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LITTLE-KNOWN AND UNDESCRIBED PERMO-CARBONIFEROUS PELECYPODA IN THE AUSTRALIAN MUSEUM.

By R. ETHERIDGE, Junr., Curator.

(Plates xxxi. – xxxiii.)

Genus STUTCHBURIA,* *gen. nov.*

In our Permo-Carboniferous formation are two bivalves that have been variously referred to *Orthonota* by Morris, *Cardinia* by Dana, and one of them to *Pleurophorus* by DeKoninck, the determination of the last named author having been at various times accepted by myself and others; possibly also one or more of the shells from the same series of rocks, termed *Cypricardia* by Dana, may be congeneric. I have, however, for some time past, from the edentulous nature of the shells in question, doubted the propriety of these references.

The species are *Orthonota? costata*, Morris (= *Pleurophorus morrisii*, DeKon.), and *O.? compressa*, Morris, which may, or may not be only the internal cast of *O. costata*. To these may perhaps be added *Pleurophorus biplex*, DeKon., and *P. randsi*, mihi. The internal structure of the two first, and particularly of *O.? costata* is known to some extent, but that of the third very little, and of the fourth not all. It is by no means certain that *P. biplex*, and *P. randsi* are congeneric with *O? costata* and *O? compressa*, and in consequence are left for the present in *Pleurophorus*. At the same time there is still an undescribed form in our Marine Series, that appears to be generically identical with *Pleurophorus:* this will be described later.

In form *O.? costata* and *O.? compressa* are narrow, transversely elongate, and more or less compressed Molluscs, inequilateral in the extreme, with simple pallial lines, strongly marked muscular scars, particularly the anterior, which are complex, and, so far as I can ascertain, edentulous, at any rate the examination of a very large number of internal casts has failed to reveal the presence of hinge teeth. In the place of the latter the cardinal margins were very much thickened, particularly at the extremities, and in all probability this was accompanied by an internal ligament. In the face of these combined characters the reference of the species

* Named in honour of Samuel Stutchbury, the first Government Geologist of New South Wales, as it then was.

in question to either *Cardinia*, *Orthonota*, or *Pleurophorus* appears to be impossible. It is a remarkable fact that the authors who have dealt with these shells invariably describe the cardinal margins as linear, narrow and concave. Indeed the remarks of both Dana and Morris indicate their mental uncertainty as to what genus they should be referred to.

I therefore propose, under the circumstances, the genus *Stutchburia* for the reception of *Orthonota*? *costata*, Morris, and if differing from it *O.* ? *compressa* also, in honour of Samuel Stutchbury, the pioneer Naturalist, and one of the two pioneer Geologists of Australia.

The characters of the new genus will be as follows :—

Shell transversely elongate, equivalve, very inequilateral, the posterior end the longer, more or less compressed, closed, test thin; posterior slopes always rounded; a mesial sulcus sometimes present in each valve; edentulous; ligament supported on the thickened hinge plates; dorsal or cardinal margins erect and sharp; umbones very anterior; the anterior adductors large, with single smaller supplementary scars (?) between them and the umbones, in the cavity of which there are at times other scars; posterior adductor scars large, but less defined; pallial lines simple; sculpture concentric and at times radiate.

The form, edentulous nature of the thin shell, internal ligament, and often radiate sculpture indicate the Solemyidæ as the family to which *Stutchburia* should be referred. The representatives of this family are *Solemya*, *Janeia*, and *Clinopistha*, to which Mr. W. H. Dall has suggested* the addition of *Orthodesma* and *Whitevesia*. Now, the proposed new genus, although resembling *Solemya* in its edentulous nature, and simple pallial line, differs entirely in having the ligament practically posterior, and no trace of the umbonal ligamental clefts. From *Janeia* it is easily distinguished by the equality of its valves, and from *Clinopistha* by outline, the presence of an internal ligament, and by the fact that the umbones are anterior and not posterior. The reference of *Orthodesma*, as described by Hall and Whitfield, to the Solemyidæ does not appear to be well established, but two of the species so described by Ulrich, from the Lower Silurian of Minnesota approach much nearer to *Stutchburia*, especially in their muscular scars.

