Late Devonian (Frasnian) Conodonts from Ettrema, New South Wales

JOHN PICKETT

ABSTRACT—Conodont faunas from two localities are discussed and illustrated. Their age is considered to be late Frasnian (to18). One new subspecies, Polygnathus nodocostatus ettremae, is described.

Introduction

During preparation of correlation tables for the Devonian System of Australia and New Zealand (Pickett, 1972), a number of units remained only doubtfully correlated, due to insufficient data regarding their precise age.

An occurrence of limestone near Ettrema Mine, on Jones Creek (GR 207780 Nerriga 1 : 31,680 sheet, 35 km. ESE of Nowra), one of these, had been reported initially as Silurian in age (Rose, 1966), then as mid-Devonian (Croft et al., 1970). Because of its palaeographical implications, a mid-Devonian age seemed questionable. Accordingly, the locality, which is most difficult of access, was visited, and samples taken.

The most obvious elements of the macrofauna in the limestones in Jones Creek are large, inflated atrypid brachiopods, and rare plocoid phillipsastreid corals. The limestones themselves are well-bedded, with occasional interbeds of shale which may dominate the sequence over a vertical distance of up to 20 metres. The beds are strongly folded and in places much sheared. The area has not been mapped in any detail because of the rugged topography and the blanket of Permian sediments which obscure the older Palaeozoic rocks everywhere but in the gorges. The locality is important because it is the first limestone occurrence in New South Wales of proven Frasnian age. It is probable that the sediments will be referable to a horizon in the Merrimbula Group. Other fossil localities within the Merrimbula Group, notably locality UP. 4 of Wood (in McElroy and Rose, 1962), appear to be Frasnian also. Specimens from this locality in the Mining Museum collections contain abundant Productella, Cyrtospirifer and Tentaculites, with some Tenticospirifer and a large coarsely ribbed pectenoid. These are preserved in a well-washed orthoquartzite. The presence of the four named genera is good evidence for a Frasnian age for this fauna. In Ettrema Creek, on a horizon very close to that of conodont fauna 2, are occasional shale bands with abundant fossils, sheared to a varying extent. One of these contains a few specimens of Productella ? sp., another contains crowded Cyrtospirifer sp.

Nomenclature

Recent advances in conodont research have been towards description of conodont assemblages, “natural” genera, and species. While it is not the intention of the author to become involved in the current debate on nomenclatorial procedures, some justification for the procedure adopted is warranted. Polygnathids make up 39% of the present fauna. It is thus apparent that if a given conodont apparatus contains only two polygnathid elements and a number of others (as suggested by Klapper and Philip, 1971) there must have been some winnowing of the fauna, especially considering that a further 3% of other platform types occurs in the fauna, and that icriodids constitute another 7%. Apparently, therefore, the fauna contained a number of species of Polygnathus (sensu Klapper and Philip, 1971), i.e. of apparatuses of their type 1. The sorting of the fauna (and probably also the number of specimens available) precludes determination of which other elements belonged to the natural species. Hence, although it is possible to identify to “species” most of the discrete elements present, it is not possible to apply a specific name to the natural species, and only possible in two cases for the genera (and this with some doubt). Furthermore, since ranges of natural species are in general not established, these can only be determined from those of the discrete elements. The examination of the present fauna was undertaken for
stratigraphic reasons rather than for information on the conodonts themselves. Thus I am in support of the standpoint clearly enunciated by Rhodes (1962), since the stratigraphical palaeontologist is in most cases forced to use a terminology for the discrete units. Until the natural taxonomy becomes refined to a point where the various elements can be confidently referred to their natural species, the present morphological taxonomy remains the most useful means of designation.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Occurrences of Conodont Species</th>
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<tbody>
<tr>
<td><strong>Locality 1</strong></td>
<td>Bed of Jones Creek, 1/2 mile upstream from Ettrema Mine. GR 207780 Nerriga 1 : 31,680 sheet:</td>
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<tr>
<td>Ancyrodella curvata (Branson and Mehl)</td>
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<tr>
<td>Ancyrognathus asymmetricus (Ulrich and Bassler)</td>
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<td>Ancyrodella subtilis (Bassler)</td>
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<td>Ancyrognathus asymmetricus var. Branson and Mehl</td>
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<tr>
<td>Apalognathus sp. nov.</td>
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<td>Apalognathus sp.</td>
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<td>Bryantodus sp.</td>
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<td>Hindeodella germana ? Holmes</td>
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<td>Hindeodella subtilis Bassler</td>
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<td>Icriodus brevis angustulus Seddon</td>
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<td>Icriodus expansus Branson and Mehl</td>
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<td>Ligonodina magnidens Ulrich and Bassler</td>
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<td>Ligonodina sp.</td>
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<td>Lonchodina robusta ? Branson and Mehl</td>
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<td>Lonchodina typica (Stauffer)</td>
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<td>Ozarkodina elegans (Stauffer)</td>
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<td>Ozarkodina immersa Hinde</td>
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<tr>
<td>Palmatolepis hassi Muller and Muller</td>
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<td>Pelekysgnathus cf. planus Sannemann</td>
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<tr>
<td>Polygnathus nodocostata ettreeae subsps. nov.</td>
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<tr>
<td>Polygnathus normalis Miller and Youngquist</td>
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<tr>
<td>Polygnathus xyly ? Stauffer</td>
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<tr>
<td>Roundya aurita Sannemann</td>
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<td>Roundya sp.</td>
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<tr>
<td>Synprioniodina alternata Ulrich and Bassler</td>
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</table>

