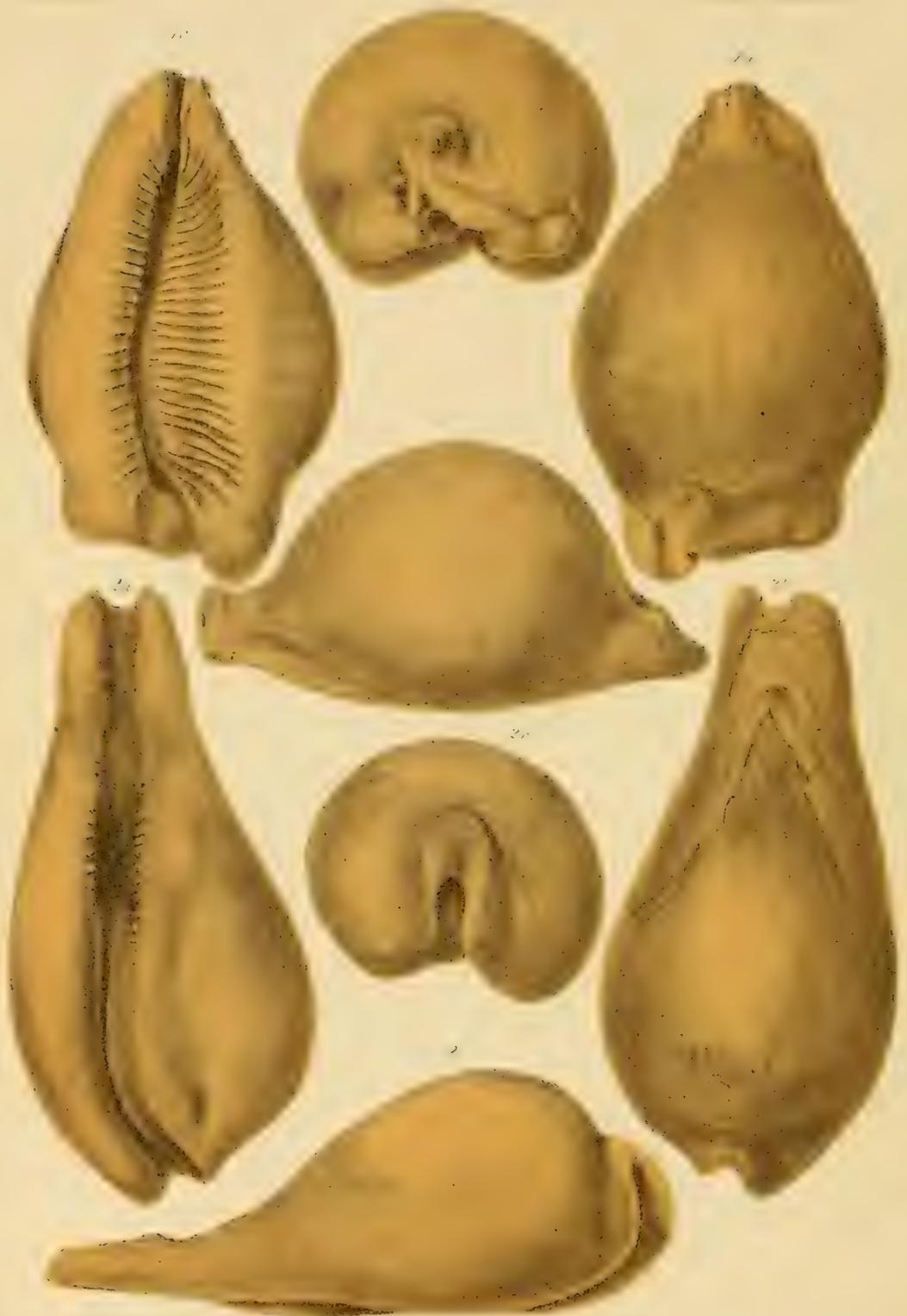
Very common in the blue Oligocene Tertiary clays and limestone between Mount Eliza and Mount Martha, in the Bay; very rare but

of large size in the blue clays of Muddy Creek, near Grange Burn, 5 miles from Hamilton; very rare and of small size in blue clay (A^d 14), outer Geelong harbor; very rare, of moderate size, in yellow marls (A^d 15), Corio Bay.

