

folding of the rocks in Otago, in Nelson, and in Malborough, but not in Canterbury. Since then three depressions and two elevations have taken place, during which the greater part of the cretaceous and tertiary rocks were removed by denudation. A third elevation is going on at present.

No one who, after visiting the Alps of Switzerland, should explore the Alps of New Zealand could, I think, fail to notice two remarkable points of difference between these mountain regions. The first is that mountains, with sharp serrated summits, which are the exception in Switzerland, are the rule in New Zealand. The second is that waterfalls are rare in New Zealand in comparison with Switzerland, although the mountains of New Zealand are quite as rough and as rugged as the Alps of Europe. Also, the passes in New Zealand are lower, the valleys are much more terraced, and the mountains are generally much more covered with loose *debris*, than any part of the Swiss Alps. The explanation of these differences lies in the fact that the New Zealand Alps are far older than those of Switzerland. They have been constantly exposed to the action of rain and wind ever since the Jurassic period, and most of the larger valleys had been cut down nearly to their present depth before the Oligocene; a time when the European Alps and the Himalaya were only just rising above the sea.

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## CONTRIBUTION TO THE PALÆONTOLOGY OF THE UPPER PALÆOZOIC ROCKS OF TASMANIA.

By ROBT. M. JOHNSTON, F.L.S.

[*Read April 13, 1886.*]

During many years of observation among the Upper Palæozoic rocks of Tasmania I have made large collections of fossils in different parts of the island. Among these I have identified many forms, already described by Morris, M'Coy, Dana, de Koninck, and other authors, as occurring in a similar formation in New South Wales. There is a considerable number of important fossils which I believe to be new to science, and, as it is very desirable for purposes of reference and classification that these fossils should be described, I have ventured to submit a list of the fossils known to me as occurring in Tasmanian rocks, together with provisional descriptions of the species deemed by me to be new to science. I have long studied the variability of the various fossil forms



(especially the genera *Pachydomus* and *Notomya*), and hope that these notes and descriptions will be an aid to others who have not had equal local advantages in frequently observing such forms in the field.

LIST OF UPPER PALAEOZOIC MARINE FOSSILS KNOWN TO OCCUR  
IN TASMANIAN ROCKS.

<i>Class ACTINOZOA.</i>		<i>Localities.</i>
<i>Favosites ovata.</i>	<i>Lonsdale.</i>	Hobart, Porter's Hill, One-Tree Point, Bruny, Maria Island, Ross.
<i>Stenopora crinita.</i>	<i>Lonsdale.</i>	Hobart, Maria Island, Ross, Fingal, Prosser's Plains, Variety Bay.
„ <i>Tasmaniensis.</i>	<i>Lonsdale.</i>	Common E.T.
<i>Class CRUSTACEA.</i>		
<i>Cythere Tasmanica.</i>	<i>R.M. Johnston.</i>	Porter's Hill Beds, Hobart.
<i>Class POLYZOA.</i>		
<i>Fenestella internata.</i>	<i>Lonsdale.</i>	Very common E.T.
„ <i>plebeia.</i>	<i>M'Coy.</i>	Ditto
<i>Protoretetpora ampla.</i>	<i>Lonsdale.</i>	Ditto
<i>Class BRACHIOPODA.</i>		
<i>Leptaena.</i>		Huon Road, Porter's Hill.
<i>Orthis Michelini.</i>	<i>L'Eveillé.</i>	
<i>Orthotetes crenistria.</i>	<i>Phillips.</i>	Huon Road. (?)
<i>Productus brachythyærus.</i>	<i>G. Sowerby.</i>	River Styx, Bellerive.
„ <i>Clarkei.</i>	<i>R. Etheridge.</i>	Porter's Hill, Proctor's Road, Hobart.
„ <i>cora.</i>	<i>D'Orbigny.</i>	
„ <i>Murchisonianus.</i>	<i>de Koninck.</i>	
„ <i>pustulosus.</i>	<i>Phillips.</i>	Hobart.
„ <i>scabriculus.</i>	<i>Martin.</i>	Hall's Quarry, Hobart.
„ <i>subquadratus.</i>	<i>Morris.</i>	Mounts Dromedary and Wellington.
„ <i>undatus.</i>	<i>De-france</i>	Allan River.
<i>Rhynchonella inversa.</i>	<i>de Koninck.</i>	Bellerive, River Styx, King River.
<i>Spirifera Chee-Hiel</i>	<i>de Koninck.</i>	
„ <i>convoluta</i>	<i>Phillips.</i>	Common E.T.
„ <i>crassicostata.</i>	<i>Jukes (M.S.)</i>	Point Puer, Spring Vale
„ <i>Darwinii.</i>	<i>Morris.</i>	Common E.T.
„ <i>duodecimocostata.</i>	<i>M'Coy.</i>	Ditto
„ <i>crebristria.</i>	<i>Morris.</i>	Ilfracombe, Bellerive.
„ <i>glabra.</i>	<i>Martin.</i>	Bellerive, River Styx, Ross, Huon Road, Por- ter's Hill, etc.
„ <i>bisulcata</i>	<i>J. Sowerby</i>	Prosser's Plains ?
„ <i>lata.</i>	<i>M'Coy.</i>	Huon Road.
„ <i>oviformis.</i>	<i>M'Coy.</i>	Bellerive.
„ <i>Stokesii.</i>	<i>König.</i>	Eagle Hawk Neck, Mt. Dromedary.



