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GASTROPODS FROM THE EARLY DEVONIAN BELL POINT LIMESTONE, CAPE LIPTRAP PENINSULA, VICTORIA

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Abstract

One new genus and five new species of gastropods are described from the late Early Devonian Bell Point Limestone, on Cape Liptrap Peninsula, 150 km south-east of Melbourne. Six other gastropod taxa are recorded. The new genus *Bassotrochus* is assigned to the family Omphalotrochidae. Together with *Orecopia murrayi* sp. nov., also from the Bell Point Limestone, *Bassotrochus angulatus* sp. nov. represents the earliest known occurrence of this family to date. The other species are *Tropidodiscus waratahensis* sp. nov., *Straparollus (Euomphalus)* sp., ? *Mourlonia* sp., *Gyronema bellense* sp. nov., *Murchisonia (Murchisonia) bassensis* sp. nov., *M. (Murchisonia)* sp. A, *M. (Murchisonia)* sp. B and *M. (Hormotomina)* sp. Also described are *Micromphalus clarkei* (de Koninck) from near Yass, N.S.W. and an indeterminate form from the Waratah Limestone, Cape Liptrap Peninsula.

This shallow water gastropod fauna occurs as both coquinite and non-coquinite assemblages associated with a diverse invertebrate community which includes corals, stromatoporoids, bivalves and brachiopods.

Introduction

The Bell Point Limestone occurs as a small faulted block on the eastern side of Cape Liptrap Peninsula which is approximately 150 km south-east of Melbourne. Exposed on this peninsula are sections of the Waratah Bay axis, one of a number of such structural axes occurring in Victoria. This axis has been the site of considerable tectonic activity and as a consequence some major faults occur on the eastern side of the peninsula. Besides the Bell Point Limestone, certain other units are also only exposed in a few small areas. These include the Early Devonian Waratah Limestone and the Early Ordovician Digger Island Limestone.

The limestones at Cape Liptrap have been known for some time, Ulrich (1875) being the first to mention them in print. However, it was not until recently that the stratigraphy of the area has become adequately known. The most recent account of the geology being that of Singleton (1968).

McCoy (1877) described the first fossil *Palaeopora interstincta* (Wahl) from the Waratah Bay area. In 1898 Etheridge noted a dorsal valve of a spirifer, some crinoid fragments and a new coral *Tryplasma*. Since then some elements of the limestone fauna including corals, ostracods and brachiopods have been described.

Although abundant at Bell Point, gastropods have only been mentioned in passing until now. Lindner (1953, p. 82) noted 'a trochoform gastropod is the only fossil in the lowest 75 feet'. Above this spiriferid brachiopods occur together with the gastropod. Higher in the section 'several small species of gastropods, including turreted and turbinate forms' occur. Similarly, Teichert (1954) listed gastropods amongst the abundant fauna of the Bell Point Limestone at Bell Point.

Talent (as cited by Singleton, 1968) listed *Bellerophon* and *Coelocaulus* amongst the gastropods occurring in the Waratah Limestone. The gastropods listed for the Bell Point Limestone include *Tropidodiscus*, *Amphelissa isisensis* and 'a new Trochid'.

Bounded by faults and in close proximity to the large Waratah fault, the Bell Point Limestone has been subjected to some stress. Partly as a result of this many of the gastropods are distorted, in addition to the crushing and fragmenting of the shells associated with the initial compaction of the sediment.

As many of the specimens are either crushed, fragmented or distorted the measurements given can only be considered as a general indication of the specimens' original shape. All measurements are in millimetres and the following symbols relating to the measurements have been used: c, number of spiral cords; Hap, height of aperture; Ht, total height of shell; L, length measured at the selenizone in

the bellerophontids, Wap, width of aperture; Wh, total number of whorls in shell; Wt, total width of shell.

All specimens used in this study are lodged in the palaeontological collection of the National Museum of Victoria.

Age of the Faunas

When Talent (1965) discussed the Bell Point Limestone he commented upon the similarity of the brachiopod fauna to that in the Buchan Caves Limestone. Such a similarity is also found amongst some of the other faunal elements of the two limestones (Vandenberg *et al.*, 1976). Philip and Pedder (1967) recognized their coral-conodont Fauna D in both the Buchan Caves Limestone and the Taemas Limestone. This coral-conodont fauna is now considered to be Early Emsian in age (Strusz, 1972).

In the older Waratah Limestone, Talent (1965) recognized a fauna containing many elements which showed considerable similarity to that found in the Coopers Creek Formation. The coral-conodont Fauna B of Philip and Pedder which has been found in both the Waratah Limestone and the Coopers Creek Formation is now considered to be Late Siegenian in age (Strusz, 1972).

As with previous studies of middle Palaeozoic gastropods in southeastern Australia, this study makes little contribution toward age determinations of the limestones. Certainly *Murchisonia (Murchisonia)* sp. A from the Bell Point Limestone is very similar to *Murchisonia (Murchisonia) turris* de Koninck known to occur in the Emsian *'Receptaculites'* Limestone at Taemas, N.S.W. Similarly the indeterminate cyrtoconoid gastropod from the Waratah Limestone would appear to have an affinity with the poorly preserved *Michelia* sp. from the similarly aged Toongabbie Limestone.

What is of considerable interest is the presence of the genera *Orecopia, Bassotrochus* and *Straparollus (Euomphalus)* in the gastropod fauna. Both *Orecopia* and *Bassotrochus* are members of the Omphalotrochidae, a family known principally from the Late Palaeozoic. The presence of these genera at Bell Point constitutes the earliest occurrence of the family to date. Their presence and that of *Micromphalus clarki* in the Late Silurian sediments of the Yass Basin, indicate an affinity not previously suspected of the Australian gastropod fauna with younger Devonian gastropod faunas of the Northern Hemisphere (Tassell, 1976).

