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LOWER DEVONIAN BRACHIOPODS FROM THE POINT HIBBS LIMESTONE
OF WESTERN TASMANIA

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(with two text-figures and four plates)

ABSTRACT

Fourteen brachiopod species belonging to the following genera are described from the middle Lower Devonian (Siegenian) Point Hibbs Limestone, Tasmania: *Schizophoria*, *Isorthis*, *Cymostrophia*, *Megastrophia*, *Hipparionyx* (?), "*Chonetes*", *Machaeraria*, *Uncinulus*, *Hebeotoechia*, *Atrypa*, *Meristella*, *Athyris*, *Cyrtina*, and *Acrospirifer*. *Megastrophia hillae* sp. nov., *Hebeotoechia hibernensis* sp. nov., and *Acrospirifer banksi* sp. nov. are erected. This fauna displays close affinity to faunas recorded from the Coopers Creek Formation, the Lilydale Limestone, and the Tabberabbera Formation of Victoria, and the Baton River Beds of New Zealand.

INTRODUCTION

The Point Hibbs Limestone is a constituent formation of the Spero Bay Group: a succession which crops out along the shoreline north of Point Hibbs and along the northern shore of Spero Bay (Figure 1). The succession has been described by Banks (*in* Spry and Banks, 1962), and by Banks, Ahmad and Ford (1960). The sequence is illustrated in figure 2.

The fauna of the Limestone has been mentioned by several authors: Hill, 1942; Banks *in* Spry and Banks, 1962; Hill, 1967; Banks *in* Talent and Banks, 1967; Philip and Pedder, 1967; Jell and Hill, 1970; Strusz, 1972; and Pickett, 1972.

This taxonomic study is based on two small collections of brachiopods, numbering about 350 specimens. The University of New England material was collected by A.E.H. Pedder and G.M. Philip in February, 1964, and is stratigraphically located mainly within the interval 45 to 90 metres above the base of the Point Hibbs Limestone (UNE macrofossil localities 455 and 456 respectively). These specimens have been assigned UNE numbers. The second collection, part of the University of Tasmania's fossil collection, includes brachiopods collected by M.R. Banks while mapping the Point Hibbs 1-mile Sheet. Specimens in this collection cannot be precisely located within the stratigraphic section. These specimens are assigned UT numbers. Attempts to locate a third suite of fossils, submitted to Robert Etheridge Jnr. in 1914 (mentioned in Hills, 1914, p.9), proved unsuccessful. Neither the Australian Museum, nor the Geological Survey of New South Wales, knows of its whereabouts (*in litt.*, 9 September, 1969; 21 October, 1969 respectively).

FAUNA, AGE AND CORRELATION

The brachiopod fauna of the Point Hibbs Limestone includes *Schizophoria* sp. cf. *S. provularia* (Maurer), *Isorthis* sp. cf. *I. festiva* Philip, *Cymostrophia bellarugosa* Talent, *Megastrophia hillae* sp. nov., *Hipparionyx* (?) sp., "*Chonetes*" sp., *Machaeraria* sp. cf. *M. formosa* (Hall), *Uncinulus* (?) *globosus* Talent, *Hebeotoechia hibernensis* sp. nov., *Atrypa* sp. cf. *A. reticularis* (Linnaeus), *Meristella* sp., *Athyris* (?) sp., *Cyrtina heteroclita* (Defrance), and *Acrospirifer banksi* sp. nov.

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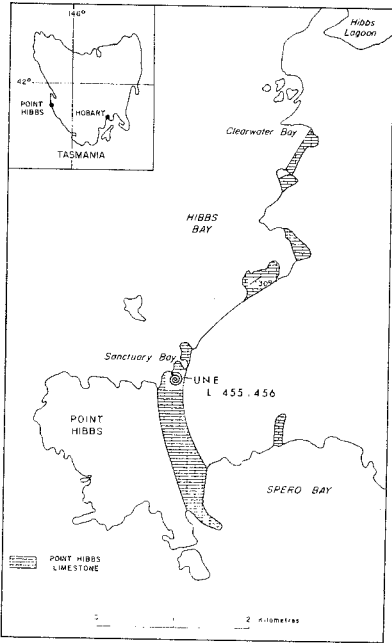


FIG. 1. - Map showing the distribution of the Point Hibbs Limestone.

Limestone (Philip and Jackson, 1970), and from the Garra Formation (Druce, 1970).

Intercontinental Lower Devonian biostratigraphic correlations have been under review (Savage, 1973b) since Carls (1969) demonstrated that Rhenish section was placed too low relative to the Bohemian section of the Lower Devonian. Therefore it has become necessary to reassign a Middle and Upper Siegenian age respectively to the Upper Yeringian and Tabberabberan Brachiopod Faunas. The Point Hibbs brachiopod fauna would be Middle to Upper Siegenian in age.

This fauna shows similarities with faunas described from the Coopers Creek Formation (Chapman, 1903; Philip, 1962), the Lilydale Limestone (Gill, 1945; 1950), and the Kilgower Member of the Tabberabbera Formation (Gill, 1945; 1949; Talent, 1963) all of Victoria, and the Baton River Beds (Shirley, 1938; Gill, 1945; Wright, 1967) of New Zealand. The fauna appears to be transitional between the Upper Yeringian (Fauna II) and the Tabberabberan (Fauna III) Brachiopod Faunas described by Strusz (1972) from Eastern Australia (see Strusz, *op. cit.* for Intra-Australian correlations).