„ Strzeleckii.	<i>de Koninck.</i>	Common E.T.
„ Tasmaniensis.	<i>Morris.</i>	Ditto
„ vespertilio.	<i>G. Sowerby.</i>	Ditto
<i>Strophalosia Jukesii.</i>	<i>R. Etheridge, jun.</i>	Proctor's Road, Porter's Hill.
„ productoides.	<i>Murchison.</i>	Porter's Hill.
<i>Strophomena rhomboidalis.</i>	<i>Wahlenberg.</i>	Ditto
<i>Terebratula sacculus.</i>	<i>Martin.</i>	Common E.T.
„ sacculus, var. hastata.	<i>I. de C. Low.</i>	Ditto
<i>Class PELECYPODA.</i>		
<i>Allorisma (?) curvatum.</i>	<i>Morris.</i>	Maria Island, Porter's Hill.
<i>Arca costellata.</i>	<i>M'Coy.</i>	Porter's Hill.
„ interrupta.	<i>de Koninck.</i>	Ditto
„ subarguta.	<i>de Koninck.</i>	Ditto
<i>Astartila cyprina.</i>	<i>Dana.</i>	Maria Island, Porter's Hill.
„ cytherea.	<i>Dana.</i>	Bellerive.
„ Robertsii.	<i>R.M. Johnston.</i>	New Town Falls.
„ polita.	<i>Dana.</i>	Ilfracombe.
<i>Avicula decipiens.</i>	<i>de Koninck.</i>	Porter's Hill, Bridgewater.
„ Hardyii.	<i>de Koninck.</i>	Porter's Hill, Mersey.
„ Tasmanica.	<i>R.M. Johnston.</i>	Porter's Hill, Mersey.
<i>Aviculopecten elongatus.</i>	<i>M'Coy.</i>	Ditto
„ Fittoni.	<i>Morris.</i>	Common E.T.
„ Hardyii.	<i>de Koninck.</i>	Porter's Hill.
„ Illawarensis.	<i>Morris.</i>	Common E.T.
„ limaeformis.	<i>Morris.</i>	Ditto
„ profundus.	<i>de Koninck.</i>	Porter's Hill.
„ ptychotis.	<i>M'Coy.</i>	Ditto
„ squamuliferus.	<i>Morris.</i>	Common E.T.
„ Tasmaniensis.	<i>M'Coy (M.S.)</i>	New Norfolk.
„ tessellatus.	<i>Phillips.</i>	Porter's Hill.
„ consimilis.	<i>M'Coy.</i>	Ditto
„ subquinque-lineatus.	<i>M'Coy.</i>	Ditto
„ lenisulcus.	<i>J. D. Dana.</i>	Bridgewater. (?)
„ Sprentii.	<i>R.M. Johnston.</i>	Porter's Hill, Hobart.
„ Diemenensis.	<i>R.M. Johnston.</i>	Maria Island.
„ Hobartensis.	<i>R.M. Johnston.</i>	Porter's Hill, Hobart.
<i>Streblopteria Mortonii.</i>	<i>R.M. Johnston.</i>	Shot Tower, Hobart.
<i>Cardinia (?) costata.</i>	<i>Dana.</i>	Bridgewater.
<i>Cardiomorpha gryphoides.</i>	<i>de Koninck.</i>	Mersey.
„ (?) minuta.	<i>R.M. Johnston.</i>	Prosser's Plains.
<i>Edmondia striato-costata.</i>	<i>M'Coy.</i>	Porter's Hill.
„ (?) dubia.	<i>R.M. Johnston.</i>	River Styx.
<i>Eurydesma cordata.</i>	<i>Morris.</i>	Maria Island, Porter's Hill.
„ sacculus.	<i>M'Coy.</i>	Porter's Hill.