Palaeoecology

The Bell Point Limestone is a well bedded dark muddy limestone within which minor amounts of lighter grey limestone and black shale occur. Lindner (1953) considered that it was at least 140 feet thick. Although there has been some disagreement about the depth of deposition of the Early Devonian sediments elsewhere in the Melbourne Trough it is generally agreed that the carbonate sediments occurring on the Waratah Bay axis were deposited in shallow water (Singleton, 1968; Vandenberg *et al.* 1976).

Part of the prolific and diverse fauna of the Bell Boint Limestone has been described in the past (Hill, 1954; Krommelbein, 1954; Talent, 1956; Pedder, 1965). The fauna includes stromatoporoids, tabulate and rugose corals, brachiopods, bivalves, rostroconchians, gastropods and ostracods. The faunas in this unit are preserved in two ways, either as coquinite assemblages or non-coquinite assemblages. Although less frequent the coquinite assemblages are extremely prominent, for example, assemblages of *Orecopia murrayi* and *Bassotrochus angulatus* thickly cover surfaces sometimes exceeding 25 sq m in area. A characteristic of these coquinite assemblages is their low faunal diversity. This is true for any such assemblage whether it is composed of gastropods, bivalves or any other faunal component. Similar, almost monospecific, coquinite assemblages have been reported in Eastern North America (McGhee, 1976).

Coquinas composed largely of *O. murrayi* are the most frequently occurring gastropod assemblages in the limestone. They consist of complete specimens of *O. murrayi* ranging in diameter from 4 mm upwards, as well as large quantities of angular shell fragments of

the same species. Both the fragments and the complete shells lack evidence of abrasion and transport. *S. (Euomphalus)* sp. and *B. angulatus* also occur frequently in *O. murrayi* coquinas. Similarly *O. murrayi* occurs in some of the coquinas composed of *B. angulatus* or the presently undescribed bivalves.

In contrast to the spectacular coquinas of *O. murrayi* and *B. angulatus* the coquinas or bedding plane concentrations of *Tropidodiscus waratahensis* are quite restricted, rarely exceeding a sq m in area. Unlike *O. murrayi* which occurs in association with bivalves in some coquinas, those of *T. waratahensis* contain numerous brachiopods. Again, evidence of transport or abrasion is lacking.

The non-coquinite assemblages possess a much greater faunal diversity. For example *M. (Murchisonia) bassensis* occurs in the light grey limestone with rugose corals, bivalves, brachiopods, rostroconchians as well as occasional individuals of *O. murrayi*. *M. (Murchisonia)* sp. B found in a similar limestone is associated with rugose corals, ostracods, bivalves, brachiopods, rostroconchians and infrequent examples of *T. waratahensis*.

The composition of this gastropod fauna differs considerably from any other non-platyceratid fauna of similar age known from southeast Australia. Unlike the Lilydale fauna which is dominated by turbiniform and high spired gastropods, notably *'Cyclonema'* and some murchisoniaceans, the Bell Point Limestone fauna is dominated absolutely by the medium-sized rotelliform *O. murrayi*. High spired and turbiniform gastropods form only a small component of the fauna in numerical terms although they account for much of the fauna's diversity.

Systematic Descriptions

Family BELLEROPHONTIDAE McCoy, 1851

Subfamily TROPIDODISCINAE Knight, 1956

Genus Tropidodiscus Meek and Worthen, 1866

Type Species: Bellerophon curvilineatus Conrad, 1842; Lower Devonian; Schoharie, New York.

Tropidodiscus waratahensis sp. nov.
(Plate 1, figure 1)

Diagnosis: small form of genus with subdued dorsal crest and fine closely spaced growth lines.

Description: Small form with angular dorsal crest; whorl profile gently rounded between dorsal crest and edge of the umbilicus, then rounds more strongly into the umbilicus; umbilici deep and wide; aperture sub-triangular with a ridge formed by the dorsal crest of preceding whorl on the inner lip; inner lip thin; thick strongly prosocyrt outer lip passes backwards obliquely from the suture to form a moderately deep v-shaped sinus at the dorsal crest, narrow convex selenizone raised above former edges of the slit; fine closely spaced collabral lines.

Dimensions:

	L	Wh
P46963	7·5	—
P46964	3	2
P46965	4	3+
P46966	7	3+
P46967	8	—

Location of Types: National Museum of Victoria. Holotype, P46963. E. D. Gill Coll.

Material: Holotype and 20 other specimens.

Discussion: Besides being substantially smaller than the type species, *T. waratahensis* has finer, more closely spaced collabral lines. *T. centrifugalis* (Chapman) from Lower Devonian mudstones at Killara and Loyola in the Melbourne Trough is of similar size to *T. waratahensis*. However, its prominent dorsal crest and widely spaced, frequently foliaceous collabral lines distinguish it from the Bell Point Limestone species. An undescribed species from the Lilydale Limestone is smaller and has more prominent collabral lines than *T. waratahensis*.

Talent (1963) described *Tropidodiscus* sp. A from the Kilgower Member, Tabberabbera. This species does have fine closely spaced prosocyrt collabral lines similar to those of *T. waratahensis*. Poor preservation of the slightly larger Tabberabbera forms precludes further comparisons.

Family EUOMPHALIDAE de Koninck, 1881
Genus Straparollus Montfort, 1810
Subgenus Straparollus (Euomphalus), J. Sowerby, 1814

Type Species: Euomphalus pentangulatus J. Sowerby, 1814; Lower Carboniferous; near Dublin, Ireland.

Discussion: The variability of specific characters in this genus has been commented upon by numerous authors (Knight, 1934; Batten, 1966). The latter author cited the example of *S. (E) acutus* (J. Sowerby) which possesses the high spired shell of *S. (Straparollus)* and the well developed angulate whorl of *S. (Euomphalus).* The limited material from the Bell Point Limestone provides a further example of this variability.