Corroborating evidence is afforded by the conodont fauna (Philip and Pedder, 1967) which contains *inter alia* *Spathognathodus sulcatus* (Philip) which has been recorded from the Coopers Creek Formation (Philip, 1965), the Lilydale Limestone (Philip and Pedder, 1967c), the Waratah

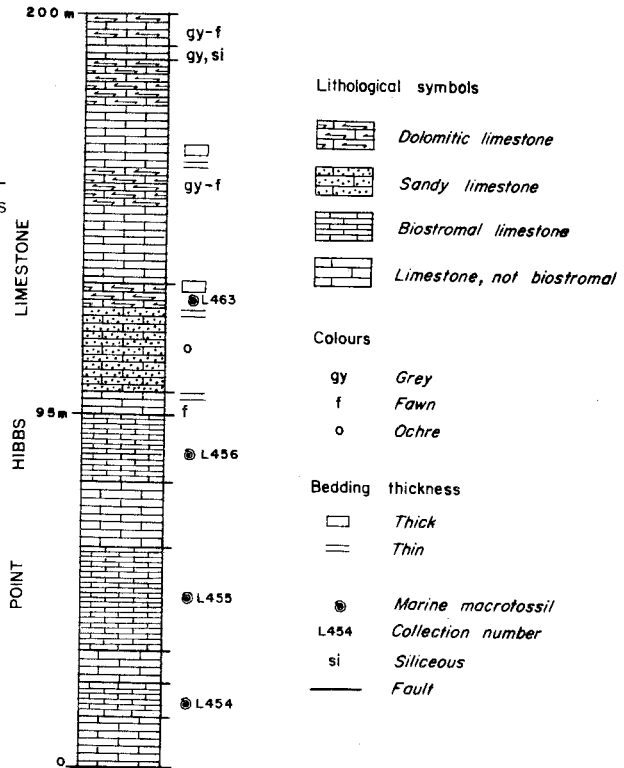


FIG. 2. - Section of the Point Hibbs Limestone, located on the northern side of Point Hibbs (measured by estimation, A.E.H. Pedder, February, 1964).

SYSTEMATIC PALAEOLOGY

Systematic designations above generic rank have been omitted. The classification given by Williams and Rowell (*in* Moore, 1965) may be consulted for taxonomic designations above the generic level. Definitions of morphological terms are contained in the brachiopod volumes of the Treatise on Invertebrate Paleontology (Moore, *op. cit.*).

Genus *Schizophoria* King, 1850

Type species. *Conchylilolithus (Anomites) resupinatus* Martin, 1809

Schizophoria sp. cf. *S. provulvaria* (Maurer, 1886)

Pl. 1, figs. 9-12

Material. 18 articulated and disarticulates shells.

University of New England: 10971 - 10985. University of Tasmania: 52132, 51931, 51389.

Description. Shells medium to large sized; unequally biconvex with brachial valve more convex than pedicle valve; cardinal extremities rounded; greatest width at midlength; hinge line straight, about half the width of the shell; dorsal valve without fold; anterior half of ventral valve with broad shallow sulcus; ventral interarea almost plane, apsacline; delthyrium high and narrow, open; dorsal interarea about half as long as ventral interarea, evenly curved, apsacline; notothyrium open, wide; external ornament of numerous fine rounded costellae, separated by narrow interspaces; costellae increase by bifurcation and intercalation; costellae crossed by few concentric growth lines.

Pedicle valve interior with long, strong, oblique dental plates, extending around the margin of the muscle area as a sharply defined ridge (Pl. 1, fig. 11); delthyrial cavity bounded by high dental plates; diductor scars only slightly divergent, separated by a narrow high ridge, presumably the site of attachment of the adductors; adjustor scars not observed; crural fossettes not seen.

Brachial valve interior with widely divergent brachiophores; fulcral plates define the sockets basally; sockets deep, notothyrial cavity occupied by a trilobate cardinal process with a thin triangular plate medially and two smaller rod-like lobes on either side; very low median ridge developed on valve floor, only extends a short distance; internal margin is crenulated by the costellae; musculature not observed.

Figured specimens. UNE 10973, 10971, 10976.

Discussion. *Schizophoria* sp. cf. *S. provulvaria* closely resembles *S. provulvaria* (Maurer) *sensu* Binnekamp (1965) from the Lower Siegenian Labanza Formation of Spain (see Renouf (1972 p. 100) for discussion). The only apparent difference is that the Tasmanian specimens have a slightly more pronounced muscle bounding ridge in the ventral valve, and the cardinal process appears to have fewer lateral lobes.

Gill (1942) described *S. provulvaria* from early Devonian strata in Victoria, and Shirley (1938) also described this species from the Baton River Beds of New Zealand. Until these specimens can be examined or comparative material collected, the author considers it best to assign the Point Hibbs material to cf. *S. provulvaria*.

S. sp. cf. *S. provulvaria* differs from other specific descriptions of *Schizophoria* in the following ways: it has a different arrangement of the pedicle valve musculature from the type species; *S. vulvaria* Schlotheim, figured by Comte (1938), possesses much finer costellation; the figure of *Schizophoria* sp., Talent (1963), from the Tabberabbera Formation, Victoria, is insufficient to allow specific comparison; *Schizophoria* sp.,

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Philip (1963), from the Boola Beds, has different pedicle muscle impressions; *S. schnurri* Struve, figured by Anderson *et al.*, (1969) is flatter and has a different arrangement of the pedicle valve musculature; the Tasmanian specimens are unlike the three species and five subspecies of *Schizophoria* described by Struve (1965); *S. ruregatensis* Renouf (1972) possesses a different muscle impression in the brachial valve.

The New Zealand material which Allan (1942) referred to *S. provulvaria* is now assigned to *Reeftonia* Allan (see Johnson & Talent, 1968).

Genus *Isorthis* Kozłowski, 1929

Type species. *Dalmanella (Isorthis) szajnockai* Kozłowski, 1929

Isorthis sp. cf. *I. festiva* Philip, 1962

Pl. 1, figs. 1-4, 8.

Material. 27 complete and incomplete shells.

UNE: 10987 - 11012. UT: 51985 - 51930.

Description. Shells medium sized, unequally biconvex; pedicle valve more convex than brachial; wider than long, maximum width near mid-length; cardinal angles obtuse, rounded to subangular; pedicle beak slightly incurved; interarea slightly curved, apsacline, about half to two-thirds the width of the shell; delthyrium open, higher than wide; poorly defined fold extends from the umbo; brachial interarea short, less than half the width of the shell, analcine; brachial beak small; a relatively deep sulcus extends from the beak; anterior commissure sulcate.

Surface multicostellate; costellae increasing by bifurcation, 15-19 costellae per five mm at ten mm from beak; surface may be marked by one or two pronounced concentric growth lines; shell substance punctate.