With regard to *Whitevesia*, the edentulous nature of the hinge, simple pallial line, and internal ligament, indicate a departure towards our shell, but the grooved hinge plate, and both external and internal ligament if present, but of which there seems to be some doubt, as well as the very much feebler muscular scars,

* Dall—Trans. Wagner Free Inst., iii., 1895, p. 515.

should be sufficient to separate them. I have seen no trace of an external ligament in actual specimens of *Stutchburia*, but in one of Morris' figures† of *S. costata*, as it must now be called, there is some shading above the hinge line that certainly does present the appearance of a cartilage, but I think it is misleading and not structural.

Before proceeding with the specific descriptions, a few generic points may be dwelt on more in detail. The dorsal or cardinal margins, or hinge lines of the valves, are erect and unquestionably closed, but on their inner and lower sides form thickened obtusely rounded edges. These continue past thein conspicuous umbones, and in their substance immediately anterior to the latter, are excavated two depressions, one in each valve, which, in all probability gave attachment to the ligament at this end of the shell. If not of this nature, the only other solution is that these depressions are muscular. In the cast these thickened internal margins are represented by wide, shallow, longitudinal concavities, whilst the depressions are indicated by two sharp projections about midway between the umbones and the anterior adductor scars. The latter are large and deep, in the type species at any rate, and must have received strong and well developed muscles. On their posterior sides the interiors of the valves were much thickened, and in consequence deep depressions are left on the surface of casts, circumscribing the impressions of the muscles, which stand out boldly from the general surface, with an oblique inclination to the anterior.

The posterior adductor scars are situated high up on the flanks of the valves, immediately under the hinge lines, and although conspicuous, are less so than the anterior. They have an oblique inclination to the posterior, with the test correspondingly thickened on their anterior sides, but to a smaller extent than those of the other extremities of the shell. The simple pallial scars are well defined, continuous, and from their prominence in casts must have presented deep and sharp lines on the valve interiors.

The following are the species known to me :

STUTCHBURIA COSTATA, *Morris*, sp.

(Pl. xxxi., fig. 1.)

Orthonota ? costata, Morris, Strzelecki's Phys. Descrip. N.S. Wales, &c., 1845, p. 273, pl. 11, f. 1 (? excl. f. 2).

Cardinia ? costata, Dana, Wilkes' U. S. Explor. Exped., x., 1849, p. 692 (? pl. 4, f. 8, 8*a*, *b*, *c*.).

Pleurophorus Morrisii, DeKoninck, Pal. Foss. Nouv.-Galles du Sud, 3, 1877, p. 143, pl. 20, f. 5.

Pleurophorus Morrisii, Eth. fil., Cat. Austr. Foss., 1878, p. 77.

† Strezelecki.—Phys. Descrip. N. S. Wales, &c., 1845, pl. 11, f. 1.

(Compare *Cypricardia (Avicula?) veneris*, Dana, loc. cit., pl. 9, f. 3, 3*a* and *b*.)

Sp. Char.—Shell more or less compressed pod- or filbert-shaped, very inequilateral; dorsal and ventral margins almost parallel, the former straight, and the latter but little curved, with a slight inflection at about its anterior third; no diagonal ridges, but the valves uniformly and very slightly convex throughout, except for shallow cinctures running obliquely from the umbones posteriorly to the ventral margins; umbones inconspicuous, depressed. Anterior ends very small, slightly protruding, the margins rounded; posterior ends compressed, the margins obliquely rounded above and below. Ligamental fulcra large, leaving deep impressions in casts; ligamental (?) pits transversely elongated, inclined to triangular, represented in casts by sharp crests. Anterior adductor impressions very large, rather deltoid, concentrically grooved, the thickened posterior edges leaving wide groove-like depressions in casts, which extend to immediately in front of the umbones. Sixteen to twenty radiating costæ proceed from the umbones to the posterior margins commencing just behind the shallow oblique cinctures, with the whole surface crossed by close concentric fine lines, which imbricate the costæ.

Obs.—As this was the first species described by Morris, it must be regarded as the type. His fig. 1, of the reference quoted above, gives a faithful and accurate representation of the shell, and it will be observed that the radiating costæ are there visible on the cast, the test having broken away along the hinge line in both valves. Fig. 2 is an equally good illustration, but on this, although again a cast, the costæ are not visible at all. In DeKoninck's figure of this species the umbones are too acute and projecting, as they do not in reality overhang the anterior ends.