Straparollus (Euomphalus) sp.
(Plate 1, figures 15, 21)

Description: Medium to large low spired gastropod with angular whorl profile; sutures distinct but variable in form during growth; numerous whorls with profile which varies with growth and the degree of development of the upper keel; initially whorls gently rounded to nearly flat between sutures; with growth, profile flat to gently concave and inward sloping between the upper suture and the variability developed upper keel at the junction of the upper and outer whorl surfaces; the junction of the outer and basal whorl surfaces particularly in the late growth stages forms a prominent narrow thickened peripheral frill; between the upper keel and the basal frill the whorl profile is gently rounded; base gently rounded to circum-umbilical swelling where it becomes more strongly arched; narrow distinct umbilicus; aperture sub-elliptical; short thickened columellar lip slightly oblique outwards; parietal lip thin; outer lip of moderate thickness extends forwards gently from the upper suture to just above the peripheral frill where it rounds gently before crossing the base in a strongly oblique manner; the columellar and outer lips on the base are strongly concave; where a keel is present a shallow concave flexure of the lip may be developed on it; the closely spaced growth lines range from fine to moderately coarse on both the outer and basal whorl surfaces; the growth lines continue into the umbilicus.

Dimensions:

	Ht	Wt	Hap	Wap	Wh
P47503	24	59	7	18	5
P47564	25	53	—	—	3+
P47505	—	—	—	—	6
P47506	15	51	—	—	5+

Location of Types: National Museum of Victoria. Figured specimen P47503. Collected T. A. Darragh, 1971.

Materials: One figured specimen and eight other specimens all of which are either crushed or distorted.

Discussion: The small number of specimens and their poor state of preservation precludes detailed comparisons wtih other members of the genus and the formal naming of the species. The Bell Point form differs considerably from *S. (Euomphalus) pentangulatus.* The latter is a large discoidal gastropod with a wide umbilicus and thin lips which contrasts with the low spire, narrow umbilicus and thickened lips of the Bell Point form. The shape of both the aperture and lips together with the distinct peripheral frill of *S. (Euomphalus)* sp. also serve to distinguish it from the type species.

The Bell Point form can be distinguished quite readily from the other members of the genus previously described from Victoria. The low spire, narrow umbilicus, aperture shape, thickened lips and relatively few whorls distinguish it from the dextrally coiled *S. (E.) northi* (Etheridge) from the Lilydale Limestone. *S.(S.) serpenteus* Talent from the mudstones of central Victoria differs from the Bell Point form in its smaller size, trochiform shape, more numerous whorls, wider umbilicus, apertural shape, growth line characters and whorl profile.

Talent (cited by Singleton, 1968) included the gastropod *Amphelissa isisensis* in the faunal list for the Bell Point Limestone. Of all the forms known from this limestone, *S. (Euomphalus)* sp. most closely resembles this species. *A. isisensis*, the type species of the genus, was described by Etheridge (1921) from

the Isis River area, Scone district, N.S.W. This gastropod occurs in one of two faunas in the Timor Limestone Member regarded by Voisey and Packham (1969) as Givetian.

Unfortunately the quality of Etheridge's illustrations and the nature of his description makes comparison difficult. Etheridge (p. 2) noted that 'as the individual specimens vary much in their state of preservation it is difficult to select features of a constant character other than those of the strongly angular and upstanding whorls, deeply seated sutures and nearly flat bases'. Subsequently Knight *et al.* (1960) synonymized *Amphelissa* with the subgenus *S. (Euomphalus).*

Although poorly preserved, in each case the similar sized *S. (E.) isisensis* and *S. (Euomphalus)* sp. do possess certain similarities. Both are low spired with 5 to 6 whorls. Both possess relatively flat bases with a narrow umbilicus. There are also some differences between the two forms. While *S. (E) isisensis* appears always to possess a distinct angular keel and deep distinctive sutures this is not always the case with *S. (Euomphalus)* sp. Similarly the generally distinct peripheral frill of *S. (Euomphalus)* sp. does appear to be more variably developed on *S. (E.) isisensis.* Certainly it can be clearly seen in one of Etheridge's illustrations (plate 1, fig. 1) accompanying his original description. Other details, notably those of the apertural region are lacking for *S. (E.) isisensis. Austerum carinatum* the type species of the genus *Austerum* was described by Heidecker (1959), from Givetian limestones near Charters Towers, north Qld. This large, low spired species possesses a number of characteristics similar to those of the Bell Point form. Both are large, low spired gastropods with sub-elliptical apertures, thickened lips and concave basal and collumellar lips on the basal surface. There is also a flexure on the keel. The shallow umbilicus, persistence of the keel through most growth stages, consistent deep sutures and lack of a peripheral frill all distinguish the north Qld. form from *S. (Euomphalus)* sp. If specimens P47512—15 from near Arthur's Peak in the Fanning River District, north Qld. are indicative of the variations in this species then there is considerable variation in the height of the shell (pl. 1, figs. 16, 19). These specimens are distinctly trochiform in shape, another feature which distinguishes them from *S. (Euomphalus)* sp. A re-examination of the type material of *A. carinatum* is required. Whether this results in this genus being synonymized with *Straparollus (Euomphalus)* or establishes a subgenus of *Straparollus* characterized by features such as its thickening of the columellar and outer lips remains to be seen. Certainly the presence of at least two Devonian low spired euomphalids forms with substantially thickened lips in eastern Australia is of interest.

Genus Micromphalus Knight, 1945

Type Species: Micromphalus turris Knight, 1945; Lower Carboniferous; Elizabethtown, Kentucky, United States of America.

Range: Late Silurian to Lower Carboniferous. The presence of a species of this genus near Yass extends the lower limit of its range from Middle Devonian to Late Silurian.

Distribution: North America and Australia. This is the second record of the genus in Australia; Roberts *et al.* (1967) noted *Micromphalus* sp. amongst a fauna from the Frasnian Westwood Member in the Bonaparte Gulf Basin of northern Western Australia.

Micromphalus clarkei (de Koninck), 1876
(Plate 1, figures 20, 23)

1876 *Euomphalus (Omphalotrochus) clarkei* de Koninck, p. 41, pl. 1, figs. 7, 7a-7b.