Pedicle valve interior with large, bluntly rounded teeth, supported by dental plates which continue anteriorly as low but distinct muscle bounding ridges; ventral muscle field elongate, extending about one-third the length of the valve, and consists of two expanding diductor scars separated by a narrow adductor ridge (Pl. 1, fig. 4); adjustor musculature not observed.

Brachial valve interior with moderately deep dental sockets, bounded by low fulcral plates, anteriorly bordered by prominent, but thin bladed, inner socket ridge; blade-like brachiophores diverge forward of the midline at about 50°; cardinal process with long shaft and usually a bilobed myophore, tending to close the notothyrium; muscle area subquadrate, extending more than half the length of the valve, with a wide median ridge; posterior adductors slightly larger than anterior adductors, line of separation not obvious.

Figured specimens. UNE 10987 - 9, 10992, 10994.

Discussion. The Point Hibbs specimens are assigned to *Isorthis* and not to *Reeftonia* (see Boucot *et al.*, 1967; and Johnson *et al.*, 1968, for discussion of *Reeftonia*) because they possess a strong pair of anteriorly divergent dental plates; the ventral diductor scars are divided by a narrow, anteriorly prominent adductor platform; the dental sockets are defined by low fulcral plates, and the dorsal adductor scars are quadripartite and so situated on the platform as to appear to have muscle bounding ridges both laterally and antero-laterally. *Isorthis festiva* is known from the Boola Beds (Philip, 1962) and the Mandagery Park Formation (Savage, 1971). The type specimens of *I. festiva* are of smaller size than the Point Hibbs specimens.

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Genus *Cymostrophia* Caster, 1939Type species. *Leptaena stephani* Barrande, 1848*Cymostrophia bellarugosa* Talent, 1963

Pl. 1, figs. 5-7.

Material. 63 incomplete articulate shells.

UNE: 1103-45. UT: 5135?, 51357, -58, -63, -73, -79, -80; 51433, -72;
51580, -83; 51907, -21, -33, -40, -83, -86; 52110;
53302, -03.

Description. Shells medium to large sized, wider than long; angle of genticulation 80° - 90° at anterior margin, decreasing towards the rectangular cardinal extremities; maximum width along hinge line; hinge line denticulate for greater than half its width; ventral inter-area low, flat, apsacline to orthocline; pseudodeltidium slightly convex; pedicle valve weakly convex, anterior and lateral margins bent dorsally, producing a long trail; visceral disc separated from trail by an inconspicuous edge; pedicle and brachial valves closely fitting; delicate papillae on both valves.

Prominent transverse rugae on disc of both valves, and interrupted by costellae; ornamentation of costellae and fine capillae; between eight and twelve costellae per 10 mm measured parallel to, and 10 mm from the hinge line; average of eight capillae between costellae, but increasing to fifteen or seventeen when central capillae become costellae.

Internals not observed.

Figured Specimens. UNE 11015-7.

Discussion. The type specimens of *Cymostrophia bellarugosa* Talent are from the Kilgower Member of the Tabberabbera Formation. The following forms which may be closely related to *C. bellarugosa* have been described: *Cymostrophia* sp. indet., and *Megastrophia* (?) sp. by Philip (1962) from the Coopers Creek Formation; *C. stephani* by Shirley (1938) and Allan (1942) from the Baton River Beds. As nothing is known of the interiors or degree of variation of these, no meaningful comparison can be made.

Genus *Megastrophia* Caster, 1939Type species. *Strophomena (Strophodonta) concava* Hall, 1857*Megastrophia hillae* sp. nov.

Pl. 2, figs. 7-9.

Name. Patronym in honour of Dorothy Hill who was the first palaeontologist to suggest a Devonian age for the Point Hibbs Limestone.

Material. Four complete and ten incomplete shells.

UNE: 11046, 11048-50. UT: 51911, -25, -46, -68, -76, -89; 51266, 51376; 94095.

Diagnosis. Small to medium sized, thin shelled *Megastrophia* with strongly developed ornament.

Description. Shells of small to medium size, concave-convex, with the pedicle valve gently arched; cardinal extremities subrounded; hinge line straight, denticulated three-

quarters the width of the valve; maximum width occurs posterior of midlength; ventral interarea long, flat, apsacline; delthyrium small, covered by pseudodeltidium; dorsal interarea long but narrow; ornamentation of costellae that increase by bifurcation and intercalation; shell substance pseudopunctate.

Pedicle valve interior with well developed myophragm, anterior of the umbo; nature of the dental plates or musculature unknown.

Brachial valve interior with low cardinal process, with posteriorly disjunct lobes, also divided into two circular muscle fields inserted on a gently elevated platform, divided by a low, narrow median ridge.

Figured specimens. Holotype UT 94095; paratypes UNE 11049, 11050.

Discussion. The pedicle valve interior impression of *Megastrophia hillae* sp. nov. illustrated on Pl. 2, fig. 9, shows close resemblance to the interior of *M. iddingsi* (Merriam), and the exterior ornament resembles *M. transitans* Johnson (see Johnson, 1970, pp. 120-123, Pl. 26, fig. 9). There are no known species of *Megastrophia* from eastern Australia that show any similarity to *M. hillae* sp. nov.

Genus *Hipparionyx* Vanuxem, 1842

Type species. *Hipparionyx proximus* Vanuxem, 1842

Hipparionyx (?) sp.

Pl. 2, figs. 10, 14

Material. Five incomplete and poorly preserved brachial valves.

UNE: 11068 - 70. UT: 51945, 51913.

Description. Exceptionally large shells, with rounded cardinal extremities; ornamentation of costellae that increase by bifurcation; brachial valve interior with high, divergent cardinal process lobes (Pl. 2, fig. 10) and median septum; no other features observed.

Figured specimens. UNE 11068-9.

Discussion. Talent (1963, p. 66) has discussed the problem of the assignment of Australian orthotetaceans to the genus *Hipparionyx*. The Point Hibbs specimens are so few and so poorly preserved, that they can only be questionably referred on the basis of a few morphological features to the previously described Australian species (Compare Pl. 2, fig. 14, with Talent, 1963, Pl. 31, fig. A2).