<i>Inoceramus elegantula.</i>	<i>R.M. Johnston.</i>	Ditto
<i>Lithodomus Gouldii.</i>	<i>R.M. Johnston.</i>	Bridgewater.
<i>Modiomorpha ornatis-</i> <i>sima.</i>	<i>R.M. Johnston.</i>	Shot Tower.
<i>Notomya Gouldii.</i>	<i>R.M. Johnston.</i>	Maria Island, Bridge water.
„ <i>trigonalis.</i>	<i>R.M. Johnston.</i>	Western Tier.
„ <i>Beddomei.</i>	<i>R.M. Johnston.</i>	Bridgewater.
<i>Pachydomus carinatus.</i>	<i>Morris.</i>	Port Arthur.
„ <i>gigas.</i>	<i>M'Coy.</i>	Maria Island.
„ <i>globosus.</i>	<i>I. de C. Low.</i>	Maria Island, Mounts Dromedary and Wel- lington.
„ <i>Konincki</i>	<i>R.M. Johnston.</i>	Common E.T.
„ <i>Hobartensis.</i>	<i>R.M. Johnston.</i>	Ditto
„ <i>pusillus.</i>	<i>M'Coy.</i>	Bellerive, Porter's Hill.
<i>Pleurophorus Morrisii.</i>	<i>de Koninck</i>	Tasmania. (?)
„ <i>quinque-costatus.</i>	<i>R.M. Johnston.</i>	Bridgewater.
<i>Pterinea macroptera.</i>	<i>Morris.</i>	Common E.T.
<i>Pteronites latus</i>	<i>M'Coy.</i>	Ditto
<i>Sanguinolites Etheridgei.</i>	<i>de Koninck.</i>	Ditto
„ <i>undulatus.</i>	<i>Dana.</i>	Ditto
<i>Scaldia (?) depressa.</i>	<i>de Koninck.</i>	Porter's Hill. (?)
„ <i>lamellifera.</i>	<i>de Koninck.</i>	Ditto (?)
<i>Tellinomya Etheridgei.</i>	<i>R.M. Johnston.</i>	River Styx, Porter's Hill.

*Class GASTEROPODA.*

<i>Capulus sp.</i>		Porter's Hill.
<i>Euomphalus catillus.</i>	<i>Martin.</i>	Common E.T.
<i>Pleurotomaria Morrisiana.</i>	<i>M'Coy.</i>	Ditto.
„ <i>Woodsii.</i>	<i>R.M. Johnston.</i>	Mersey, Porter's Hill.
<i>Platyschisma ocula.</i>	<i>I. de C. Low.</i>	Common E.T.
„ <i>rotundata.</i>	<i>Morris.</i>	Ditto

*Class PTEROPODA.*

<i>Conularia inornata.</i>	<i>Dana.</i>	Mersey. (?)
„ <i>lævigata.</i>	<i>Morris.</i>	River Styx, Porter's Hill.
„ <i>tenuistriata.</i>	<i>M'Coy.</i>	Bridgewater. (?)
„ <i>Derwentensis.</i>	<i>R.M. Johnston.</i>	Ditto.
<i>Theca lanceolata.</i>	<i>Morris.</i>	Porter's Hill.

*Class CEPHALOPODA.*

<i>Cameroceras Phillipsii.</i>	<i>de Koninck.</i>	Shot Tower.
<i>Goniatites microm-</i> <i>phalus.</i>	<i>Morris.</i>	River Styx.
„ <i>strictus.</i>	<i>Dana.</i>	Ditto.
<i>Orthoceras sp.</i>		Mersey.

NOTE. — The references E.T. signify the marine mudstones, limestones, and sandstones (*Up. Pal.*) throughout the eastern half of Tasmania. The localities are too numerous to mention in detail.



## CYTHERE TASMANICA (NOV. sp.)

Shell minute, slightly compressed, oblong-ovate, surface smooth; there is a shallow depression near the middle. Length, not exceeding .5 or .75 millimetre.

This little ostracod occurs in myriads in the Porter's Hill sandstones associated with *Spirifera Darwinii*, *Conularia laevigata*, and other well-known fossils of the Upper Marine Beds. (Up. Pal.)

## Family ASTARTIDÆ. Genus ASTARTILA. (Dana.)

Shell elongately sub-triangular, inequilateral, slightly inflated, moderately thick at the beaks, and near the margins; thin in the middle; on the surface concentrically striated or lamellated; ligament external, very long; muscular impression rather large; the anterior close to the hinge, and with a small superimposed impression; pallial line entire, hinge unknown. (Tryon.)

## ASTARTILA ROBERTSII. (NOV. sp.)

Shell small, elongately oval, somewhat trigonal and equilateral, nearly a third longer than broad; beaks prominent, recurved, and approximate, central; posterior, margin arched; anterior slope deeply concave about the middle; valves regularly convex, rather compressed anteriorly; posterior and anterior muscular impression vertically oval, well-defined on cast; ventral margin gently curved; surface ornamentation unknown.

Length, 31 millimetres; height, 22 mil.; thickness, 16 mil.

Upper Pælozoic sandstones, New Town Falls.

This form approaches most closely to *Pachydomus politus*, J. D. Dana, but differs in being less tumid, in having the umboes more central, and in its greater comparative length; *P. politus* being only about one-eighth longer than broad.