Diagnosis: Large low spired form of genus with strongly embracing whorls and narrow shoulder.

Description: Large, low spired trochiform gastropod with each whorl strongly embracing that above; distinct, moderately narrow shoulder; flat to strongly rounded; gently rounded to flat whorl profile from edge of shoulder to angular basal whorl periphery; initially sutures impressed, with growth become canaliculate; base rounded; small umbilicus present; aperture circular or nearly so; reflexed columellar lip; thin parietal inductura, extends forward of aperture; moderately thick irregularly prosocline outer lip; from upper suture the outer

lip passes backwards to below the shoulder where a distinct but variable shallow concave flexure or sinus is developed; the outer lip then continues more gently to the whorl periphery; the base is gently rounded; shell of moderate thickness; growth lines strongly foliaceous.

Dimensions:

	Ht	Wt	Hap	Wap	Wh
P47516	26	58	—	—	4+
P47517	39	59	—	—	5
P47519	32	49	13	14	4+
P47520	36	62	—	—	5

Location of Types: 1. *Euomphalus (Omphalotrochus) clarkei*, the specimen figured by de Koninck was apparently destroyed when the Garden Palace in Sydney was burnt on September 22nd, 1882.

2. *Micromphalus clarkei*, National Museum of Victoria.
Hypotypes P47517 and P47519, A. J. Shearsby Coll.

Type Locality: 1. *Euomphalus (Omphalotrochus) clarkei*, Yass District, NSW.

2. *Micromphalus clarkei*, Limestone or Derringullen Creek, near Yass, NSW.
Stratigraphic Range: Although Shearsby's locality data was vague the nature of preservation of the material from Limestone Creek would suggest that it comes from the Bowspring Limestone, a unit containing silicified gastropods and brachiopods (Dr K. S. W. Campbell *pers. comm.*) Brown (1941) has recorded the occurrence of this gastropod in the Bowspring Limestone, near Yass. This unit was considered by Link (1970) to be Middle Ludlovian in age.

Material: 2 hypotypes and 4 other specimens.

Discussion: When Knight (1945) erected the genus *Micromphalus*, he noted that *M. turris* possessed features similar to both *Orecopia* and *Straparollus*. That a form should exhibit features suggestive of a position intermediate to the families Euomphalidae and Omphalotrochidae is consistent with Yochelson's (1956) contention that the omphalotrochids were derived from the euomphalids.

M. clarkei differs from the type species in possessing a lower spire, narrower shoulder, considerably stronger embracing whorls, more variable sutures and being considerably larger. Both possess the distinctive prosocline outer lip with a shallow sinus and narrow umbilicus.

De Koninck, when describing *M. clarkei*, was aware of its similarity not only with the genus *Euomphalus* but also with the then recently established genus *Omphalotrochus*. As a consequence he placed the species from near Yass in the genus *Euomphalus* and the subgenus *Omphalatrochus*.

Family OMPHALOTROCHIDAE Knight, 1945

Genus Orecopia Knight, 1945

Type Species: Platyschisma ? mccoyi Walcott, 1884; Upper Devonian; Nevada, United States of America.

Discussion: The presence at Bell Point of this genus extends its known distribution. Previously it was confined to Europe and North America. The Bell Point occurrence also extends the lower limit of the generic range from Upper Devonian to Lower Devonian.

Orecopia murrayi sp. nov.
(Plate 1, figures 6, 8, 12, 13)

Diagnosis: Rotelliform member of genus frequently lacking umbilicus, with an ovoidal aperture and variably developed sinus in the outer lip.

Description: Medium rotelliform gastropod with a broad shallow rounded sinus in the outer lip; whorls each embracing that above; whorl profile flat to gently arched between sutures; sutures sharp, incised, shallow and irregular; basal periphery strongly rounded; base flat to gently rounded; small variably developed umbilicus sometimes present aperture ovoidal; columellar lip thickened, and strongly oblique outwards thins towards junction with outer lip; parietal inductura of moderate thickness, occasionally developed forward of aperture; moderately thick outer lip with u-shaped sinus of variable depth; from upper suture the outer lip passes backwards before rounding in sinus and passing forwards to the periphery

where it turns roundly before continuing backward, obliquely across the base; below rounded sinus broad forward projection variably developed at or just above the periphery; secondary deposits variably developed in peripheral angle; growth lines fine to foliaceous on both outer whorl surface and base; when umbilicus is open growth lines continue into it; occasional growth rugae occur; no other sculpture developed.

Dimensions:

	Ht	Wt	Hap	Wap	Wh
P46987	15	29	—	—	6+
P46988	—	35	5	11	—
P46989	—	15	—	—	—
P46992	—	23	4	8	—
P46993	—	—	6	8	—
P46994	8	15	—	—	8
P46996	11	17·5	3	—	6+
P46999	13	27	—	—	—

Location of Types: National Museum of Victoria. Holotype, P46987, Paratypes, P46988, P46989 and P46990. Collected C. B. Tassell, 1975.

Material: Holotype, 3 paratypes and more than 100 other specimens, most of which are crushed or fragmented.

Discussion: O. mccoyi (Walcott) is quite variable in shape, Knight (1945, pl. 80, figs. 1a-g) figured forms ranging from rotelliform to beehive like. In contrast *O. murrayi* is typically rotelliform. Comparison between the Bell Point species and the more rotelliform examples of *O. mccoyi* reveals few differences. *O. murrayi* is generally lower spired with a more ovoidal aperture resulting from a longer more outwardly oblique columellar lip. The frequent absence of an umbilicus, lack of an angulation on the upper whorl surface, and the apparently more variable depth of the sinus in the outer lip also distinguish *O. murrayi* from the type species.

O. murrayi has the peripheral angle thickened by secondary deposits. As a consequence the thinnest and weakest section of the base is at the inner edge of the peripheral thickening. When crushed as is frequently the case at Bell Point, the base is broken and fragmented most severely at the inner edge of the peripheral thickening. A similar pattern of fracturing occurs on the base of *Scalaetrochus lindstromi* Etheridge from the Lilydale Limestone (Tassell, 1976). Typically the fragmented thin outer shell layer on the base has been lost.