Species of *Hipparionyx* have been recorded by Shirley (1938) from the Baton River Beds, by Gill (1942, 1949) from sediments at Sandy Creek, and by Talent (1963) from the Tabberabbera Formation.

Genus *Chonetes* Fisher de Waldheim, 1830

Type species. *Terebratulites sarcinulatus* von Schlotheim, 1820

"*Chonetes*" sp.

Pl. 2, figs. 5-6

Material. Three incomplete pedicle valves.

UNE: 11071 - 3.

Description. Pedicle valve is medium to large sized, moderately convex; hinge line straight, slightly less than maximum width; ornament consisting of low rounded radiating costae, originating in the umbonal and hinge line region; costae increase by bifurcation; spines or concentric growth lines not observed.

Figured specimens. UNE 11071-2.

Discussion. The Point Hibbs material is referred to as "*Chonetes*" because many of the Victorian and southern New South Wales chonetid species are now referred either to *Parachonetes* or to *Protochonetes*. A more definite assignment would require material illustrating the internal structures of both valves.

"*Chonetes*" sp. may be closely related to *Chonetes robusta* Chapman (1903) which has been recorded from the Lilydale area (Gill, 1945), and from the Baton River Beds (Gill, 1952). Gill's illustrations are too poor for a detailed comparison.

"*Chonetes*" sp. has similar arrangement of costae, but is of smaller size than *Chonetes baragwanathi* Gill, described by Talent (1963) from the Tabberabbera Formation.

Genus *Machaeraria* Cooper, 1955

Type species. *Rhynchonella formosa* Hall, 1857

Machaeraria sp. cf. *M. formosa* (Hall)

Pl. 3, figs. 5-6, 9-12.

Material. 51 complete shells.

UNE: 11077 - 11122. UT: 51337, -73, -74, -77, -95; 51407, -12, -28;
51926, -42, -55, -64; 52100, -04, -08, -67.

Description. Shells small to medium sized, inequivalved, subpentagonal biconvex; wider than long; greatest width and height forward of midlength; cardinal extremities rounded; hinge line curved and small; ventral valve moderately convex; suberect beak; small submesothryd foramen; delthyrium medium sized, restricted by narrow disjunct deltidial plates; sulcus wide and deep bearing three plications, increasing by intercalation; dorsal valve strongly convex; broad umbo; small uncurved beak; fold wide and low, bearing four plications, increasing by bifurcation; anterior commissure strongly uniplicate; sinus strongly trapezoidal; surface ornament of 12-24 strong angular plications; number of plications on lateral slopes constant for each specimen; fine growth lines visible on well preserved specimens.

Pedicle valve interior with short, narrow dental plates supporting slender teeth, with small fosettes which articulate with the outer edge of the inner socket ridges; musculature not observed.

Brachial valve interior with divided hinge plate; outer plates broad and triangular, serve as crural bases; crura long and curved, free end bluntly pointed, conjunct posteriorly, forming a narrow elongate norothyrial cavity, occupied by a long thin cardinal process; musculature not impressed.

Figured specimens. UNE 11077, 11088-89.

Discussion. The Point Hibbs specimens resemble *M. formosa* (Hall) in external morphology, but definite assignment is deferred until comparative material can be obtained. The Point Hibbs specimens consistently display four plications on the fold and three in the sulcus. This, together with the angular nature of the plications, readily distinguishes them from *M. catombalensis* Strusz (1970), *M. (?)* sp. Talent (1963), and *M. cf. formosa* described by Savage (1971).

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Genus *Uncinulus* Bayle, 1878Type species. *Hemithyris subwilsoni* d'Orbigny, 1850*Uncinulus* (?) *globosus* Talent, 1956

Pl. 2, figs. 1-4.

Material. 23 complete shells.

UNE: 11148 - 69. UT: 51433; 51984.

Description. Shells small, unequally biconvex, subpentagonal to rounded in outline; lateral margins rounded; postero-lateral margin slightly concave and meeting in an acutely angular beak; beak slightly incurved to suberect; foramen minute; fold and sulcus begin anterior of mid-length; fold bears a medium depression; sulcus with an enlarged costae which appears as a median fold; anterior commissure strongly uniplicate; external ornament of 13 to 27 costae, commonly bifurcating near the anterior margin; sulcus bearing three plications; fold bearing four plications.

Pedicle valve interior with posteriorly located dental plates; teeth, musculature, median ridge not seen.

Brachial valve interior with very shallow septalium, supported posteriorly by a high, narrow median septum; median septum extends up to one third the length of the valve; hinge plate broad, thin and anteriorly divided; dental sockets narrow; musculature not distinguishable; cardinal process not observed.

Figured specimens. UNE 11154-55.

Discussion. The subtlety of the differences between the related genera of the Rhynchonellacea, added to the fact that the internal structure of *Uncinulus* (?) *globosus* Talent is not known, makes a definite generic assignment of this species questionable.

It was impossible to determine the true nature of the internal structure of the Tasmanian specimens because their very small size renders serial sectioning techniques useless and they are assigned to *U.* (?) *globosus* solely on the basis of their similar external morphology. *U.* (?) *globosus* is known from the Coopers Creek Formation (Talent, 1956)

Genus *Hebeotoechia* Havlíček, 1959Type species. *Terebratula hebe* Barrande, 1848*Hebeotoechia hibbensis* sp. nov.

Pl. 3, figs. 1-4, 7-8.

Name derivation. Point Hibbs, a headland on the western coast of Tasmania, where the species is known to occur.

Material. 50 complete and incomplete articulated shells, and six incomplete disarticulated shells.

UNE: 11123 - 11145. UT: 51360, -61, -66, -67; 51371, -75, -78, -81, -83, -84, -86, -90; 51402, -3, -5, -16, -21, -26, -27, -65, -66; 51582; 51959, -60, -74, -80, -91; 52107, -28, -33, -56; 53300; ?6908; 5336?