## Family AVICULIDÆ. Genus AVICULA (Klein) Lamarck.

Shell obliquely oval, very inequivalve, eared; the posterior ear produced wing-like; right valve with a byssal sinus beneath the anterior ear; cartilage-pit single, oblique; hinge line with one or two small cardinal teeth, and an elongated posterior tooth, often obsolete; posterior muscular impression (adductor and pedal) large, subcentral; anterior (pedal scar) small, umbonal. (Tryon.)

## AVICULA TASMANICA. (NOV. sp.)

Shell small, obliquely spathulate; bilobed coarsely striate, concentrically; hinge line scarcely as long as shell; anterior lobe small, umbonal; posterior ridge rounded and well-defined; there is a shallow wedge-shaped trough between ridge and hinge-line, the margin of which is somewhat concave;



posterior ventral margin, rounded, gradually curved towards small oblique posterior lobe.

Length, 11 millimetres; height, 14 mil.

Common Upper Marine Beds (Upper Pal.), Mersey.

*Family* PECTINIDÆ. *Genus* AVICULOPECTEN. (McCoy.)

Shell inequivalve, suborbicular, eared; hinge-areas flat, with several long narrow cartilage furrows, slightly oblique on each side of the umbones; right valve with a deep and narrow byssal sinus beneath the anterior ear; adductor impression large, simple, sub-central; pedal scar small and deep beneath the umbo. (Tryon.)

AVICULOPECTEN DIEMENENSIS. (NOV. sp.)

Shell large, truncate-orbicular depressedly, convex; ears unequal, the posterior one of moderate size, obliquely triangular, somewhat concave; the anterior one large, subovate, flattened or slightly convex, separated at the margin from the body by a deep and acutely rounded sinus; surface of both ears and body of shell marked with numerous, rather sharp concentric lines of growth, between which there are numerous microscopic wavy concentric striae; the body is ornamented with about 22 simple raised ribs radiating from umbo to margin, where they are somewhat broader; the interspaces are deep and somewhat narrower than the ribs, and there are eight of them posteriorly, which broaden out towards margin and are divided by a fine ridge; the ribs and channels become shallower as they approach the sides; both ears are similarly ornamented with regular, simple, radiating ridges.

Length,  $3\frac{1}{2}$  inches; breadth,  $3\frac{1}{2}$  inches.

Upper Palæozoic mudstones, Maria Island.

AVICULOPECTEN SPRENTII. (NOV. sp.)

Shell truncate-orbicular, longer than wide, slightly convex; ears comparatively large, sub-equal and symmetrical, broadly wedge-shaped, slightly convex; both ears are separated from body of shell by a moderately deep sinus, that under the anterior ear being more acute; there are close, faint, concentric lines of growth on the ears, and body of shell producing an obtusely granular appearance upon the regular flattish radiating riblets; there are only about 15 riblets running from umbo to margin, towards which they gradually increase by a furcated division of the broadening, intervening spaces; generally at the extreme margin there are from two to three finer secondary riblets between each primary; each of the secondary spaces again are faintly divided near extreme margin by a tertiary riblet.



Some of the specimens attain a considerable size as indicated by fragments. The specimen from which the description is taken is about 30 millimetres long, and 30 mil. broad.

Common in Upper Palæozoic sandstones, Porter's Hill, Hobart.

In the larger fragments the radiating spaces between the fine, rounded, primary riblets seem to be bracketed together as a group by the wavy transverse striae, which are also slightly arched between each primary riblet.

AVICULOPECTEN HOBARTENSIS. (NOV. SP.)

Shell truncate-orbicular, wider than long, flatly convex; ears widely expanded, somewhat unequal—the posterior one obliquely triangular, slightly concave; the anterior one flatly convex, cuneate, separated from the body of shell by a deep, obtusely angled sinus; surface of ears and body of the shell smooth, marked with a few obtuse concentric lines of growth, and radiated by numerous fine, rounded riblets, more or less regular and simple; the intervening spaces or channels nearly equal in width to riblets; there are about 56 riblets near margin.

Length, 53 millimetres; breadth, 45 mil.; length of hinge line, 49 mil.

This is a very distinct form, although at first sight it resembles *A. subquinque-lineatus*, from which it is distinguished by its greater relative breadth, and the fineness and regularity of the riblets.

One specimen from Upper Palæozoic sandstones, Porter's Hill.

AVICULOPECTEN LATROBENSIS. (NOV. SP.)

Shell sub-orbicular, slightly convex, a little longer than broad; ears small, small, sub-equal; the posterior one is the smallest and is obliquely wedge-shaped; the anterior ear is produced into a sharply-pointed wing, and is separated from the body of shell by a deep obtuse oblique sinus; both ears and body of shell are ornamented by regular and somewhat sharply imbricated rays; on the body there are about 21 rays proceeding from umbo to ventral margin, separated by channels of about the same width; each channel is divided by a fine, slightly raised riblet, thus forming a regular alternation of large and small riblets. From the appearance of the inner face of the valve, it would seem probable that the outer surface of these imbricated ribs is somewhat squamose, and is more pronounced at distant intervals corresponding with concentric lines of growth.