| **Locality 2** | East bank of Ettrema Creek 1 mile upstream of junction with Jones Creek. GR 197798, Tonga 1 : 31,680 sheet: |
| Hindeodella sp. | |
| Icriodus cf. expansus Branson and Mehl | |
| Polygnathus normalis Miller and Youngquist | |

**Age of the Strata**

The faunas from the two localities are given in Table 1. The fauna from Ettrema mine contains as important species Ancyrodella curvata, Ancyrognathus asymmetricus, Palmatolepis hassi, Polygnathus normalis and Polygnathus nodocostatus ettreeae. The ranges of the first four species in Western Australia as given by Glenister and Klapper (1966) are conodont zones 5–11, 8–9, 5–11, 6–18, respectively. The best fit with the present samples is given by the range of Ancyrognathus asymmetricus, i.e. zones 8–9, upper gigas-zone, lower to ts. Seddon (1970a) reports Polygnathus normalis and Palmatolepis hassi-subrecta occurring together in samples BC 23–3, for which he gives no age, and BC 25–5, for which he determines a toly age. Ancyrodella curvata he reports from the lower gigas-zone. The toly interval is poorly represented in Seddon’s material, the only samples being BC 76–6 and BC 76–7. The species recorded by him are very different from those of the present samples, which according to Glenister and Klapper’s ranges fit best into this interval. Ziegler (1962) indicates that Ancyrognathus asymmetricus is restricted to the upper gigas-zone. The fauna has many species in common with that described by Seddon (1970b) from crack fillings in the Pillar Bluff area, notably that from locality TF–294, which is correlated with Ziegler’s upper gigas-zone.

**Acknowledgements**

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**Systematic Palaeontology**

Genus Ancyrognathus Branson and Mehl 1934

Type species: Ancyrognathus asymmetricus Branson and Mehl 1934.

Ancyrognathus asymmetricus (Ulrich and Bassler 1926).

Plate I, Figs. 3–6

1926. Palmatolepis asymmetrica Ulrich and Bassler, p. 50, Pl. 7, Fig. 18.

1966. Ancyrognathus asymmetricus Glenister and Klapper, p. 801, Pl. 87, Figs. 1–5. (cum syn.).

1967. Ancyrognathus asymmetricus Adrichem Boogaert, p. 178, Pl. 1, Fig. 2.


Material: Seven more or less complete specimens.