EXPLANATION OF FIGURES.

Plates XXVIII. and XXIX.—Fig. 3, average specimen, natural size, viewed from below. Fig. 3*a*, same specimen, viewed from above. Fig. 3*b*, same specimen, viewed from behind. Fig. 3*c*, portion of dorsal sulcus of same specimen, magnified.

FREDERICK MCCOY.



Ambuliceras ...

Tridacna ...

J.M. Ferguson, imp.

... Melbourne

PLATE XXX., FIGS. 1-1c.

CYPRÆA (ARICIA) PLATYPYGA (McCoy).

[Genus CYPRÆA (LIN.). (Sub-kingd. Mollusca. Class Gasteropoda. Order Pectinibranchiata. Fam. Cypræidæ.)

Gen. Char.—Shell ovato-oblong; spire very short, or entirely covered by the body whorl; back rounded; inner and outer lips inrolled; aperture narrow, as long as the shell, reflected at both ends, transversely toothed and ridged on each side.

Sub-genus.—*Aricia* (Gray). Surface highly polished; gibbous above; flattened, thickened, and dilated at the sides below; spire covered; aperture straight, narrow, outer and inner lips callous, thickened, wide, dentated.]

DESCRIPTION.—Sub-pyriform, globose; back nearly semicircular in longitudinal profile, the posterior end being more abruptly arched than the anterior portion, which forms nearly quarter of a circle, from which the narrow sub-cylindrical slightly reflexed anterior canal extends abruptly, nearly at right angles, flanked on each side by a thickened extension of the base; posterior canal short, extremely wide, extended chiefly on the right hand side, undulato-truncate behind; spire visible, of $2\frac{1}{2}$ narrow convex turns; base moderately thickened; outer lip inflected, rounded, the whole length set with coarse, strong, sub-equal teeth extending from 3 to 4 lines laterally as strong rounded ridges; inner lip with a broad flattened space sloping inward, very coarsely sulcated throughout by sub-equal, broad, flattened, prominent ridges, separated by narrow sulci, about 6 lines long. Length, 3 inches 4 lines; proportional width, $\frac{6}{100}$; depth, $\frac{5}{100}$; length of anterior canal, $\frac{1}{100}$; width of anterior canal, about $\frac{1}{100}$; length of posterior canal, $\frac{1}{100}$; width of posterior canal, $\frac{4}{100}$; diameter of exposed spire, $\frac{1}{100}$.

In the form of the base, the strong dental sulcation of the lips, and in the size of the exposed whorls of the spire, this species approaches *C. eximia*, but is much shorter and more gibbous, has much shorter anterior canal without tubercles, and it differs from it and all other species most remarkably in the great width of the subtruncate posterior end, indicated by the specific name.

Very rare in the Oligocene Tertiary clays of shore near foot of Mount Eliza.

EXPLANATION OF FIGURES.

Plate XXX.—Fig. 1, longitudinal profile, natural size. Fig. 1a, dorsal view of same specimen, showing the narrow cylindrical anterior canal, the wide truncated posterior end, and the partially exposed spire. Fig. 1b, posterior end view of same specimen, showing rounded transverse outline, and partially exposed spire. Fig. 1c, under view of same specimen, showing thickened rounded base, with narrow mouth, strong teeth of outer lip, and coarse sulcation of inner lip.

PLATE XXX., FIGS. 2-2c.

CYPRÆA (ARICIA) PLATYRHYNCHA (McCoy).