Length, 46 millimetres; breadth, 43 mil. Occurs with *Spirifera Tasmaniensis* and *Pleurotomaria Woodsii*, in the Marine Tasmanite bed at the Mersey.



This is a very distinct form, and is easily recognised by the regularly, alternating large and small riblets.

*Family* PECTENIDÆ. *Genus* STREBLOPTERIA. (McCoy.)

Shell ovate or rounded, obliquely extended towards the anterior side; posterior wing broad, undefined, nearly rectangular, extending nearly as far as the posterior margin of the shell; anterior ear small, deeply defined; surface smooth or radiatingly ridged; one large, faintly-marked muscular impression a little behind the middle; one short, narrow tooth slightly diverging from the hinge line on the posterior side of the beaks; ligament confined to a narrow, simple facet on the hinge margin.

These shells differ from the short-winged Aviculæ to which they are most allied by the obliquity of the body of the shell towards the anterior instead of the posterior side. Carboniferous. (Tryon.)

STREBLOPTERIA MORTONII. (Nov. sp.)

Shell small, somewhat ovate, longer than broad, obliquely extended towards anterior side; hinge line straight; beak small, acute, situated near posterior shoulder; posterior wing reduced to a lineal sunken border extending along the whole of the posterior side; anterior ear small, rectangular; posterior side, well-defined, short, oblique, straight, nearly as long as hinge line; anterior side rounded towards inferior angle; anterior ridge well-defined, obtusely rounded near umbo, continues well-defined, near and parallel to anterior slope; surface smooth, with a few distant, faintly-defined, concentric lines of growth which are more pronounced towards ventral margin; ventral margin rounded at anterior side, thence gently curving towards posterior slope,

Length, 24 millimetres; height, 22 mil.; length of hinge line, 12 mil.

Casts common in Upper Palæozoic marine beds, One Tree Point and Porter's Hill, near Hobart.

*FAMILY* ANATINIDÆ. *Genus* CARDIOMORPHA. (Koninck.)

Shell isocardia-shaped, smooth or concentrically furrowed; umbones prominent, hinge edentulous; hinge margin with a narrow ligamental furrow, and an obscure internal cartilage groove. (Tryon.)

CARDIOMORPHA GRYPHOIDES. (de Koninck.)

Shell globular, inflated; umboes remarkably arched and laxly recurved; approximating surface of valves ornamented with fine, regular, concentric lines of growth.

Length, 75 millimetres; thickness across valves (somewhat distorted and compressed), 67 mil.



I have no hesitation in referring this form to *C. gryphoides* (de Koninck), although the specimen is distorted somewhat.

Upper Marine beds, Mersey, associated with *Gangamopteris angustifolia*. (McCoy.)

CARDIOMORPHA (?) MINUTA. (NOV. sp.)

Shell minute, somewhat compressed, wedge-shaped; beaks greatly expanded, approximate, but slightly recurved; surface with distinct concentric grooves, the interspaces being regularly, concentrically ornamented with fine striæ.

Length, 13 millimetres; breadth, 10 mil.

This very curious form is doubtfully referred to *Cardiomorpha*. Only one slightly imperfect specimen obtained from Upper Palæozoic sandstones, River Styx.

FAMILY ANATINIDÆ. Genus EDMONDIA. (Koninch.)

Shell oblong, equivalve, thin, concentrically striated, close; umbones anterior; ligamental grooves narrow, external; hinge line thin, edentulous, furnished with large oblique cartilage plates placed beneath the umbones, and leaving space for an ossicle, or the plate may be equivalent to the sub-umbonal blade in *Pholas*; pallial line simple? (Tryon.)

EDMONDIA (?) DUBIA. (NOV. sp.)

Shell small, broadly oval, inequilateral, about one-third longer than broad, regularly convex; beaks small, slightly recurved, situated nearer anterior side; surface ornamented with regular and somewhat coarse lines of growth.

Length, 24 millimetres; height, 24 mil.; thickness, 9 mil.

This form is abundant in Upper Palæozoic sandstones, River Styx. It is doubtfully placed under the genus *Edmondia*, although closely resembling *Cardiomorpha striatella* (de Koninck), from which it differs in the umboes being placed nearer anterior side, and in having the dorsal margin more decidedly arched.

FAMILY AVICULIDÆ. Genus INOCERAMUS. (Sowerby.)

Shell inequivalve, ventricose, radiately or concentrically furrowed; umboes prominent; hinge line straight, elongated; cartilage pits transverse, numerous, close set. (Tryon.)

INOCERAMUS (?) ELEGANTULA. (NOV. sp.)