Diagnosis. Medium to exceptionally large sized *Hebeotoechia*, with 28 to 52 costae, increasing by bifurcation; fold and sulcus almost imperceptible; sulcus with five to seven costae; ventral muscle field circular, shallowly impressed; dental plates almost obsolete; teeth large; septalium supported by a median septum and filled out in its posterior part with callus projecting above the hinge plate as a bilobed process.

Description. Shells medium to large sized, biconvex, rounded to subpentagonal in outline; suberect pedicle beak; minute foramen; fold and sulcus almost imperceptible, developed slightly posterior of mid-length; anterior commissure strongly uniplicate; external ornament of 28 to 52 low, slightly rounded bifurcating costae, separated by narrow furrows; sulcus bears five to seven costae; longitudinally grooved costae near the commissure.

Pedicle valve interior with almost obsolete concave dental plates, supporting strong, blunt teeth; small circular muscle field shallowly impressed; pedicle cavity small.

Brachial valve interior with deep septalium, supported posteriorly by a high, narrow median septum; septalium filled out in its posterior part with callus forming the cardinal process; cardinal process bilobed and bears a bordering ridge; always a groove between the two lobes of callus; hinge plate thin and bearing short dental sockets bounded by the cardinal margin and the inner socket ridges; median septum extending about one-third the length of the valve; musculature not distinguishable.

Figured specimens. Holotype UT 51416; paratypes UNE 11123; UT 51421.

Discussion. The Point Hibbs specimens are assigned to *Hebeotoechia* Havlíček and not to *Plethorhyncha* Hall and Clarke on the basis of the internal structure of the brachial valve. Havlíček (1961, p. 119) remarks that the septalium of *Hebeotoechia* bears a bilobed cardinal process that always has a groove between the two lobes, whereas *Plethorhyncha* has a completely callus filled septalium.

Hebeotoechia hibbensis sp. nov. differs in external form from the four species, *H. hebe* (Barrande), *H. ornatia* Havlíček, *H. compta* (Barrande), and *H. nitidula* (Barrande) described by Havlíček in 1961. It also differs in external shape from *H. cantabrica* Binnekamp (1965), and from *H. cf. H. hebe* described by Lenz (1970).

Philip (1962, p. 216) referred to the presence of large rhynchonellids in the Lower Devonian of Victoria and suggested that the Lilydale form identified as *Eatonia* (*Eatonia*) affin. *bithynica* Gill (1952) (= ? *Uncinulus stricklandi* Sowerby, Chapman 1903, p. 78) could represent a species of *Plethorhyncha*. *E. bithynida* has been recorded by Shirley (1938) from the Baton River Beds. Talent (1963, p. 76) also commented on the presence of large cuboidal rhynchonellids in the Lower Devonian of Victoria. He referred specimens from Lilydale and from Tabberabbera to *Sphaerirhynchia* Cooper and Muir Wood, but qualified this assignment by suggesting that the forms could be assignable to *Hebeotoechia*. Unfortunately, the internal structures of the Victorian and New Zealand rhynchonellids are poorly known and so a detailed comparison with the Tasmanian material is not meaningful.

Genus *Atrypa* Dalman, 1828

Type species. *Anomia reticularis* Linnaeus, 1758

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Atrypa sp. cf. *A. reticularis* (Linnaeus)

Pl. 4, figs. 5, 10, 15.

Material. 11 complete shells.

UNE: 11179 - 87. UT: 51928; 53118.

Description. Shells medium to large sized; unequally biconvex, brachial valve more convex than pedicle valve; cardinal extremities subrounded; hinge line straight; maximum width near or posterior of midlength; dorsal fold and ventral sulcus present towards anterior margin; commissure gently uniplicate; pedicle beak pointed, suberect to slightly incurved; brachial beak strongly incurved, not exposed externally; inter-area or delthyrium not observable.

Ornament of well developed, rounded radial costae, numbering about ten per 10 mm at 20 mm from the beak; costae separated by narrow U-shaped interspaces; costae commonly increase by bifurcation on the pedicle valve, and by intercalation on the brachial valve; costae increase in size anteriorly; concentric growth lines only moderately defined posteriorly.

Pedicle valve interior with large blunt teeth, joined to the lateral margin of the shell and supported by dental plates which are sometimes obscured by secondary shell deposition; bounding the teeth posterolaterally are two well developed secondary dental sockets; the dorsal end of the tooth is notched by a shallow groove; musculature deeply impressed.

Brachial valve interior with what appears to be a small cardinal process; deep dental sockets are defined between the postero-lateral edge of the valve and the prominent, strongly curved crural plates; crural lobes recurve ventrally and then laterally to cover the inner edge of the posterior part of the sockets; the spirialium consisting of about 13 turns; apices of the spiralia are close to the inner surface of the valve; median septum absent; musculature not observed.

Figured specimens. UNE 11179, 11182.

Discussion. The species name cf. *A. reticularis* is generally used for forms close to the type species of *Atrypa*, because the original description, and Alexander's (1949) revision of the type species allow a wide range of forms to be placed in this species. Atrypids of this type constitute an exceedingly common and widespread group, many forms of which have names that have been erected with little or no regard to comparable forms.

Numerous Australian atrypids have been referred to as *Atrypa reticularis*. Gill (1950) described *Atrypa reticularis* from Lilydale; Chapman (1903) described *A. reticularis* var *decurrens* from the Coopers Creek Formation and Boola Beds; Philip (1962) described *A.* sp. cf. *A. reticularis* from the Boola Beds; Talent (1963) described *A.* cf. *reticularis* from the Tabberabbera Formation; Mitchell and Dun (1920) recorded *A. reticularis* from several localities in southern New South Wales; and Savage (1970) recorded a new subspecies *A. reticularis inversa* from the Mandagery Park Formation.

Until a comprehensive study is made of all Australian atrypids and a comparison made with overseas species, it would be unreasonable to positively identify the Point Hibbs material as the species *A. reticularis* as there is an enormous range of variation in shape and external ornament within that species (see *Atrypa reticularis* figured by Bowen (1967, Pl. 5, figs. 28-40), *A. "reticularis"* figured by Boucot and Johnson (1968, Pl. 3, figs. 30-49) or *A. "reticularis"* figured by Anderson *et. al.*, (1969, Pl. 7, figs. 6-19).