DESCRIPTION.—Pyriform; back rounded, most convex near posterior end, where a slight depression marks the place of the entirely concealed spire, gradually tapering to the anterior end, which is abruptly depressed or flattened from above downwards, and extended into a broad flat rostrum, channelled below by the straight anterior canal; posterior canal very short and abruptly reflexed to the place of the spire, the right thickened margin much larger than the left; under side rounded, mouth narrow, flexuous, nearly edentulous, the posterior half and anterior fourth of both lips without teeth, the intervening quarter of the length of the outer lip having about 12 obtuse small teeth on the edge, and the corresponding portion of inner lip with still smaller and fewer similar teeth, not extended as sulci over the base. Length, 4 inches; proportional width, $\frac{4.7}{100}$; greatest height, $\frac{4.3}{100}$; length of anterior canal, $\frac{2.5}{100}$; posterior canal, $\frac{7}{100}$; width of anterior rostral prolongation, $\frac{2.4}{100}$.

This belongs to the curious group of anteriorly prolonged *Cowries* of which the *C. eximia* is the oldest known. In this species the rostrum is flattened like a duck's bill in the type specimen; but I have seen others in which, although depressed, it is narrower, and in one or two a slight indication of the two anterior dorsal tubercles so conspicuous in *C. eximia* may be seen, and in one the number of teeth on the outer lip is greater, in all those respects showing an approach to *C. eximia*, from which, even if the anterior end were broken off, it is easily distinguished by its nearly obsolete teeth never extended into sulci, and by the completely concealed spire.

Not uncommon in the Miocene Tertiary of Bird-Rock Point, 15 miles S. of Geelong (A^d 22).

EXPLANATION OF FIGURES.

Plate XXX.—Fig. 2, profile view, natural size. Fig. 2a, view of base of same specimen, showing the paucidentate character of the mouth. Fig. 2b, dorsal view of same specimen, showing the flattened anterior beak and absence of exposed spire. Fig. 2c, posterior view of same specimen, showing form of transverse outline and absent or concealed spire.

FREDERICK MCCOY.

By Authority: GEORGE SKINNER, Acting Government Printer, Melbourne.

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N.B.—The originals of all the Figures are in the National Museum, Melbourne.

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- PLATE XX.—*Graptolites* (*Didymograpsus*) *extensus* (Hall sp.).—*Graptolites* (*Didymograpsus*) *caduceus* (Salt.).—*Diplograpsus palmeus* (Bar.).—*Graptolites* (*Cladograpsus*) *ramosus* (Hall sp.).—*Cladograpsus furcatus* (Hall sp.).—*Graptolites* (*Didymograpsus*) *gracilis* (Hall sp.).—*Retiolites Australis* (McCoy).

DECADE III.

- PLATE XXI.—*Thylacoleo carnifex* (Ow.).
- PLATES XXII. and XXIII.—*Phacops* (*Odontochile*) *caudatus* (Brong.).—*Phacops* (*Portlockia*) *fecundus* (Bar.).—*Forbesia euryceps* (McCoy).—*Lichas Australis* (McCoy).—*Homalonotus Harrisoni* (McCoy).
- PLATE XXIV.—*Aturia zic-zac* (Sow. sp.). Var. *Australis* (McCoy).
- PLATE XXV.—*Pleurotomaria Tertiaria* (McCoy).—*Haliotis ovinoides* (McCoy).—*Haliotis Mooraboolensis* (McCoy).
- PLATE XXVI.—*Haliotis Nævosoides* (McCoy).—*Cerithium Flemingtonensis* (McCoy).
- PLATE XXVII.—*Trigonia Howitti* (McCoy).—*Cucullæa Corioensis* (McCoy).
- PLATES XXVIII. and XXIX.—*Cypræa* (*Aricia*) *gigas* (McCoy).—*Cypræa* (*Aricia*) *eximia* (Sow.).—*Cypræa* (*Trivia*) *avellanoides* (McCoy).
- PLATE XXX.—*Cypræa* (*Aricia*) *platypiga* (McCoy).—*Cypræa* (*Aricia*) *platyrhyncha* (McCoy).



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