There appears to be every probability of Dana's *Cypricardia (Avicula ?) veneris* being nothing more than a small individual of this species.

Loc. and Hor.—Jamberoo, Black Head, and Crooked River, near Gerringong, Illawarra District—Upper Marine Series.

STUTCHBURIA COMPRESSA, *Morris*, sp.

(Pl. xxxi., fig. 2, and xxxiii., fig. 1.)

Orthonota ? costata, Morris, loc. cit., pl. 11, fig. 2, (non f. 1)
Orthonota ? compressa, Morris, loc. cit., p. 274, pl. 13, f. 4.
Orthonota compressa, Eth. fil., loc, cit., p. 74.

Obs.—The specific value of this form mainly depends on the presumed absence of the posterior radiate sculpture, but as this is seen on one of Morris' types of *S. costata*, and not on the other, it may be taken as a specific character. I have therefore included the figure without the posterior radii as a synonym of *S. compressa*,

and from the examination of several actual specimens, I believe the separation will hold good. It is also necessary to make the same remark on Dana's figure; he certainly describes *S. costata* plainly enough, but his illustration represents the form or condition known as *S. compressa* without a doubt.

The characters of *S. compressa* are practically those of *S. costata*, with the following exceptions :—The shell is rather more compressed, ligamentary pits of the hinge larger, anterior adductor scars subdivided by a groove, posterior adductor scars much transversely elongated, and an entire absence of the radiating posterior costæ. The general characters are so much alike in the two, that I shall look forward with much curiosity to future descriptions of these shells.

Loc. and Hor.—Jamberoo, and Black Head, Illawarra District —Upper Marine Series.

STUTCHBURIA SIMPLEX, *Dana*, sp.

Modiolopsis simplex, Dana, Am. Journ. Sci., iv., 1847, p. 159.

Cypricardia simplex, Dana, Wilkes' U. S. Explor. Exped., x., 1849, p. 703, pl. 9, f. 2.

Obs.—Four shells in our collection correspond in outline and size with the above species of Dana's, but with the internal characters agreeing in every respect with those of *Stutchburia*, as for instance those of the hinge, adductor impressions, and palial lines. The only points of departure are the size, a more truly oblong shape, and the exterior simple, sub-plicate, and not at all radiate. In the absence of Dana's type, it is, of course, impossible to speak with certainty, but I am strongly of opinion that his species appertains to the present genus.

Loc. and Hor.—Wollongong, Illawarra District; Jervis Bay, Shoalhaven District.—Upper Marine Series.

STUTCHBURIA FARLEYENSIS, *sp. nov.*

(Pl. xxxii., figs. 3 – 6.)

Sp. Char.—Shell transversely elongated, oblong to almost quadrangular, moderately compressed, average length one and three quarter inches, breadth one inch; dorsal and ventral margins sub-parallel, the former straight, and not quite as long as the vales, the latter slightly insinuated near the middle, and expanding posteriorly; anterior ends very small, margins slightly oblique from the umbones downwards, but in some examples almost straight walled; posterior ends much compressed, margins well and gently rounded; valves most convex about widway between the umbones and posterior termination of the hinge lines; posterior ridges very obtuse, dying out on the compressed posterior ends, above and

between them and the dorsal margins the surface of the valves is somewhat hollowed, and before them are shallow ill-defined cinctures dying off towards the insinuated points on the ventral margins; umbones inconspicuous; anterior adductor impressions triangular, of medium size but strongly marked, deep anteriorly and superiorly, with well marked bounding grooves on the posterior sides; posterior adductor impressions inconspicuous, flattened, placed high up under the hinge lines, and immediately at the ends of the dorsal margins: indications of scars exist within the umbonal cavities. Ligamental fulcral impressions wide and shallow; ligamental pits transversely elongated, each giving off an oblique and posteriorly directed ridge, and forming the anterior boundaries of the shallow cinctures. Pallial scars well marked, continuous (*i.e.*, not broken up), the surfaces below rapidly thining away o the ventral margins.

Obs.—All the specimens are in the form of internal casts, as an impure somewhat concretionary limonite, allowance must therefore be made in applying the above description to future examples with the test preserved. What the nature of this envelope was we are ignorant, but on a few of the specimens there are apparently faint indications of posterior radiating costæ. An example from the Upper Marine Series of Wollongong, possessing the outline and measurements of this species, and with the test preserved, exhibits a few radiating posterior costæ and strong imbricating laminæ of growth that may represent the more perfect condition of *S. farleyensis*, but it cannot be accepted as by any means certain.