Genus *Meristella* Hall, 1860

Type species. *Atrypa laevis* Vanuxem, 1842

Meristella sp.

Pl. 2, figs. 11-13

Material. One complete and eight incomplete shells.

UNE: 11170 - 2; 11174; 11177 - 8.

Description. Shells medium sized, sub-equally biconvex, subcircular in outline, elliptical in profile; lateral slopes from the umbo to mid-length almost straight; length greater than width; maximum width occurring slightly posterior of midlength; hinge line short with rounded cardinal extremities; pedicle foramen small, suberect beak; sulcus and fold absent; ornament of concentric growth lines crossed by closely crowded radial lines.

Pedicle valve interior with long, strongly divergent dental plates; teeth not observed; median septum absent; musculature indistinct.

Brachial valve interior with long, high median septum extending up to midlength; median septum united to the well defined dental sockets to form a shallow cruralium; spirallium and jugum not seen; musculature indistinct.

Figured specimen. UNE 11170.

Discussion The Point Hibbs specimens are so few and so poorly preserved that a precise specific assignment is not possible. *Meristella* has been recorded from the Bell Shale (Gill, 1950), Lilydale (Gill, 1950b), Boola Beds (Philip, 1962), and from the Mandagery Park Formation (Savage, 1971).

Genus *Athyris* McCoy, 1844

Type species. *Terebratulula concentrica* von Buch, 1834

Athyris (?) sp.

Material. Three poorly preserved, incomplete shells.

UNE: 11173, -5, -6.

Description. Shells small sized, subequally biconvex, subcircular in outline; maximum width occurs close to midlength; cardinal angles obtuse and well rounded; dorsal fold and ventral sulcus slightly developed; pedicle beak slightly incurved; no other features observable.

Pedicle valve interior with short dental plates, gently concave medially; teeth not observed; median septum absent; musculature indistinct.

Brachial valve interior with well defined dental sockets; hinge plate short, perforated posteriorly, conjunct anteriorly; crura short, widely divergent; median septum absent; no other features observable.

Discussion. The degree of recrystallisation and scarcity of specimens hinders precise definition of the Point Hibbs material. The general shape, divergent dental plates, perforate hinge plate, and absence of a median septum are suggestive of *Athyris*, to which the material is tentatively assigned.

Lower Devonian Brachiopods from the Point Hibbs Limestone

Chatterton (1969) has shown that the internal structure of *Buchanathyris waratahensis* Talent (1956) agrees with that of *Athyris*. It would appear that the validity of the genus *Buchanathyris* Talent, 1956, is questionable and that forms from the Tabberabbera Formation, described by Talent (1963) could be just as well assigned to *Athyris*. The Point Hibbs specimens show resemblance to *B. westoni* (?), described by Talent (1963) from the Kilgower Member, but the preservation of the material in either collection, is insufficient to allow a more precise comparison.

The Point Hibbs specimens are relatively flatter than the figured types of *B. westoni* Talent (1956) from the Buchan Caves Limestone.

Genus *Cyrtina* Davidson, 1858

Type species. *Calceola heteroclita* DeFrance, 1828

Cyrtina heteroclita (DeFrance)

(Pl. 4, figs. 1, 6, 11)

1962 *Cyrtina* cf. *hamiltonensis*, Banks in Spry and Banks, p. 185.

1967 *Cyrtina* cf. *hamiltonensis*, Banks in Talent and Banks, p. 159.

Material. 27 complete, or almost complete shells.

UNE: 11188 - 11208. UT: 51924, -31, -47, -70, -77, -90, -93.

Description. Shells medium sized, strongly unequally biconvex; the brachial valve weakly convex, uniform convexity; pedicle valve deep and hemipyramidal, in some deformed; pedicle beak pointed, erect to slightly curved at the posterior tip; ventral interarea high, triangular, planar to moderately concave, apsacline, divided by a long narrow delthyrium; subhypoathyridid foramen present at apex of delthyrium; brachial interarea narrow and inconspicuous; cardinal angles acute (60° - 85°); maximum width at or slightly anterior of the hinge line; fold and sulcus prominent, extending from the posterior margin to the parasulcate anterior commissure; fold commonly flattened along its crest; lateral margins convex, bearing three to four rather strong rounded plications on either side of fold and sulcus; micro-ornament consists of irregularly spaced, concentric growth lamellae; shell substance finely punctate.

Pedicle valve interior with convergent dental plates, paralleling the inner edge of the delthyrium and uniting just above the floor of the valve to form a prominent spondylium, supported by a high median septum which intrudes the spondylial cavity as a trichorhinum; teeth of moderate size; muscle scars not observable.

Brachial interior with deep triangular dental sockets, supported by anteriorly divergent crural bases; crural plates absent; spiralia large, occupying most of the shell interior, each consisting of five to six volutions; median septum, cardinal process or musculature not observable.

Figured specimens. UNE 11189; UT 51393.

Discussion. Specimens from Point Hibbs are similar to *C.h. gregale* Talent (1963) in that they have similar numbers of plicae, and a deep pedicle valve that at times is twisted. Unfortunately, the originals of *C. h. gregale* consists of moulds which are distorted thus making detailed comparison with the Point Hibbs material difficult. The illustrations of specimens from the Baton River Beds of New Zealand which Shirley (1938) referred to as *C. heteroclita* are inadequate to allow any comparison with the Point Hibbs material.

An examination of the type specimens of *C. wellingtonensis* (Dun, 1904) and silicified topotypic material collected by Dr. D.L. Strusz from the Garra Formation, reveals that the Point Hibbs species can be distinguished by its smaller cardinal angle, flatter fold, less convex brachial valve, relatively larger size, and its "rugged" appearance.

Genus *Acrospirifer* Helmbrecht and Wedekind, 1923

Type species. *Spirifer primaevus* Steininger, 1853, by designation of Wedekind, 1926, p. 202.

Acrospirifer banksi sp. nov.

Pl. 4, fig. 2-4, 7-9, 12-14.

1962 *Acrospirifer*, Banks in Spry and Banks, p. 185.

