

Stehli, F.G.,
1961a-b

HEINZ A. LOWENSTON

NEW TEREBRATULOID GENERA FROM AUSTRALIA

**NEW GENERA OF UPPER PALEOZOIC
TEREBRATULOIDS**

BY
FRANCIS G. STEHLI

Reprinted from
JOURNAL OF PALEONTOLOGY
Vol. 35, No. 3, May, 1961

NEW TEREBRATULOID GENERA FROM AUSTRALIA

FRANCIS G. STEHLI
Western Reserve University, Cleveland, Ohio

ABSTRACT—Three new genera of terebratuloid brachiopods from the Permian of Australia have been recognized. These genera are here described as *Gilledia* with *Terebratula cymbaeformis* Morris 1845 as genotype, *Fletcherina* with *Terebratula amygdala* Dana 1847 as genotype, and *Yochelsonia* with a new species *Y. thomasi* as genotype. This investigation has included study of the internal structures of these forms and both serial sections and reconstructions of internal structures are provided.

INTRODUCTION

IN CONNECTION with studies undertaken for the *Treatise on Invertebrate Paleontology*, Mississippian, Pennsylvanian and Permian terebratuloid brachiopods have been assembled from all over the world. Consideration of the species obtained from Australia has resulted in the recognition of three previously undescribed genera. These three new genera are here described and figured. The writer wishes to express his thanks to G. A. Cooper, U. S. National Museum; H. Fletcher, the Australian Museum, Sidney; E. D. Gill, National Museum of Victoria, Melbourne; G. Thomas, Bureau of Mineral Resources, Canberra and K. S. W. Campbell, University of New England, Armidale, N.S.W., all of whom provided material or offered helpful suggestions.

Genus GILLEDIA Stehli, n. gen.
Text-figs. 1A,2

Genotype.—*Terebratula cymbaeformis* Morris, 1845, p. 278, pl. 17, figs. 4-5.

Diagnosis.—Large radially carinate Dielasmatidae in which the ventral valve is longitudinally convex but transversely almost flat or slightly sulcate. Dorsal valve longitudinally and transversely convex. Ventral interior with pedicle collar; dental plates present but united with wall of rostral cavity by callus deposit. Dorsal interior with the crural bases attached to the floor of the valve, but not united by the cardinal plate with the socket plate; cardinal plate medially sessile and so divided into two discrete plates; cardinalia overgrown with

heavy callus deposits; loop broad, terebratuliform with main bands far apart.

Geologic range.—Wyro Stage, Wooramel Dist., W. Australia; Marine Series, Bowen River Coalfield, Queensland, Australia; Upper Marine Series, Wyro, near Ulladulla, N.S.W., Australia. Early Permian.

Geographic range.—Probably only from the Australian region.

Discussion.—This genus is remarkable for its peculiar surface ornamentation which consists of a pattern, not unlike that of some recent members of the genus *Terebratulina*, except for waviness of the carinae. The carinae as in *Terebratulina* probably reflect the positions of setae in the mantle edge. Internally the excessive callus deposition tends to obscure the cardinalia but the basic elements as described above appear to be present.

Species assigned.—*Terebratula cymbaeformis* Morris, 1845, genotype and only known species.

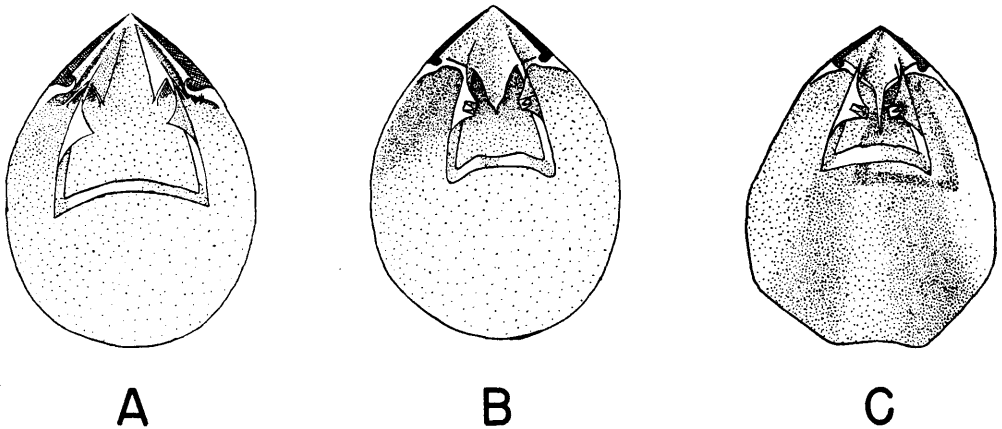
GILLEDIA CYMBAEFORMIS (Morris)
Pl. 61, figs. 1-6

Terebratula cymbaeformis Morris, 1845, p. 378, pl. 17, figs. 4,5.