Dana described two shells as *Cardinia ? recta* and *C.? cuneata*,* both from the Illawarra District differing greatly in outline from those forms I have made typical of the new name *Stutchburia*, but the internal features depicted in his figures are precisely similar to those of *S. farleyensis*. They seem to be edentulous, and the only point allying them with *Cardinia* are the nasute posterior ends. It is possible, therefore, that the shells in question may be species of *Stutchburia*, in which case the generic characters of the latter, will of necessity require to be slightly modified.

The internal casts of *S. farleyensis* occur in great numbers in the Lower Marine Series at Farley, near West Maitland, and it is essentially a Lower Marine species, but the Geological Survey Collection contains a shell from the Upper Marine Series of Richmond Vale, Parish of Stanford, County Northumberland, of somewhat larger dimensions than the measurements above given; otherwise it agrees in every detail with my description. This bears out the suggestion that the shell found at Wollongong, with the test preserved is also *S. farleyensis*.

* Dana—Wilkes' U.S. Explor. Exped., x., 1849, pl. 4, f. 5*a*, *b*, and f. 6*a* – *e*.

Loc. and Hor.—Railway Cutting at Farley, near West Maitland —Lower Marine Series; ? Wollongong, Illawarra District, and ? Richmond Vale, as above—Upper Marine Series.

STUTCHBURIA OBLIQUA, *sp. nov.*

(Pl. xxxi., fig. 3.)

Sp. Char.—Shell transversely obliquely oblong, slightly modioliform; length two to two and a quarter inches, depth one and one-eighth to one and a quarter inches; valves moderately convex, narrowing anteriorly, and expanding to some extent posteriorly; dorsal and ventral margins sub-parallel, the former straight, but not as long as the shell, the latter with slight inflections anterior to the greatest convexity of the valves; anterior ends remarkably small, the margins obliquely rounded, posterior ends becoming flattened, the margins obliquely rounded above and below; greatest convexity anterior to the valve centres, with ill-defined cinctures from the umbones, which are almost terminal; ligamental fulcral grooves well marked; anterior adductor scars small, somewhat triangular and immediately beneath the umbones, with slightly thickened posterior margins, posterior adductor scars inconspicuous; sculpture consisting of well marked close concentric laminæ, arranged in broad growth zones, crossed by radiating costæ (six in one example, ten in another), all posterior to the shallow cinctures, and widening from one another on and above the diagonal ridges, with a generally roughened surface.

Obs.—This species differs from all the foregoing forms in its obliquity, and somewhat modioliform outline. It resembles *S. costata* in the presence of the posterior radiating costæ, but the two cannot otherwise be mistaken for one another. It is a comparatively much broader species than either *S. simplex* or *S. farleyensis*. It is known to me both in the testiferous condition, and as an internal cast, the former being in the collection of the Geological Survey, the latter in our own.

Loc. and Hor.—Jervis Bay, Shoalhaven District (cast)—Upper Marine Series; Farley (testiferous)—Lower Marine Series.

Genus PLEUROPHORUS, *King*, 1844.

(Ann. Mag. Nat. Hist., (1), xiv., 1844, p. 313,)

Obs.—Notwithstanding the fact that the shells referred to this genus by De Koninck and myself do not fall within its limits, we still have, I believe, a true and undescribed *Pleurophorns* in our Permo-Carboniferous rocks. It occurs commonly at Farley with *Stutchburia farleyensis*, and is often mistaken for it, a little examination, however, will at once enable the difference between the two to be detected.

In *Pleurophorus*, as described by King, and redescribed by Waagen,* the equivalve closed shell possesses two cardinal interlocking teeth in each valve, and a posterior lateral one, extending the entire length of the hinge; there is a lunule and an escutcheon, entire pallial lines, and fairly well marked adductor impressions, the anteriors having before them strong shelly ridges.

Waagen has pointed out that "one of the two cardinal teeth is often very little developed," and such is the case in most of our specimens, but in a cast in the Geological Survey Collection, the impressions of all four teeth are distinctly visible.