Bassotrochus gen. nov.

Type Species: Bassotrochus angulatus sp. nov.; Lower Devonian, Bell Point Limestone, Bell Point, Victoria.

Description: Trochiform gastropod with distinct peripheral frill; whorl profile gently convexly arched to nearly flat; base gently rounded to flat; broad shallow sinus developed in upper half of outer lip; broad anterior projection developed beneath sinus and above periphery; shell thickened by secondary deposits.

Stratigraphic Range: Lower Devonian.

Distribution: Bell Point, Victoria.

Discussion: This genus was established with some hesitation because of the poor preservation of the material of the type species *B. angulatus*. But the distinctive sinus, albeit shallow, on the upper part of the outer lip and the protruding lower section of the outer lip clearly indicate its familial relationships. The shallow sinus, peripheral frill, whorl profile and lack of an umbilicus all serve to distinguish this genus from any of the other trochiform genera of this family. Of the genera currently assigned to the family Omphalotrochidae, *Babylonites* from the Permian of North America most closely resembles this genus. These two trochiform gastropods have a relatively shallow sinus and weakly developed anterior projection in the outer lip when compared to *Omphalotrochus* and *Orecopia*. Both *Bassotrochus* and *Babylonites* possess a thickened periphery. In either genus a shallow depression can be developed in the thickened periphery which tends to accentuate the peripheral frill.

However, *Bassotrochus angulatus* lacking an umbilicus but possessing a convex whorl profile differs considerably from the species of *Babylonites* which possess a distinctly concave to nearly flat whorl profile and an umbilicus. The broad anterior projection beneath the sinus on the outer lip of *Bassotrochus* reaches its most anterior development above the periphery, not at the periphery as in *Babylonites*.

Although variably developed the peripheral frill of *Bassotrochus* is generally sufficiently distinct to distinguish it from the blunter periphery of *Babylonites*. The thickened columellar lip and its more strongly prosocline nature also distinguish *B. angulatus* from the American species.

The existence of two genera of the family Omphalotrochidae in the Bell Point Limestone is of considerable interest. The genus *Orecopia* from the Upper Devonian of North America and Europe has been known for some time (Pedder, 1966). Its occurrence at Bell Point enlarges its range to include the Lower Devonian. The presence of *Orecopia* and *Bassotrochus* at Bell Point not only extends the range of the family but increases the diversity of the family in the Devonian. However, the continuing absence of forms during much of the Carboniferous means that Yochelson's (1956, p. 201) comment that 'it is impossible to construct any meaningful family phylogeny at this time' is still valid.

The generic name *Bassotrochus* is derived from the trochiform shape of the type species and the close proximity of the Bell Point Limestone to Bass Strait.

Bassotrochus angulatus sp. nov.

(Plate 1, figures 7, 14, 17, 18, 22)

Description: Medium to large trochiform gastropod with thickened peripheral frill; sutures distinct, variable from adpressed to being overhung by periphery of preceding whorl; whorl profile gently convex to nearly flat from upper suture to near periphery; shallow depression frequently developed in thickened periphery emphasizes basal peripheral frill; base gently rounded to flat; umbilicus apparently lacking; aperture ovoidal; thickened prosocline columellar lip with very broad shallow sinus; thins towards junction with outer lip; parietal lip thin or wanting; outer lip of moderate thickness with a very shallow broad sinus in the upper part; from the upper suture the upper lip passes backwards a very short distance before rounding in the shallow broad sinus and continuing forwards to just above the peripheral frill where it turns gently before continuing backwards obliquely across the edge of the peripheral frill and the base; below sinus a broad anterior projection variably developed above the periphery; anterior projection may continue further forward than the contact of the outer lip with the upper suture; thick secondary deposits developed later in periphery; growth lines typically closely spaced and foliaceous on both the outer whorl surface and base; no other sculpture developed.

Dimensions:

	Ht	Wt	Hap	Wap	Wh
P47479	7	—	—	—	—
P47480	17	38	—	—	4+
P47482	12	31	4	8	5+
P47483	16	47	—	—	4+
P47485	24	56	—	—	5+
P47486	20	45	—	—	6+
P47489	19	32	—	—	5+

Location of Types: National Museum of Victoria. Holotype P47480. Paratypes P47481, P47482, P47502, P47498. Collected C. B. Tassell 1975.

Material: Holotype, 4 paratypes, 1 hypotype and more than 90 other specimens all of which are crusted, distorted or fragmented.

Discussion: Both *B. angulatus* and *O. murrayi* occur together in abundance in poorly sorted coquinas within the Bell Point Limestone. In each instance many of the shells have been broken and fragmented. However, the two species can be readily distinguished by the differences in their overall shape, nature of their sutures and whorl peripheries, the degree of development of the parietal lips and the position of the anterior projection beneath the sinus on the outer lip. In addition an umbilicus is frequently developed in *O. murrayi*.

Family EOTOMARIIDAE Wenz, 1938

Subfamily EOTOMARIINAE Wenz, 1938

Genus Mourlonia de Koninck, 1883

Type Species: Helix carinatus J. Sowerby, 1812; Lower Carboniferous; Mountain Limestone, near Settle, Yorkshire, Great Britain.

? **Mourlonia** sp.

(Plate 1, figure 9)

Description: Small to medium gastropod with prominent raised selenizone bordered by two

strong spiral cords at whorl periphery; selenizone located at about mid-whorl; basal and apertural regions unknown; from upper suture to selenizone collabral lines prosocyrt; beneath selenizone prosocyrt initially; regular collabral lines strongly developed above and below selenizone; no spiral sculpture developed.

Dimensions:

	Ht	Wt	Wh
P46975	—	14	4

Location of Types: National Museum of Victoria. Figured specimen P46975. Collected C. B. Tassell 1975.

Material: Figured specimen.