Remarks: The specimens referred by various authors to this species show a range of variation in the ornament of the oral surface and the position of the blade in relation to the margin of the anterior limb. In typical A. asymmetricus
the blade lies at the interior edge of the oral surface of the unit, although the carina below is more or less median. This situation pertains in the holotype, the Iowa specimens of Müller and Müller (1957), the Kellerwald specimens of Müller (1956) ("Ancyroides cf. uddeni"), the Western Australian material (Glenister and Furnish, 1966) and the present specimens. In this respect the specimen from the Western Sahara figured by Ethington and Furnish (1962) differs from the type, as the blade is approximately median. Bischoff’s (1956) material from the Kellerwald shows specimens of both types, and he considers the non-marginal condition to be characteristic of gerontic specimens. Glenister and Furnish remark (1966, p. 500) that the exact position of the blade on the anterior lobe is highly variable. Within the present population (seven specimens only) this feature is consistent, as is also the surface ornament with its median row of nodes on each lobe of the unit. The greatest variation is in the width of the external lobe at its base. The tip of this lobe is markedly deflected aborally, as in the Western Australian material (Glenister and Klapper, 1966, Pl. 87, Fig. 3), Bischoff’s material (1956, Pl. 8, Figs. 7, 8), and that of Seddon (1970b) from Texas. The paratype of Ancyroides uddeni Miller and Youngquist (1947), figured on Pl. 74, Fig. 16, and subsequently referred to Ancyrognathus asymmetricus by Ethington and Furnish (1962), differs in the median position of the blade, as well as having a surface ornament of nodes which are less well differentiated into median rows of larger and lateral rows of smaller nodes.

The species is apparently confined to the upper part of the Manticoceras zone of the Late Devonian (to18), according to Ziegler (1962) to the upper part of the P. gigas zone. In Western Australia it occurs in the lower part of the Virgin Hills Formation.

Genus **Apatognathus** Branson and Mehl 1934

Type species: **Apatognathus varians** Branson and Mehl 1934.

*Apatognathus* sp. nov.

Plate I, Figs. 8–10

Remarks: The few specimens of this species are fragmentary, so no formal description is undertaken. The species differs from **A. varians** chiefly in the presence of denticles of two sizes, smaller ones occurring notably between the main cusp and the first lateral denticles, but also between the other larger denticles of the bars.

Genus **Icriodus** Branson and Mehl 1938

Type species: **Icriodus expansus** Branson and Mehl 1938.

**Icriodus brevis angustulus** Seddon 1970

Plate I, Figs. 16–17

1968. **Icriodus angustus** Stewart and Sweet, Mound, Pl. 6, Figs. 23, 33.

1970a. **Icriodus brevis angustulus** Seddon, Pl. 11, Figs. 16–24.

Remarks: The present specimens are more similar to the Canadian ones figured by Mound in the consistent arrangement of the denticles into strong transverse rows, whereas in the Western Australian specimens "the median denticles alternate with the lateral denticles in immature specimens but bear no regular mutual alignment in mature ones". The Canning Basin material also tends to be higher posteriorly, while the Canadian and New South Wales material maintains much the same height over the full length of the unit. The outline of the basal cavity is nearly symmetrical, and rounded posteriorly, just as described by Seddon for the Canning Basin specimens. In the arrangement of denticles in transverse rows the specimens from Ettrema and those from Canada come closer to the types of **I. angustus** Stewart and Sweet. In the holotype of this species, however, the denticles of the posterior blade are directed obliquely backwards, while those of specimens from the other three occurrences are approximately vertical.

**Icriodus expansus** Branson and Mehl 1938

Plate I, Figs. 18, 19

1938. **Icriodus expansus** Branson and Mehl, Pl. 26, Figs. 18–31.

1968. **Icriodus expansus** Mound, p. 488, Pl. 66, Figs. 38–39 (sum syn.).

1970a. **Icriodus expansus** Seddon, p. 736, Pl. 11, Figs. 30–32, Pl. 12, Figs. 1–2.