Shell somewhat quadrangular, equilateral, hinge line and anterior slope straight, forming a rectangle; surface of valve divided by an oblique obsolete ridge proceeding from umbo, situated at angle between hinge line and anterior slope, and continuing to lower extremity of posterior slope; there is a shallow trough between ridge and hinge line; below ridge the valve is gently convex; posterior slope with a shallow sinus



between hinge line and extremity of posterior ridge, rounded inferiorly; ventral margin curved; surface with distant, obsolete, concentric lines of growth, which follow the curve of the sinus above posterior ridge; there are fine microscopic elongate punctures arranged quincuncially as seen under the lens.

Greatest breadth at hinge line, 35 millimetres; length, 32 mil. Upper Palæozoic Marine beds, Porter's Hill, Hobart.

FAMILY MYTILIDÆ. *Genus* LITHODOMUS. (Cuvier.)

Shell cylindrical, inflated in front, wedge-shaped behind; epidermis thick, dark; interior nacreous. (Tryon.)

LITHODOMUS AUSTRALIS. (NOV. sp.)

Shell very elongate, wedge-shaped, inflated in front, contracted anteriorly; greatest breadth about one-third of the length; there is a shallow, lateral, diagonal depression proceeding from a point near umbo to margin, forming a broad, shallow concavity in the latter; surface of valves marked with distinct concentric lines of growth which coalesce anteriorly.

Length, 77 millimetres; breadth, 28 mil.

One slightly imperfect specimen in Tasmanian Museum, from Bridgewater limestone. (Up. Pal.)

FAMILY MYTILIDÆ. *Genus* MODIOMORPHA, (Hall.)

Shell equivalve, very inequilateral, compressed subovate; beaks small, compressed within the anterior third of the length; surface with rugose or undulating concentric striæ, usually coalescing or fasciculating anteriorly; valve crossed, crossed obliquely by a more or less distinct sinus constructing the basal margin; anterior end rounded; hinge with a single, strong, wedge-shaped tooth in the left valve, and a corresponding cavity in the right valve: no lateral teeth; ligament external, attached to the thickened margin of the shell; pallial line entire. (Tryon.)

MODIOMORPHA ORNATISSIMA. (NOV. sp.)

Shell very inequilateral, compressed, mytiliform, subovate, nearly twice as long as broad; beaks minute, situated near the crown of the anterior side, which is comparatively narrow; posterior side broadly rounded; dorsal margin gently arched towards posterior; ventral margin slightly concave near the middle; surface ornamented with somewhat distant rugose or undulating lines of growth, which coalesce towards margins anteriorly; interspaces marked with microscopic concentric striæ, and these again are in many casts crossed with fine radiating lines forming a fine network.

Greatest length, 42 millimetres; greatest breadth, 20 mil.

Common as casts in Upper Marine beds (Up. Pal.), Porter's Hill, Hobart.



FAMILY Astartidæ. Genus NOTOMYA. (McCoy.) (Mœonia, Myonia, Pyramia, Cleobis.)

Shell transversely oval, sub-equivalve, inequilateral, solid, slightly gaping at both ends; hinge with one strong tooth in the right valve, which appears to correspond to a pit in the left; two muscular impressions are large and deep; a third small accessory one is situated above the interior large one; pallial sinus very small, or only indicated by a truncation of the pallial line; ligament strong, external. (Tryon.)

NOTOMYA GOULDII. (Nov. sp.)

Shell large, ventricose, solid, triognal, hatchet-shaped, inequilateral; umboes gibbose; beaks approximate; posterior slope somewhat rounded and truncate, with compressed and slightly-winged margin; anterior slope straight, longer than posterior, contained angle between both slopes fully 90 deg; a deep and obliquely curved furrow or depression on both valves runs from a point near the umboes, and continues to the ventral margin, dividing each valve into two symmetrical wedgel like lobes, and forming a somewhat deep sinus at ventral margin, the anterior lobe being larger and more produced; the surface of both valves is ornamented with very coarse, irregular, concentric, cord-like sulci, which follow the sinuation produced by the deep mesial furrow.

Breadth,  $6\frac{1}{2}$  inches; length, 7 inches; greatest depth of both valves at umboes,  $4\frac{1}{2}$  inches. Not uncommon in the Maria Island limestones. (Up. Pal.)

NOTOMYA TRIGONALIS. (Nov. sp.)

Shell large, trigonal, ventricose, thickest at umboes, inequilateral; beaks roundly obtuse, incurved, approximate; anterior slope almost straight; posterior slope slightly depressed and produced, scarcely arched; posterior ridge arched towards anterior shoulder, obtusely rounded, and becoming obsolete towards interior angle of posterior slope; ventral margin gently curved, obtusely rounded at base of posterior slope; sharply rounded, almost angled at base of anterior slope; surface of valves ornamented with regular, comparatively fine concentric striæ, and with distant obsolete concentric undulations; angle contained between slopes fully 90 deg.