Discussion: The incomplete preservation of the specimen precludes its confident assignment to the genus. The specimen from Bell Point differs considerably from *M. carinata* (J. Sowerby). Above the selenizone of the larger type species the fine closely spaced collabral lines are weakly prosocyrt to prosocline in contrast to the strong prosocyrt lines of the Bell Point form. The selenizone of the type species with its weaker bordering spiral cords is located lower on the whorl than that of the Bell Point form.

The larger *M. striata* (J. Sowerby), type species of *Ptychomphalina* synonymized with the genus *Mourlonia* by Knight *et al.* (1960) has strongly developed collabral lines above and below a selenizone located high on the whorl in later growth stages. The selenizone is bordered by prominent spiral cords. The collabral lines, position of the selenizone and the cords bordering the selenizone are similar to those developed on the Bell Point form. *M. talboti* (Dickens) described by Batten (1972) from the Permian of Malaya is similar in size to the Bell Point form. The Malayan species also has strong collabral lines and a selenizone bordered by threads located higher on the whorl surface.

Family HOLOPEIDA Wenz, 1938

Subfamily GYRONEMATINAE Knight, 1956

Genus Gyronema Ulrich, 1897

Type Species Trochonema (Gyronema) pulchellum Ulrich and Scofield, 1897; Middle Ordovician; Chatfield, Minnesota, U.S.A.

Range: Ordovician to Middle Devonian.

Distribution: North America, Europe, Africa and Australia. The occurrence of a species of this genus at Bell Point extends the generic range to include Australia.

Gyronema bellense sp. nov.
(Plate 1, figures 10, 11)

Diagnosis: Typical form of genus with numerous elements of spiral sculpture of only one order and thin inner and outer lips.

Description: Medium, turbiniform gastropod with numerous elements of spiral sculpture; whorls rounded between impressed sutures; periphery probably at mid-whorl; base rounded; small variably developed umbilicus sometimes present; aperture circular; no apertural emargination present; columellar lip slightly thickened; thin peripheral inductura developed; outer lip moderately thin; straight and oblique backwards from the upper suture; fine to slightly foliaceous, prosocline collabral lines present; sculpture composed of regularly spaced spiral cords.

Dimensions:

	Ht	Wt	Hap	Wap	Wh	C
P46941	—	15	—	4	—	7+
P46945	—	—	16	15	3+	10+
P46954	—	57	28	25	—	10+

Location of Types: National Museum of Victoria. Holotype P46945. Paratype, P46941. Collected C. B. Tassell 1975.

Material: Holotype, paratype and 13 other specimens which are all crushed or broken.

Discussion: The holotype is a crushed incomplete specimen. Some apertural details are preserved as are numerous spiral sculptural elements and evidence of its turbiniform shape. The paratype shows clearly the straight collabral lines.

The species from the Bell Point Limestone is in many ways similar to *G. pulchellum*. Both possess thin lips, fine growth lines, a similar number of strongly developed cords and prominent concave interspaces between the cords, although in a number of specimens from Bell Point the development of the prominent cords has been enhanced by subsequent weathering.

However, *G. bellense* can be quite clearly distinguished from the type species by its very much larger size and differing development of the cords.

In terms of size *G. bellense* is comparable with *'Cyclonema' australis* Etheridge from the Lilydale Limestone. *G. bellense* can be distinguished from this species by its thinner lips, lack of growth rugae, single order of cords and relatively fewer cords.

Family MURCHISONIIDAE Koken, 1896

Genus Murchisonia D'Archiac and De Verneuil, 1841

Subgenus Murchisonia (Murchisonia) D'Archiac and De Verneuil, 1841

Type Species: Muricites turbinatus Schlotheim, 1820; Middle Devonian; *Stringocephalus* limestone, near Gladbach in Bergischen, Germany.

Murchisonia (Murchisonia) bassensis sp. nov. (Plate 1, figure 4)

Diagnosis: Small form of subgenus with well rounded whorl profile selenizone in upper half of whorl; prominent, well-developed collabral lines.

Description: Small, high-spired numerous whorled gastropod with a selenizone bordered by two fine cords above the rounded mid-whorl periphery; whorl rounded; impressed sutures moderately deep; base rounded; lacking umbilicus aperture sub-circular; gently arcuate columellar lip of moderate thickness; no suggestion of canal-like constriction at junction of columellar and outer lips; parietal inductura thin; outer lip with angular sinus that forms a slit which generates the selenizone; depth of angular sinus increases with growth; from the upper suture to the selenizone the nearly straight outer lip passes posteriorly with only a slight obliquity; below the selenizone it passes forwards to the edge of the base before continuing backwards across the base; flat selenizone located above mid-whorl periphery; with collabral lines becoming finer but remain strongly developed; no sculpture.

Dimensions:

	Ht	Wt	Hap	Wap	Wh
P46969 a	4	1	—	—	7
P46969 b	—	—	0·5	0·5	—
P46971	4	1·5	—	—	7
P46970 a	3	1	—	—	8
P46970 b	—	1·5	0·6	1	—

Location of Types: National Museum of Victoria. Holotype P46969a. Paratype P46969b. Collected C. B. Tassell 1975.

Material: Holotype, paratype and at least 30 other specimens.

Discussion: The principal differences between *M. (M.) bilineata* (Dechen), the type species, and this species are the latter's small size, well rounded whorl profile and selenizone located above mid-whorl. The species from the Bell Point Limestone also possesses more strongly developed collabral lines and weaker spiral cords bordering the selenizone than the type species.

A number of other similar sized members of the subgenus are known from Victoria. In most cases they are inadequately known because of poor preservation or lack of specimens. As a result any comparisons that can be made are limited. *M. (Murchisonia) bassensis* can be distinguished from a number of undescribed murchisoniacians from the Lilydale Limestone by its well-rounded whorl profile, strong collabral lines and possession of a selenizone located above mid-whorl. All the specimens from Lilydale possess prominent cords bordering the distinctly concave selenizone in contrast to the subdued cords of *M. (M.) bassensis*.