Remarks: On Seddon’s figured specimen of this species the denticles of the median row are not alternate with those of the lateral rows, as is the case with the present specimens and that figured by Mound (1968); the type specimens show both conditions. Branson and Mehl remark that younger representatives of the species tend to have the three rows of nodes reduced to transverse ridges, a condition Seddon’s specimen approaches. The Ettrema specimens are markedly alternate. The basal cavity of the present specimens and of those
from Western Australia is very much expanded, being much broader than in most specimens referred to the species by other authors.

Genus Palmatolepis Ulrich and Bassler 1926

Type species: Palmatolepis perlobata Ulrich and Bassler 1926.

Palmatolepis hassi Müller and Müller.

Plate II, Fig. 12
1957. Palmatolepis hassi Müller and Müller, p. 1102, Pl. 139, Fig. 2, Pl. 140, Figs. 2–4.
1970a. Palmatolepis hassi Seddon, p. 738, Pl. 12, Fig. 27 (cum syn.).

Remarks: This species is represented by a single, rather small specimen, which is virtually identical with the paratype figured by Müller and Müller on Pl. 139, Fig. 2. In Western Australia it occurs commonly, chiefly in samples of Toly age. Müller and Müller report the species from the Amana beds, the Independence Shale and the Sweetland Creek Shale. Seddon’s specimens from Texas range well into Toly time.

Genus Pelekysgnathus Thomas 1949

Type species: Pelekysgnathus inclinatus Thomas 1949.

Pelekysgnathus cf. planus Sannemann 1955.

Plate II, Figs. 13–16
1955. Pelekysgnathus planus Sannemann, p. 149, Pl. 4, Figs. 22, 23.
1970a. Pelekysgnathus planus Seddon, p. 738, Pl. 11, Figs. 1–12 (cum syn.).

Remarks: Seddon describes a wide range of variations for Western Australian representatives of this species. Many of his remarks are applicable here. The species is morphologically very close to Icriodus brevis angustulus, but the variation is not continuous between the two. In general, the degree of posterior taper is less than in Seddon’s specimens. The Ettrema specimens are also narrower.

Genus Polygnathus Hinde 1879

Type species: Polygnathus dubius Hinde 1879.

Polygnathus nodocostatus ettrumae subsp. nov. Plate II, Figs. 17–19; Plate III, Figs. 1–5
Holotype: MMMC 0309.

Other Material: Figured paratypes MMMC 0322, 0323, 0324; 25 other specimens.

Diagnosis: Polygnathus nodocostatus with a carina of fused nodes, a deep furrow on either side, bounded internally and externally by a submarginal ridge which may be slightly nodose, and which begins at the anterior edge of the platform but fades out posteriorly. A much lower row of nodes may be developed marginally.

Description: Polygnathus nodocostatus with very short blade and a platform which is only weakly arched in juvenile forms, but strongly arched in gerontic individuals. The outline of the platform is ovate-lanceolate or a little truncate anteriorly. The posterior third of the platform is deflected inwards, scarcely in juvenile specimens, strongly in gerontic individuals. The free portion of the blade is from 0.24 to 0.31 of the total length of the unit. It bears usually three denticles, the second being the tallest. The blade is continued as a carina over the full length of the unit. Frequently, though not invariably, the first denticle on the carina is as strong or nearly as strong as the second one on the blade. The carina is formed of a row of 10–15 fused denticles, those at the posterior of the unit being more discrete and represented as rounded nodes, about four in number. On either side of the carina is a wide deep furrow, progressively less well defined posteriorly. The abcarinal side of the furrow is formed by a fairly straight ridge, made up of a row of nodes, sometimes so fused as to be almost indistinguishable. Marginal to this is a narrow aborally curved zone which usually bears another row of smaller nodes. In the inward deflected posterior portion of the platform the lateral ornament disappears, the carina being flanked by a narrow smooth area or a few small nodes. In profile the unit is deepest anteriorly, the aboral surface arching up strongly to its highest point at the pit, near the centre of the unit, turning again aborally at the posterior. The highest point of the platform profile is just posterior of the pit. The platform is moderately arched in both longitudinal and transverse directions, the degree of arcing being greatest in gerontic specimens. The aboral surface bears a strong keel occupying a median position over the full length of the unit. The pit is small, situated slightly forward of centre. The pit is tapered at both front and back, but no extension of it along the keel can be made out. A pronounced crimp is present. Ornament of growth lines may occur.