Length,  $5\frac{5}{8}$  inches; breadth, 4 inches; thickness at umboes,  $3\frac{3}{8}$  inches.

This shell approaches more closely to *M. gracilis* (J. D. Dana) than to any other form, but differs from the species named in size in the straighter slopes and in the gently-curved ventral margin. Western Tiers, Tasmania.



## NOTOMYA BEDDOMEI. (Nov. sp.)

Shell large, thick, elongate, very convex, inequilateral; length fully twice the breadth; beaks gibbose, laxly incurved and approximate, situate at the anterior quarter of the valve; posterior slope gently arched and greatly produced; posterior margin slightly compressed; posterior ridge greatly arched, obtusely angular, abruptly sloping dorsally, and disappearing before reaching the posterior inferior angle; anterior slope oblique, concave under incurved beaks, and rounded inferiorly; ventral margin gently curved, obtusely rounded at junction with posterior slope, more acutely rounded at posterior slope; surface ornamented with a few flattened, distant, concentric folds, which become more dense towards anterior side.

Length,  $7\frac{1}{2}$  inches; height,  $3\frac{1}{2}$  inches; greatest thickness through centre of both valves, — inches.

One fine specimen in Tasmanian Museum, collected at Bridgewater Limestone Quarry by Captain Beddome. (Up. Pælozoic.) The only shell which approaches the above is *N. elongata* (de Koninck), from which it is easily distinguished by the concave anterior slope, and the absence of a mesial furrow or depression.

FAMILY ASTARTIDÆ. Genus PACHYDOMUS. (Morris.)  
(Megadesmus.)

Shell oval, ventricose, very thick; ligament area external; lunette more or less distinct; hinge line sunk; teeth, one or two, in each valve; adductor impressions deep; anterior pedal scar distinct; pallial line broad and simple, or with a very shallow sinus. (Tryon.)

## PACHYDOMUS KONINCKI. (Nov. sp.)

Shell transversely oval, solid, thickest at umboes: breadth about three-fourths of the length; dorsal margin arched; valves regularly convex; surface ornamented with numerous, somewhat regular concentric striae; umboes thick, greatly recurved, and mutually touching each other; some of the specimens attain a large size, and become very thick at the hinge; there is a single tooth, large and blunted, fits into a corresponding cavity in the hinge of each valve; the layers of growth on hinge and teeth are very obvious.

Specimen of moderate size.

Length,  $3\frac{7}{8}$  inches; height, 3 inches; thickness, 2 inches.

Very common in Up. Pal. rocks at Cheshunt, St. Paul's River, Ross, Styx River, Bridgewater, Hobart, One Tree Point, Bruny, Maria Island.

This shell is no doubt identical with the form figured and described as *P. globosus* by de Koninck, but quite distinct from



original form figured and described by J. Sowerby. (See Mitchell's *Three Exped. Aust.*) and Strezlecki's Phys. Descrip. of N. S. Wales and Tasmania, p. 272, plate x., figs. 2 and 3. Both species are common in the limestones at Maria Island. *P. Konincki* is much more compressed, with dorsal margin more rounded or arched; the sinus under umbo is more concave, and relatively the thickness is not half so great as in *P. globosus*.

*PACHYDOMUS HOBARTENSIS.* (Nov. sp.)

Shell large, orbicular, thick, moderately convex, equilateral; beaks recurved, approximating, gibbose; there is a prominent saddle-shaped tooth immediately under beak of left valve, the anterior wing of which is prolonged, and runs some distance parallel with curve of interior sinus; anterior slope slightly concave under beak; posterior and dorsal margins almost perfectly rounded; surface of valves ornamented with coarse concentric striæ.

Length,  $4\frac{3}{4}$  inches; breadth the same. Common in the limestones of Upper Pal. age, at the Cascades, Hobart, and in *Pachydomus* beds, Maria Island.

The almost perfectly orbicular form of this species distinguishes it from all other allies.

FAMILY ASTARTIDÆ. Genus *PLEUROPHORUS.* (King.)

Shell oblong; dorsal area defined by a line or keel; umbones anterior depressed; hinge teeth, 2·2; laterals, 1·1; elongated posterior; anterior adductor depression deep, with a small pedal scar close to it, and bounded posteriorly by a strong rib from the hinge; pallial line simple.

*PLEUROPHORUS QUINQUECOSTATUS.* (Nov. sp.)

Shell oblong-oval, compressed, very inequilateral; surface ornamented with fine concentric striæ; there are fine, somewhat broadly obsolete or flattish ridges radiating diagonally from umbo to margin across the posterior half of shell; at the junction of each ray the concentric striæ are sharply angled.

Length, 64 millimetres; height, 27 mil.

This is a very singular form, and easily distinguished from *P. Morrisi* (de Koninck) by the compressed form and the fine, flattened diagonal rays. Bridgewater limestone. (Up. Palæozoic.)