Chapman (1912) mentioned the presence of a small member of the genus in the Buchan Limestone. From thin sections it was seen to have an angular whorl profile and an umbilicus. Other details, notably the presence of a selenizone, were obtained from a poorly preserved specimen P12873. Typically the genus *Murchisonia* lacks an umbilicus. Whether the specimens in the thin section were the same as the P12873 is open to question, in any case, poor preservation precludes comparison with *M. (Murchisonia) bassensis*.

Murchisonia (Murchisonia) sp. A.
(Plate 1, figure 5)

Description: Medium, high spired gastropod with a selenizone on a slightly raised narrow keel at the angular periphery; periphery just above mid-whorl; whorl face flat to slightly concave above and below the selenizone; sutures moderately deep; base rounded; umbilical region unknown; columellar lip unknown; moderately thick outer lip with deep angular sinus that forms a slit at the periphery which generates a selenizone from the upper suture to the selenizone the prosocyrt outer lip passes posteriorly with a strong obliquity; below the selenizone it passes forwards to the base less strongly; collabral lines fine; no sculptural elements present.

Dimensions:

	Ht	Wt	Wh
P46596	17	7	7+
P46957	18	—	8+

Location of Types: National Museum of Victoria. Figured specimen P46956. Collected C. B. Tassell 1975.

Material: Figured specimen and 6 other specimens which are all crushed or broken.

Discussion: The poor preservation of the specimens limits comparison. The form from the Bell Point Limestone differs from the type species principally in having a selenizone raised upon a keel on a more angular whorl periphery. In this respect it is very similar to *M. (Murchisonia) gracilicrista* Linsley from the Middle Devonian Anderdon Limestone, Michigan. However, *M. (Murchisonia) gracilicrista* has a mid-whorl peripheral selenizone.

The only other form of similar age and shape known from Australia is *M. (Murchisonia) turris* described by de Koninck (1876) from the Yass District. Study of material from the Taemas limestones reveals some differences between *M. (Murchisonia) turris* and the species from Bell Point. *M. (Murchisonia) turris* has a more rounded whorl profile with a concave selenizone located on keel at the periphery. From the upper suture the outer lip does not pass backwards as strongly as in *M. (Murchisonia)* sp. A.

Murchisonia (Murchisonia) sp. B
(Plate 1, figure 3)

Description: Small, many whorled, high spired gastropod with a selenizone bordered by two prominent coarse cords at the sub-angular mid-whorl periphery; whorl profile sub-angular; whorl surfaces flat above and below selenizone; impressed sutures; base rounded; lacking umbilicus; gently arcuate columellar lip of moderate thickness; parietal inductura thin or absent; flat selenizone located at or just below mid-whorl; no sculpture or collabral lines present.

Dimensions:

	Ht	Wt	Hap	Wap	Wh
P46976 a	4	2	—	—	5
P46976 b	7	4	—	—	6
P46977	11	5	—	—	7
P46978	3·6	—	—	—	5
P46980	4	2·5	—	—	6

Location of Types: National Museum of Victoria. Figured specimen P46976. Collected C. B. Tassell 1975.

Material: Figured specimen and at least 30 other specimens.

Discussion: M. (Murchisonia) bilineata (Dechen), the type species, is considerably larger than *M. (Murchisonia)* sp. B, from the Bell Point Limestone. Both species possess a distinctive selenizone bordered by two prominent spiral cords at an angular mid-whorl periphery. These features distinguish them from *M. (Murchisonia) bassensis* which occurs at Bell Point.

The poor preservation of the Bell Point form precludes more detailed comparison between it and the type species as also with some undescribed forms from the Lilydale Limestone, similar in size, shape, whorl profile and selenizone development.

Subgenus Murchisonia (Hormotomina)
Grabau and Shimer, 1909.

Type Species Murchisonia maia Hall, 1861; Middle Devonian; Columbus limestone, near Dublin, Ohio, U.S.A.

Murchisonia (Hormotomina) sp.

Description: Medium high spired gastropod with a median spiral thread on mid-whorl sele-

nizone; whorl profile rounded; impressed sutures; base unknown; apertural details poorly known outer lip thick with a shallow concave slit that generates a slightly elevated selenizone bordered on each side by prominent cords; sculpture absent.

Dimensions:

	Ht	Wh
P46968	48	8

Location of Types: National Museum of Victoria. Mentioned specimen P46968. Collected C. B. Tassell 1975.

Material: Mentioned specimen.

Discussion: The poor preservation of the specimen from Bell Point Limestone and the type species prevents effective comparison of these similar sized forms. The only similar described form from Victoria is *Gyrodoma etheridgei* (Cresswell) from the Lilydale Limestone. This large high-spired gastropod also has a medium spiral thread developed on a mid-whorl selenizone in some instances. However, this species is characterized by the presence of numerous fine spiral sculptural elements of two or more orders.

High-spired gastropod gen. et sp. indet.
(Plate 1, figure 2)

Description: Small to medium cyrtoconoid gastropod; numerous whorls with gently convex whorl profile between shallow impressed sutures; no other details preserved.

Dimensions:

	Ht	Wt	Wh
P46974	7	4	6

Location of Types: National Museum of Victoria. Figured specimen, P46974.

Type Locality: Waratah Limestone about 100 m west of Bird Rocks, near Walkerville South.

Stratigraphic Range: The Waratah Limestone is considered by Strusz (1972) to be Pragian.

Material: Figured specimen and one other specimen.

Discussion: Michelia sp. described by Talent and Philip (1956) from the similar-aged Toongabbie Limestone, Marble Creek is similar to the form from the Waratah Limestone. Talent (as cited by Singleton, 1968) included *Coelocaulus* in a faunal list for the Waratah Limestone. This genus had been synonymized with *Michelia* by Knight *et al.* (1960). Thus it is possible that the unidentified form may be a member of the genus *Michelia.*

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Explanation of Plate

PLATE 1

Figure 1—*Tropidodiscus waratahensis*, P46963, holotype, x3.