Terebratula sacculus cymbaeformis, de Koninck, 1877, p. 225, pl. 15, figs. 4-42.

Dielasma cymbaeformis, Etheridge, 1892, p. 225, pl. 9, figs. 10,11.

Diagnosis.—Shell large, ornamented by faint wavy radial carinae. Ventral valve moderately and rather evenly convex longitudinally; transversely with slight convexity posteriorly but becoming flat anteriorly; beak erect; foramen permesothryd, labiate;



TEXT-FIG. 1.—Diagrammatic reconstructions of the dorsal interior of A, *Gilledia*, and B, *Fletcherina*, both based on interpretation of serial sections and internal molds; C, *Yochelsonia* based on serial sections alone.

deltoidal plates conjunct; beak ridges rounded. Dorsal valve longitudinally of low convexity; transversely of moderate to high convexity. Anterior commissure uniplicate; lateral commissure sinuate. Internal characteristics as described for the genus.

Remarks.—In his original description of this species, Morris (1845) figures only an internal mold. He therefore probably had no awareness of the peculiar carinate ornamentation so characteristic of the species. His figures clearly show, however, most of the characteristics found in the specimen sectioned during the present study and the writer is confident that the two specimens are conspecific.

Material.—One almost perfect specimen from Upper Marine series, Wyro, near Ulladulla, N.S.W. Australia, (C.I.T. 5951). Several internal molds, Woodbridge Glacial formation, Blackwood Ck. near Cressy, Tasmania (U. of Tasmania 25250).

Genus FLETCHERINA Stehli, n. gen.

Text-fig. 1B,3

Genotype.—*Terebratula amygdala* Dana, 1847, p. 152.

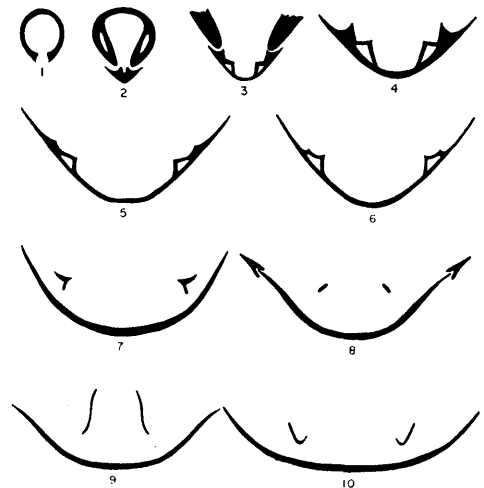
Diagnosis.—Dielasmatidae externally homeomorphic with *Dielasma* but differing internally in the fusion of the two halves of the cardinal plate to form a prominent

median septum, and in the possession of elongated crural points.

Geologic range.—Lower Permian.

Geographic range.—Presently known only from Australia.

Discussion.—The consistent union of the two halves of the cardinal plate in *Fletcherina* requires important soft part reorganiza-



TEXT-FIG. 2—Idealized serial sections of *Gilledia*.

tion. This is principally manifest in the changed insertion site of the dorsal pedicle muscles which have had to rise from the valve floor to an elevated position thus producing differences in leverage and contractility. At the present time no genera have been described which appear to be descendent from *Fletcherina* and the secondary fusion of discrete cardinal plates may represent a brief and unsuccessful "experiment." It seems possible, though perhaps unlikely, that continuance of this trend could have produced a nearly plane secondary cardinal plate supported by a median septum. Obsolescence of the middle of the hinge plate could have produced the cardinalia characteristic of so many Mesozoic terebratuloids.

The variability in external form in this genus is considerably greater than that seen in the internal structures. *F. inversa* is strongly biplicate while *F. amygdala* is only incipiently biplicate or in many individuals even completely smooth.

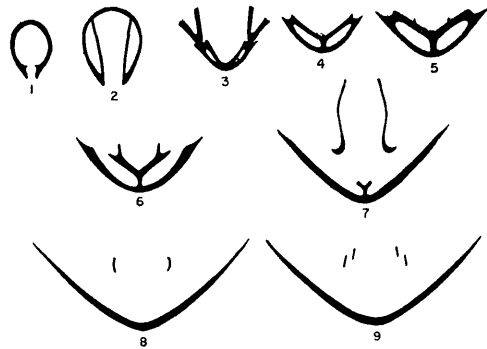
Species assigned.—*Terebratula amygdala* Dana and *Rhynchonella inversa* de Koninck.