PLEUROPHORUS GREGARIUS, *sp. nov.*

(Pl. xxxiii., figs. 2 – 5.)

Sp. Char.—Shell transversely elongated, oblong, robust, practically maintaining the same width throughout its whole length, the latter on an average one and three quarter inches, depth one inch; dorsal and ventral margins straight, parallel; bodies of the valves convex, most so at about the middle, but the flanks rather flattened or straight walled: faint cinctures exist, cutting the ventral margins at about the centre; anterior ends small, the margins convexly rounded; posterior ends but slightly flattened, the margins rounded; umbones conspicuous and incurved, a little flattened above; escutcheon long, widening posteriorly; lunule apparently cordiform, shallow; posterior cardinal teeth below the umbones, the most anterior of the left valve often inconspicuous; posterior lateral teeth leaving deep impressions in casts, the left often double; anterior adductor impressions deep, low in position, forming strong prominences in the cast, guarded by a posterior shelly ridge, which varies in intensity in individuals; posterior adductor impressions faintly marked, continuous; exterio-pallial margins flattened, leaving very conspicuous impressions in casts; sculpture of concentric laminæ, no radii.

Obs.—With one exception this is only known to me as casts, and in the adult state I find the measurements very constant. The exception referred to, otherwise possessing all the characters of the species, is two and three quarter inches long by one and a half deep. I have only seen one individual that may be *P. gregarius* with the test preserved, but it is from a different horizon. The sculpture is concentric, with well marked laminæ, but without any traces of radiating costæ. *P. gregarius* belongs to the group Imbricati in the classification of Waagen;† and in outward form resembles to some extent all three species placed by him therein, but is a broader and more robust form.

* Waagen—Mem. Geol. Surv. India, Pal. Ind. (13), iii., 1881 (Salt Range Fossils, Pelechypoda) p. 214.

† Waagen, *loc. cit.*, p. 216.

Loc. and Horizon.—Farley, near West Maitland—Lower Marine Series; ? Wollongong, Illawarra District—Upper Marine Series.

Genus LIMOPTERA, *J. Hall.*

(35th Ann. Report N.York State Mus. Nat. Hist., 1884, p. 406*a*.)*

LIMOPTERA ? PERMOCARBONIFERA, *sp. nov.*

(Pl. xxxii., figs. 1 – 2).

Sp. Char.—Shell obliquely subrhomboidal, length and width almost equal, but the latter somewhat the greater, produced postero-ventrally; valves very unequal, the left convex, the right more or less flattened, but the greatest convexity of the latter immediately below the umbone; hinge line straight, probably as wide as the shell; ligamental area not well preserved, but apparently wide and deep beneath the umbones, and narrow posteriorly; anterior ends or auricles flattened in both valves, separated from the bodies of the valves by sharp declivities, the anterior margins below obliquely and sharply rounded; posterior ends or wings triangular, flattened, much larger in the left than the right valve, distinctly demarcated from the bodies of the valves, margins sharply emarginate, then swelling out to round the protuberant postero-ventral portions. Left umbo prominent, nearly central in position, the umbonal region abrupt on the anterior, but gently sloping on the posterior side to form a posterior slope; umbonal cavity of the right valve containing a number of nodes (in the cast) indicating pits for muscular attachment; adductor impressions and pallial scars not distinctly marked; sculpture of the left valve consists of irregular concentric laminæ and faint oblique radii, extending from the umbonal centre well on to the posterior end; the surface of the right valve is transversely wrinkled on the cast.

Obs.—The specimen is somewhat mutilated, but it presents most of the principal characters of the genus *Limoptera*, with the exception of the cardinal folds and the oblique posterior tooth. The former however may be hidden by the matrix infilling the deep ligamental recess beneath the umbones. The precise generic affinity of this shell, I am not at present prepared to give, but it accords better with Hall's definition of *Limoptera* than with any other similar genus. It is more produced posteriorly than any of the shells figured by Hall under this name, and is also specifically distinct from any other yet described from New South Wales. The outward form only is that of some *Glyptodesmæ*, or *Pterinea* as restricted, or even more so perhaps *Leiopteria* or *Leptodesma*,

* It is impossible to unravel the mystery surrounding the first annunciation of many of the late Prof. James Hall's genera. This reference is simply given as one to a description of the genus.

particularly in the case of the last with its deeply emarginate posterior wing.