Figure 2—High-spired gastropod gen. et sp. indet., P46974, x3.

Figure 3—*Murchisonia (Murchisonia)* sp. B., P46976, x5.

Figure 4—*Murchisonia (Murchisonia) bassensis*, P46969, holotype, x4. The aperture visible is of another specimen of this species.

Figure 5—*Murchisonia (Murchisonia)* sp. A., P46956, x2.

Figure 6—*Orecopia murrayi*, P46990, paratype, x1½. Basal view.

Figure 7—*Bassotrochus angulatus*, P47502, paratype, x2.

Figure 8—*Orecopia murrayi*, P46987, holotype, x1.

Figure 9—? *Mourlonia* sp., P46975, x1½.

Figure 10—*Gyronema bellense*, P46941, paratype, x2. Basal view.

Figure 11—*Gyronema bellense*, P46945, holotype, x1.

Figure 12—*Orecopia murrayi*, P46988, paratype, x1. Basal view.

Figure 13—*Orecopia murrayi*, P46987, holotype, x1.

Figure 14—*Bassotrochus angulatus*, P47498, paratype, x1.

Figure 15—*Straparollus (Euomphalus)* sp., P47503, x⅔. Basal view.

Figure 16—*Austerum carinatum* Heidecker, P47513, x1. Fanning River district, Queensland.

Figure 17—*Bassotrochus angulatus*, P47482, paratype, x1½. Basal view.

Figure 18—*Bassotrochus angulatus*, P47481, paratype, x1.

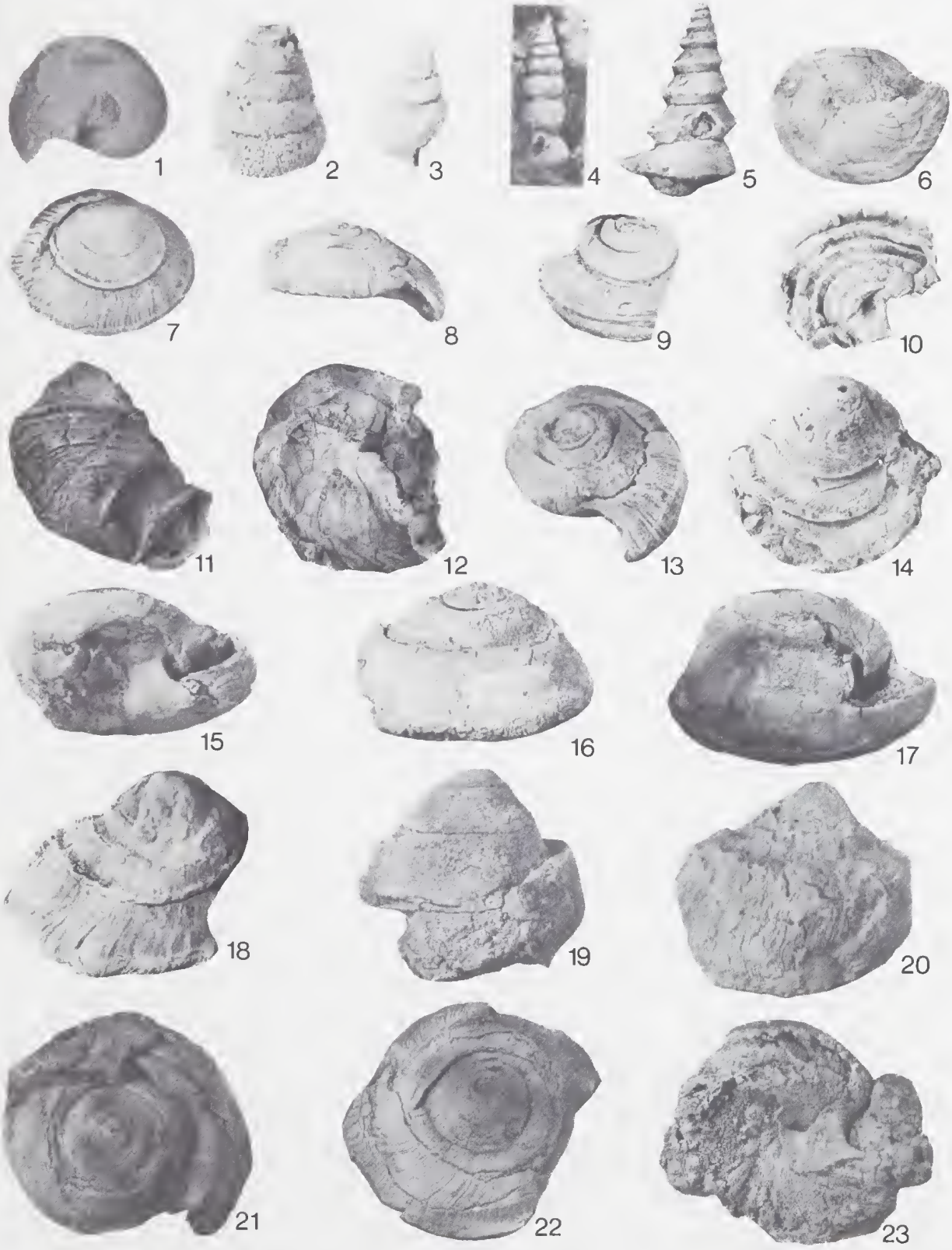
Figure 19—*Austerum carinatum* Heidecker, P47514, x1. Fanning River district, Queensland.

Figure 20—*Micromphalus clarkei* (de Koninck), P47517, x$\frac{2}{3}$. Derringullen Creek near Yass, N.S.W.

Figure 21—*Straparollus (Euomphalus)* sp. P47511, x$\frac{4}{5}$. Basal view.

Figure 22—*Bassotrochus angulatus,* P47480, holotype, x1.

Figure 23—*Micromphalus clarkei* (de Koninck), P47519, x$\frac{4}{5}$. Basal view. Derringullen Creek, near Yass, N.S.W.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