FAMILY ARCIDÆ. Genus *TELLINOMYA.* (Hall.) (CTENODONTA, Salter.)

Shell elongately oval, sub-equilateral, smooth, or finely concentrically striate; valves moderately convex; hinge represented by two diverging comb-like denticulated margins without



a special hinge area between them and the beak, and below the latter not interrupted by a pit; ligament apparently external, posterior to the beak. (Tryon.)

TELLINOMYA ETHERIDGEI. (NOV. sp.)

Shell inequilateral, trigonal, elongately oval; concentric striæ well-defined; valves moderately convex; anterior side straight and somewhat truncate, rounded inferiorly; posterior slope longest, scarcely concave, produced to a sharp point; ventral margin gently curved, simple.

Length, 13 millimetres; height, 27 mil.

Common in Upper Palæozoic Marine beds at Porter's Hill, Hobart.

This shell is easily distinguished from *T. Darwinii*, by its more convex valves, and by its more narrowly elongate form.

CONULARIA. (Miller.) (Sowerby, 1818.)

*Etym* *Conulus* (a little cone.) Syn. Conulites, Schloth, *Distr.* Fossil about 100 sp. Silurian to Carb. N. America, Europe, India, Australasia.

Shell four-sided, straight, and tapering, the angles grooved, sides striated transversely, apex partitioned off; the Conularia were the giants of the Pteropoda. *C. inornata* (Dana) of Australia is supposed to have been 16 inches long. (Tryon.)

CONULARIA DERWENTENSIS; (NOV. sp.)

Shell quadrangular, pyramidal; section rectangular; apical angle of larger sides about 25 deg., relation of the two larger sides to the two small ones, nearly as 4 to 3; faces flat or very slightly convex. A strong longitudinal furrow runs down each of the lateral angles, and a faintly marked one longitudinally divides each face into two equal parts; transverse thread-like riblets gently symmetrically arched on each face sometimes interrupted and alternate at the point where they are intersected by the faint mesial longitudinal furrow, but generally continuous; riblets coarser and more distant than in *C. lævigata*; gradually increasing in density from base to apex; near the latter there are 10 in the space of 10 millimetres, near the base there are only from 5 to 6 in the same space. It is evident that the riblets were minutely granulated as the upper riblets still preserve this character, together with fine vertical striæ in the interspaces. In the lateral channels the riblets bend abruptly towards apex, and become interrupted and alternate at junction with the riblets of the succeeding face. Sides gently sloping inwards near basal margins.

Length of perfect specimen,  $5\frac{1}{4}$  inches; greatest diameter, 49 millimetres by 37 millimetres.



There are two fine specimens in the collection of the Tasmanian Museum. The species is readily distinguished from *C. tenuistrata*, and other forms by its much wider apical angle. Dr. Waagen has recently figured a portion of a similar form from the olive group of the Salt Range, India, where it is associated with *C. lævigata* and *C. tenuistrata* as in Tasmania.

CONULARIA LÆVIGATA (Morris).

Shell smooth, elongate, pyramidal, rectangular, gradually decreasing; two of the faces larger than the other two; faces slightly concave, longitudinally sulcated at the lateral angles, ornamented with equal transverse ridges, forming a slightly obtuse angle in the mesial furrow, where they alternate with each other; ridges terminating at the bottom of the lateral channels, curving slightly upwards, and alternating with each other, producing a somewhat granulated ridge, apical angle very acute, not exceeding transverse, striæ simple, somewhat sharp, close, and regular—16 in the space of half-an-inch.

Locality. One imperfect cast from Upper Palaeozoic limestones, River Styx, and occasionally found at Porter's Hill associated with *Spirifera convoluta*, *S. glaber*, *S. Tasmaniensis*, *S. duodecimo-costata*, and other well-known forms. Occurs also at Yass Plains, New South Wales.

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NOTES ON THE GEOLOGY OF BRUNI ISLAND.

By ROBT. M. JOHNSTON, F.L.S.

[Read April 13, 1886.]

Bruni Island is separated from the mainland of Southern Tasmania by the tortuous course of D'Entrecasteaux Channel. Its greatest length—north and south—from Kelly's Point to Bruni Head is about 31 miles. Its breadth is extremely variable. A mere strip of sand over seven miles long divides Isthmus Bay on the western side from Adventure Bay on the eastern side, and the same narrow neck forms the junction between North Bruni and South Bruni. The breadth of North Bruni varies from five to seven miles, and the breadth of South Bruni varies from three to  $10\frac{1}{2}$  miles.

This variation in breadth is caused by the deep and wide indentations of its numerous bays, among which may be mentioned—Barnes Bay, Great Bay, Isthmus Bay, Little Taylor Bay, Great Taylor Bay, Cloudy Bay, and Lagoon, Adventure Bay.