FLETCHERINA AMYGDALA (Dana)
Pl. 61, figs. 7,10,11,14,15,19-22

Terebratula amygdala Dana, 1847, p. 152.

Diagnosis.—Shell of moderate size; externally indistinguishable from many species of *Dielasma* and *Beecheria* except for a tendency toward very faint biplication of the anterior commissure in some individuals. The color pattern consists of irregular radial bands. Internally the ventral valve shows dental plates and a pedicle collar. The dorsal interior, with the cardinal plates extending in a shallow "V" between the socket plates and supported by a double walled septum, formed from the union of the ancestrally discrete portions of a medially sessile cardinal plate; crura arising from the cardinal plate near its unions with the socket plates; crural points extremely long; loop short, terebratuliform.

Remarks.—Externally this species appears to differ considerably from *F. inversa* because of the weakness of the plications which are sometimes developed and sometimes not. The tendency toward biplication together with the internal similarity seems to suggest



TEXT-FIG. 3—Idealized serial sections of *Fletcherina*.

that both species must be placed in the same genus however.

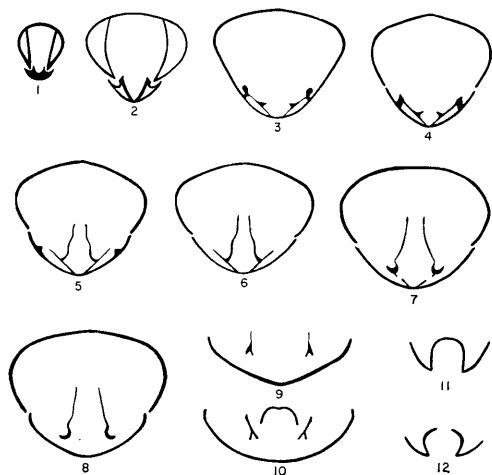
Material.—Four specimens, Upper Marine Series, Gerringong, N.S.W. Australia (C.I.T. 5956). Two specimens, "Permo-Carb" Greta, N.S.W. Australia (USNM 24474). Four specimens, Upper Marine Series, Gerringong, N.S.W. Australia (USNM 112142).

FLETCHERINA INVERSA (de Koninck)
Pl. 61, figs. 8,9,12,13,16,26

Rhynchonella inversa de Koninck, 1877, p. 171, pl. 11, fig. 11.

Dielasma inversa Etheridge, 1898, p. 175-6, pl. 19, figs. 1-13.

Diagnosis.—Moderate to large sized *Fletcherina*. Ventral valve longitudinally of moderate convexity which is strongest toward the beak, transversely of moderate convexity toward the beak but becoming flatter anteriorly; near or somewhat posterior to mid-length appears a median fold flanked by sulci which become more prominent toward the front; ventral beak erect; beak ridges rounded, foramen permesothryd, labiate; deltidial plates conjunct. Dorsal valve of slight longitudinal convexity but of high transverse convexity; a median sulcus develops posterior to mid-length and is flanked by folds; a lesser sulcus and fold are present on the lateral slopes. Anterior commissure sulciphate to episulcate; lateral commissures sinuate. Shell oval in outline; smooth or with concentric growth lines;



TEXT-FIG. 4—Idealized serial sections of *Yochelsonia*.

color pattern unknown. Interior as described for the genus.

Material.—Two specimens from Upper Marine Series, Wyro., near Ulladulla, New South Wales, Aust. One internal mold, Permo-Carboniferous, Greta, N.S.W., Aust. (C.I.T. 5954, 5955).

Genus *YOCHELSONIA* Stehli, n. gen.

Text-Fig. 1C,4

Diagnosis.—Small Dielasmatidae of subtriangular to pentagonal outline; ventral valve with a high median fold bordered by sulci; front and sides of both valves geniculate; dorsal valve longitudinally flat to concave with a pronounced median sulcus.

Ventral interior with well developed dental plates and a pedicle collar; muscles poorly impressed and their positions unknown. Dorsal interior with the cardinal plate medially sessile so as to appear as two separate plates extending from the socket plates to the valve floor; crura arising from these plates; plates becoming free of the sockets before they become free of the valve floor so that for a distance the crura are supported on a "V"; crural points developed to an extraordinary length; loop terebratuliform.

Geologic range.—Calceolispongia Stage, zones 29–32.

Geographic range.—Known only from the west side of the syncline south of Minilya River, Western Australia.