Loc. and Horizon.—Mouth of Crooked River, near Gerringong, Illawarra District—Upper Marine Series.

Genus MYTILOPS, *J. Hall.*

(1st Report State Geol. N. York, 1884, p. 15.)*

MYTILOPS ? RAVENSFIELDENSIS, *sp. nov.*

(Pl. xxxiii., figs. 6 – 7).

Sp. Char.—Shell (left valve) narrow, somewhat elliptical, oblique, generally mytiliform, gibbous and transversely arched posterior to the umbone; hinge line faintly arched in the cast, but less than the length of the shell; no ligamental furrows, but beneath the umbo is a single oblique cardinal fold, posterior teeth or folds none; ventral margin very obliquely inclined; umbone terminal, no anterior end; posterior end, or general body of the shell convex immediately behind the umbone, gradually flattening towards the rounded posterior margin, where the valve is broad; anterior muscular impression, invisible and the posterior very faint and high; pallial impression well marked and continuous, the exterio-pallial margin wide; sculpture unknown, but probably concentric and non-radiate.

Obs.—Allied either to *Mytilops* or *Mytilarca*. It possesses the outline of the latter genus, and approaches the former in its simpler hinge structure; differs from *Mytilarca* in the absence of a ligamental area and posterior teeth, and from *Mytilops* in the presence of the cardinal fold. So far as our Permo-Carboniferous fauna is concerned this is again an undescribed form.

Loc. and Horizon.—Ravensfield Quarry, near Farley—Lower Marine Series.

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* See note to preceding page.

EXPLANATION OF PLATE XXXI.

Stutchburia costata, Morris, sp.

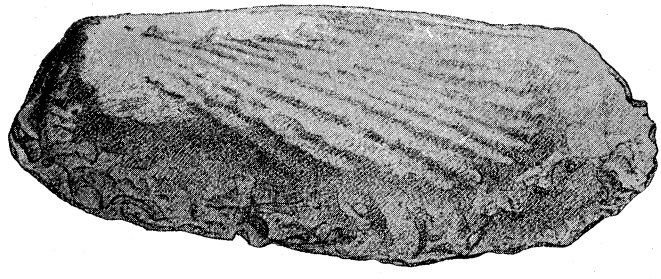
Fig. 1. Internal cast of a left valve.

Stutchburia compressa, Morris, sp.

„ 2. Internal cast of a left valve. A = crest representing the ligamental (?) pit in front of the umbo.

Stutchburia obliqua, Eth. fil.

„ 3. Internal cast of a right valve.



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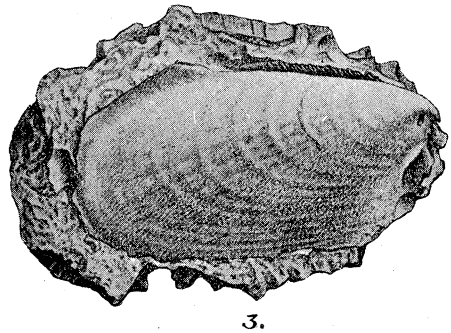

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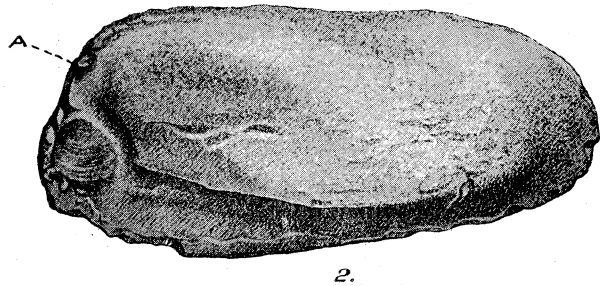

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FRANK R. LEGGATT, Del. Aust. Mus.

EXPLANATION OF PLATE XXXII.

Limoptera ? permo-carbonifera, Eth. fil.

Fig. 1. Left valve with indistinct radii.

„ 2. Right valve with ligamental pit under the left umbo and nodes representing muscular pits in the umbonal cavity of the right valve.

Stutchburia farleyensis, Eth. fil.

„ 3. Internal cast of a right valve.