1962 *Acrospirifer*, Banks in Talent and Banks, p. 159.

Name derivation. Patronym in honour of Maxwell Banks of the University of Tasmania who collected many of the brachiopod specimens.

Material. 85 complete and incomplete shells.

UNE: 11209-11214, UT: 51306, -82, -94, -97, -99; 51400, -01, -17, -19;
11216-62. 51579, 51910, -2, -17, -19, -29, -32; 51942, -44,
-49, -50, -51, -62, -73, -75, -87, -92, -93;
52124; 57906; 94096.

Diagnosis. Small to medium sized *Acrospirifer* with few (three to eight, commonly three to six) plications; plications broad and low showing a marked size increase anteriorly and marked size decrease postero-laterally; hinge line straight; cardinal extremities acute to obtuse (80° - 105°), evenly rounded; pedicle interarea long, curved, and bearing longitudinal and transverse striations; triangular delthyrium open and bordered by small deltidial plates; micro-ornament of distinct low concentric growth lamellae crossing the plications, and each bearing closely spaced tear-shaped granules.

Descriptions. Shell of small to medium size, unequally biconvex, wider than long; pedicle valve slightly more convex than brachial valve; hinge line long and straight, the place of maximum width; cardinal extremities acute to obtuse (80° - 105°) and sub-rounded; pedicle beak hooked at the posterior end; pedicle interarea long, low, triangular, slightly curved and apsacline, longitudinally and transversely striated; delthyrium triangular, open, and bordered by small deltidial plates (Pl. 4, fig. 9); brachial beak slightly incurved over the hinge area.

External ornament of three to eight well defined broad, rounded plications on each lateral slope; progressively narrower than adjoining plications; well developed non-costate brachial fold and pedicle sulcus, fold wider than high; micro-ornament of distinct low concentric lamellae crossing the plications of each lamellae bearing a row of closely spaced tear shaped granules.

Pedicle valve interior with long, well defined dental plates, widely divergent basally, commonly almost obsolescent by thick developments of secondary shell material in the umbonal cavity; teeth strong and suboval; inner surface strongly crenulated by the impression of the plications; musculature indistinct.

Brachial valve interior with short, deep dental sockets, divergent anterolaterally; socket plates thickened by the attachment of plate-like crural bases, but crural plates absent; inner surface moderately crenulated by the impression of the plications; musculature indistinct; cardinal process not observed; nature of spirallium unknown.

Figured specimens, Holotype UT94096 ; Paratypes UNE 11210 - 13 and UT 51400.

Discussion. *A. banksi* appears to be closely related to the large pauciplicate forms with deep U-shaped interspaces that are common in the Siegenian strata of the European sequence (Drot, 1964; Vandercammen, 1963), and to forms described as *A. aff. murchisoni* (Castelneau) from the *Trematospira* Zone of Nevada (Johnson, 1970, Pl. 56, figs. 5-13).

A. banksi differs from *A. lilydalensis* (Chapman, 1913) in that the latter possesses a feebly plicated ventral sulcus; a longitudinally striated dorsal fold; and eight to ten plications on each side of the fold and sulcus. Shirley's (1938) illustrations of *Acrospirifer arduennensis* from the Baton River Beds are too poor to allow comparison with the Point Hibbs specimens.

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PLATE 1

All specimens were whitened with ammonium chloride.

All figures x2 except 5 - 7 x 1½ and 4, 8 x 4.

Figs 1 - 4, 8. *Isorthis* sp. cf. *I. festiva* Philip, 1962. 1-3, Posterior, anterior, and dorsal views, UNE F10987 - 9 respectively. 4, Cast of pedicle valve interior, UNE F10992. 8, Brachial valve interior, UNE F10994.

Figs 5 - 6. *Cymostrophia bellarugosa* Talent, 1963. Ventral, dorsal, and ventral views, UNE F11015, 11017 and 11016.

Figs 9 - 12. *Schizophoria* sp. cf. *S. provularia* (Maurer, 1886). 9 - 10, Cast of ventral valve interior, and anterior, UNE F10971. II, Interior of pedicle valve, UNE 10976. 12, Ventral, view, UNE F10973.

PLATE 2

All specimens were whitened with ammonium chloride.

All figures x3 except 10 and 14 x 2.

Figs 1 - 4. *Uncinulus* (?) *globosus* Talent, 1956. Ventral, dorsal, ventral and anterior views of UNE F 11154, 11154, 11155 and 11155 respectively.

Figs 5 - 6. "*Chonetes*" sp. Ventral views UNE F11072, 11071.

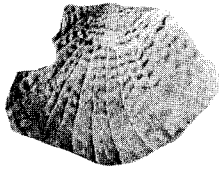
Figs 7 - 9. *Megastrophia hillae* sp. nov. Dorsal, ventral, and mold of pedicle valve interior of holotype UT 94095 and paratypes UNE 11049 and 11050.

Figs 10, 14. *Hipparionyx* (?) sp. Brachial valve interior, and shell ornament UNE 11068 and 11069.

Figs 11 - 13. *Meristella* sp. Posterior, lateral, ventral views of UNE 11170.



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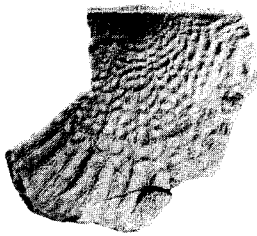
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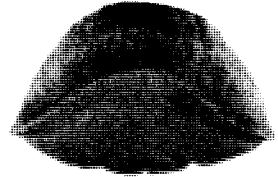
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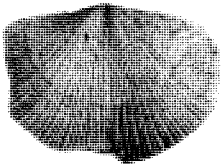
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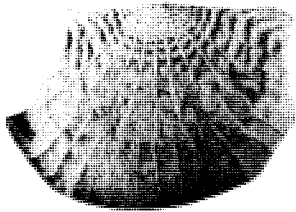
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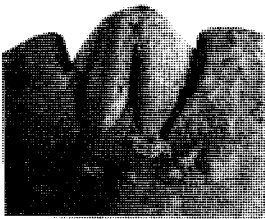
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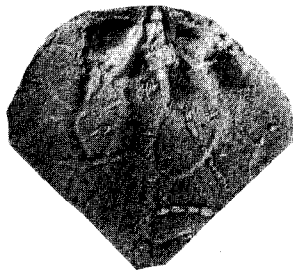
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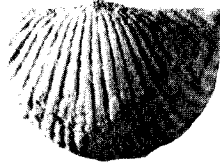
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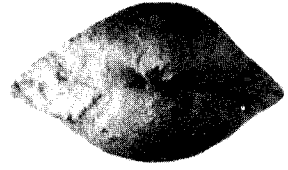
12