Remarks: Of those specimens of P. nodocostatus of which figures have been published, the two which approximate most closely to the norm of the present population are that of
Glenister and Klapper (1966), Pl. 94, Figs. 8–9, and the juvenile specimen figured by Helms (1961), Pl. 1, Fig. 13. The figure of the earliest representative of the group in Helms’ Text-fig. 17 (P. nodocostatus nodocostatus) is also fairly close.

The Western Australian occurrence is of a single specimen from borehole Wapet C, sample C 44′–66′; the stratigraphic level is high in the Virgin Hills Formation. Here it is associated with Palmatolepis minutula minutula, Pa. glabra glabra, Pa. glabra pectinata, Scutula bipennata and Palmatodella delicatula, an assemblage referred by Glenister and Klapper to the lower Pa. quadratinodosa zone. Helms’ figured specimen is from the upper part of the lower Cheiloceras-Stnie, high to IIIa. Both of these occurrences are substantially younger than that at Ettrema, which is the earliest occurrence of P. nodocostatus.

The species shows the most resemblance to P. nodocostatus nodocostatus Branson and Mehl as described by Helms (1961). Glenister and Klapper (1966, p. 829) point out that the lectotype of P. nodocostatus showed an x-shaped convergence of the rows of nodes on the platform, so that Helms’ subspecies P. nodocostatus incurvatus is a junior synonym of the type species. The present material exhibits no such incurving of the rows of nodes, and is in this respect most similar to those specimens assigned by Helms to the nominate subspecies. Points in which P. n. etremae differs from P. n. nodocostatus are the greater arching of the unit, the strong furrows, the ridge-like rows of nodes and the three or four prominent posterior nodes on the carina.

**Polygnathus normalis** Miller and Youngquist 1947

Plate III, Figs. 6–9


1968. *Polygnathus normalis* Mound, p. 509, Pl. 69, Figs. 30–31, Pl. 70, Figs. 1, 2, 5 (cum syn.).

1969. *Polygnathus normalis* Druce, p. 102, Pl. 19, Figs. 7a–10b.


Remarks: Mound (1968) indicates that the two species *P. normalis* and *P. webbi* occur together. To judge by his figures, the major point of difference is the depth of the free part of the blade (Pl. 70, Fig. 7). The present specimens cover the range of variation shown in Mound’s figures, but I am unable to separate them into two groups. The original figures of the types of *P. webbi* show no details of the profile of the blade. In material from Western Australia, Seddon appears to have experienced difficulty in separating the species, and speaks of the “*P. webbi-P. normalis* complex”. In the range of variation he describes for the Western Australian material, those from Ettrema conform most closely to his group 2, “typical specimens of *P. normalis*”, even including the tendency for the ornament of transverse ridges to break up into nodes on the posterior third of the platform. Mound (1968, p. 510) also mentions nodose ornament, but does not indicate that this is confined to any part of the platform. His specimen figured on Pl. 69, Figs. 30 and 31 has a virtually entirely nodose surface, and is quite different from all specimens in the present population.

**References**


Geological Survey of New South Wales, Geological and Mining Museum, 36 George Street, Sydney.


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EXPLANATION OF PLATES

All Figures are ×40. Specimen numbers refer to the micropalaeontological type collection of the Geological Survey of New South Wales, housed at the Geological and Mining Museum, Sydney. Unretouched photographs except Pl. I, Figs. 1, 2, Pl. II, Fig. 14, and Pl. III, Figs. 2, 4, 5, in which the background only has been blackened. Unless otherwise stated, the specimens are all from Jones Creek, upstream from Ettrema Mine.