Discussion.—This genus was probably derived from such Salt Range species as "*Dielasma*" *biplex* Waagen by extreme alteration of the shape of the valves. The internal structures are very like those of "*Dielasma*" *biplex* and the basic pattern of a median ventral fold flanked by sulci and medially sulcate dorsal valve has also been retained. In detail the pattern of folding has been greatly exaggerated. The change in convexity of the valves and the modifications of the margins are features which place the genotype far outside the range of variability encompassed in "*D.*" *biplex* and closely related species, and *Yochelsonia thomasi* is therefore considered to represent a new genus. No descendant forms are known.

Species assigned.—*Yochelsonia thomasi* Stehli, n. sp.

YOCHELSONIA THOMASI Stehli, n. sp.

Pl. 61, figs. 17,18,23–25

Diagnosis.—Small dielasmatids of subtriangular outline. Ventral valve of rather high longitudinal convexity especially near the beak; anterior margin geniculate; lateral margins geniculate, then the valve is flattened except for a high median fold which extends almost to the beak; beak erect; beak ridges slightly angular; deltidial plates conjunct; pedicle foramen permesothyrid. Dorsal valve longitudinally slightly concave; transversely of moderate convexity but with a pronounced median fold extending almost to the beak; front and sides of the valve geniculate. Shell smooth or with concentric growth lines especially on the geniculated margins. Color pattern unknown.

Ventral interior with dental plates and a pedicle collar; positions of muscle insertions uncertain. Dorsal valve with the cardinal plate medially sessile and descending unsupported from the socket plates to the valve floor; cardinal plates becoming free of the socket plates first; crura greatly elongated; loop terebratuliform.

Material.—Three specimens from Calceolispongia Stage zones 29–32; west side of

syncline south of Minilya River, Western Australia (U.S.N.M. 112685, 179050).

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MANUSCRIPT RECEIVED AUGUST 13, 1959

(Explanation of Plate 61 will be found on page 456)

EXPLANATION OF PLATE 61

All figures $\times 1$, except, as indicated.

- Figs. 1-6—*Gilledia cymbaeformis* (Morris). 1, dorsal exterior; 2, ventral exterior, note wavy carinae; 3, internal mold showing features of the interior of the pedicle valve, note impressions of the pallial sinus system; 4, internal mold showing features of the dorsal interior, note positions of attachment of the secondarily thickened crural plates and sessile cardinal plates, $\times 1.3$; 5, profile, beak of ventral valve broken; 6, anterior (California Institute of Technology 5951, Upper Marine Series, Wyro, near Ulladulla, N.S.W. Australia, 1,2,5,6; University of Tasmania 25250 Woodbridge glacial fm., Blackwood Ck. near Cressy, Tasmania, 3,4).
- 7,10,11,14,15,19-22—*Fletcherina amygdala* (Dana). 7, semiprofile of dorsal valve showing faint radial color markings $\times 1.5$; 10, dorsal exterior, note incipient plication of interior margin. Specimen with elongate ventral beak; 11, dorsal exterior, specimen with normal beak and outline; 14, internal mold showing impressions of internal structures of both valves; note impressions of pedicle collar and dental plates in ventral valve end of socket plates, median septum and medially depressed cardinal plate in dorsal valve; 15, ventral exterior of specimen showing little tendency toward plication; 19, rubber cast of internal mold of fig. 14, showing positive of internal structures noted; 20, profile; 21, posterior; 22, anterior, showing plications (USNM 152877, Upper Marine Series, Gerringong, N.S.W. Australia, 7,10,11,15, 19,20-22; USNM 24474, 14).
- 8,19,12,13,16,26—*Fletcherina inversa* (de Koninck). 8, dorsal exterior; note plications characteristic of this species, $\times 2$; 9, Ventral exterior $\times 2$; 12, Anterior, $\times 2$; 13, Internal mold showing impressions of internal structures of both valves; note pedicle collar and dental plates in ventral valve and median septum and socket plates in the dorsal valve; 16, posterior $\times 2$; 26, profile $\times 2$, (California Institute of Technology 5954, Upper Marine Series, Wyro, near Ulladulla, N.S.W., Australia).
- 17,18,23-25—*Yochelsonia thomasi*, n. gen. et sp. 17, posterior; 18, anterior, showing geniculate margins; 23, ventral exterior, showing the median fold and flanking sinuses; 24, dorsal exterior showing deep median sulcus; 25, profile showing the longitudinal flattening of the dorsal valve (USNM 179056, Calceolispongia Stage zones 29-32, west side of syncline south of Minilya River, Western Australia.)