1



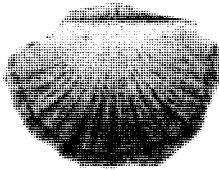
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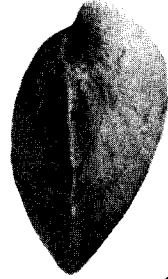
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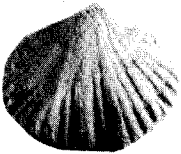
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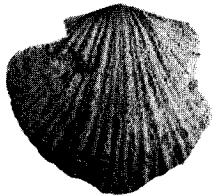
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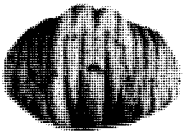
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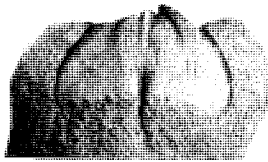
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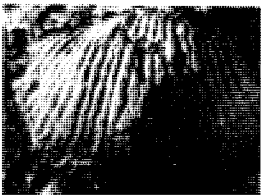
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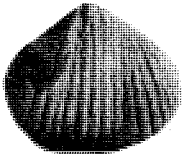
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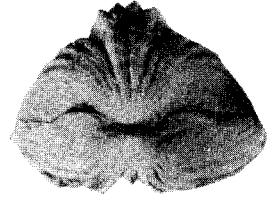
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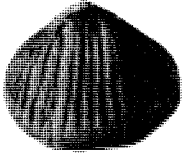
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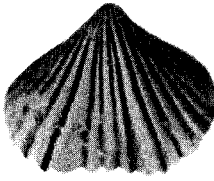
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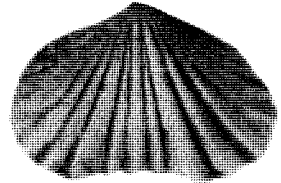
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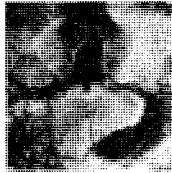
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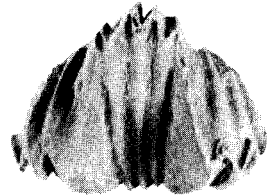
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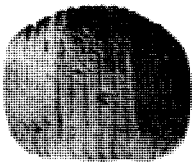
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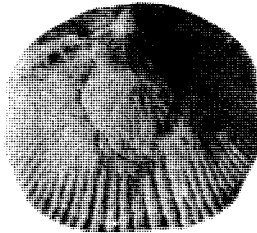
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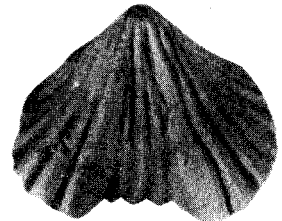
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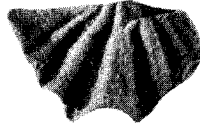
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11



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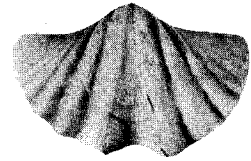
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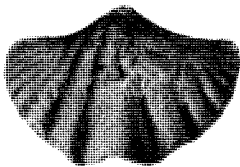
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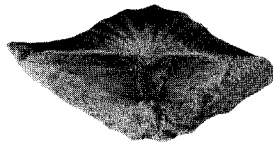
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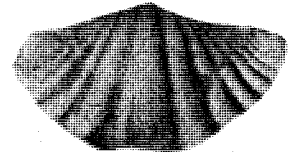
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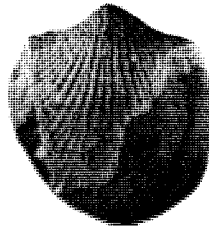
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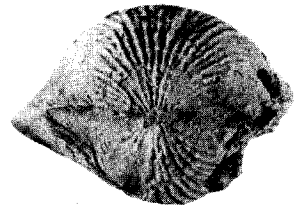
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5



10



15

PLATE 3

All specimens except 7 were whitened with ammonium chloride.
All figures x 1½ except 5, 6, 9 - 12 x 2.

Figs 1 - 4, 7 - 8. *Hebeotoechia hibbensis* sp. nov. 1 - 4, Ventral, dorsal, posterior, and anterior views, holotype UT 51416. 6, Transverse section of cardinal process, paratype UNE F 11123. 8, Cast of pedicle valve interior, paratype UT 51421.

Figs 5 - 6, 9 - 12. *Machaeraria* sp. cf. *M. formosa* (Hall, 1857) 5 - 6, Lateral and ventral views, UNE F 11088. 9 - 12, Posterior, ventral, anterior, and ventral views of UNE 11077, 11089, 11077 and 11077 respectively.

PLATE 4

All specimens were whitened with ammonium chloride.

All figures x 2 except 1, 6 and 11 x 3.

Figs 1, 6, 11. *Cyrtina heteroolita* (Defrance, 1828) Lateral, dorsal, and posterior views of UT 51393, UNE F11189 and UT 51393 respectively.

Figs 2 - 4, 7 - 9, 12 - 14. *Acrospirifer banksi* sp. nov. Anterior, lateral, dorsal, dorsal, anterior, posterior, anterior, ventral, and ventral views of paratypes UNE F 11210; 11212, UT 51400, UT 94096 (holotype) UNE F 11213, UT 51400 and UNE F 11215.

Figs 5, 10, 15. *Atrypa* sp. cf. *A. reticularis* (Linnaeus, 1758). Anterior, ventral, and anterior views of UNE F11179, 11179, and 11182.