PLATE I

Figs. 1–2.—Ancyrodella curvata (Branson and Mehl). Oral and aboral views of specimen MMMC 0325.
Figs. 3–6.—Ancyrognathus asymmetricus (Ulrich and Bassler). Oral views of specimens MMMC 0296, 0297, 0298, respectively; aboral view of MMMC 0295.
Fig. 7.—Angulodus walrathi (Hibbard). Inner lateral view of MMMC 0331.
Fig. 8.—Apatognathus varians Branson and Mehl. Inner lateral view of MMMC 0317.
Figs. 9–10.—Apatognathus sp. nov. Inner lateral views of specimens MMMC 0333, 0329.
Fig. 11.—Bryantodus sp. Inner lateral view of specimen MMMC 0326.
Fig. 12.—Hindeodella germana ? Holmes. Inner lateral view of MMMC 0302.
Figs. 13–14.—Hindeodella subtilis Bassler. Inner lateral views of specimen MMMC 0310 from locality 2, Ettrema Creek.
Figs. 15–17.—Icriodus brevis angustulus Seddon. Oral view of MMMC 0313, inner lateral view of MMMC 0314.
Fig. 18.—Icriodus expansus Branson and Mehl. Oral view of MMMC 0319.
Fig. 19.—Icriodus cf. expansus Branson and Mehl. Oral view of MMMC 0311 from locality 2, Ettrema Creek.

PLATE II

Figs. 1–3.—Ligonodina magnidens Ulrich and Bassler. Inner lateral views of MMMC 0289, 0292, 0307 respectively.
Fig. 4.—Ligonodina sp. Inner lateral view of MMMC 0328.
Fig. 5.—Ligonodina ? sp. Inner lateral view of MMMC 0308.
Figs. 6–7.—Lonchodina robusta ? Branson and Mehl. Inner lateral views of MMMC 0294 and 0298.
Fig. 8.—Lonchodina typicalis Bassler. Inner lateral view of specimen MMMC 0306.
Fig. 9.—Lonchodina sp. Inner lateral view of ? juvenile specimen MMMC 0301.
Fig. 10.—Ozarkodina elegans Stauffer. Outer lateral view of specimen MMMC 0299.
Fig. 11.—Ozarkodina immersa Hinde. Inner lateral view of MMMC 0290.
Fig. 12.—Palmatolepis hassi Muller and Muller. Oral view of specimen MMMC 0300.
Figs. 13–16.—Pelekysgnathus cf. planus Sannemann. Oral, aboral, outer lateral and inner lateral views of the same specimen, MMMC 0318.
Figs. 17–19.—Polygnathus nodocostatus ettremae subsp. nov. Oral, aboral and somewhat oblique inner lateral views of paratype MMMC 0324.

PLATE III

Figs. 1–5.—Polygnathus nodocostatus ettremae subsp. nov. 1, 2, Inner lateral and oral views of holotype MMMC 0309. 3, 4, Aboral and inner lateral views of gerontic individual, paratype MMMC 0322. 5, Oblique inner lateral view of juvenile, paratype MMMC 0323.
Figs. 6–9.—Polygnathus normalis Miller and Youngquist. 6, 7, Oblique and oral views of specimen MMMC 0321. 8, Inner lateral view of specimen MMMC 0312 from locality 2, Ettrema Creek. 9, Outer lateral view of individual with deep blade, MMMC 0320.
Fig. 10.—Polygnathus xylius ? Stauffer. Inner lateral view of specimen MMMC 0332.
Figs. 11–13.—Roundya aurita Sannemann. 11, Oral view of MMMC 0305. 12, Oblique aboral view of MMMC 0315. 13, Lateral view of MMMC 0291.
Fig. 14.—Roundya sp. Posterior view of specimen MMMC 0316.
Fig. 15.—Synprioniodina alternata Ulrich and Bassler. Lateral view of MMMC 0327.

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