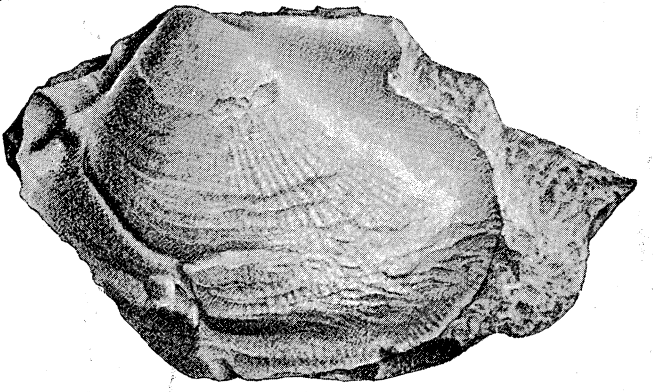
„ 4. Hinge line of conjoined valves, internal cast.

„ 5. Internal cast of anterior end of conjoined valves.

„ 6. The same of another example.

5.

6.



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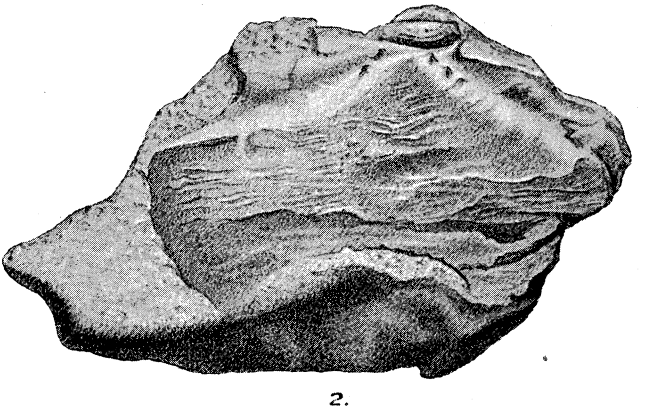

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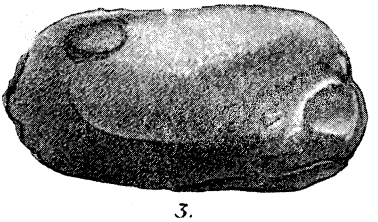

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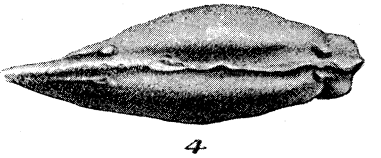

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EXPLANATION OF PLATE XXXIII.

Stutchburia compressa, Morris, sp.

Fig. 1. Internal cast of conjoined valves showing the hinge line.

Pleurophorus gregarius, Eth. fil.

„ 2. Internal cast of a right valve.

„ 3. Internal cast of the anterior end of the conjoined valves, showing the impressions of the cardinal teeth.

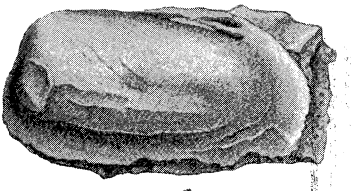
„ 4. Internal cast of a left valve, with the impressions of the lateral teeth.

„ 5. Similar to Fig. 3.

Mytilops ? ravensfieldensis, Eth. fil.

„ 6. Internal cast of a left valve.

„ 7. Anterior end showing a cardinal fold. × 3.



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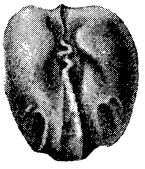

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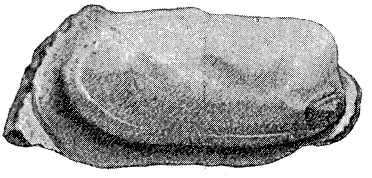

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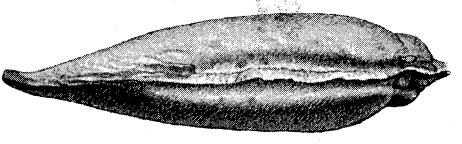

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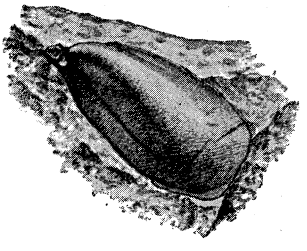

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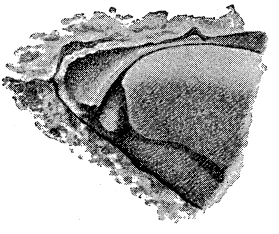

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