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LATE UPPER DEVONIAN (FAMENNIAN)
RHYNCHONELLOID BRACHIOPODS,

by Paul SARTENAER (Brussels).

(With two plates.)

INTRODUCTION.

In a forthcoming Bulletin to be published by the Geological Survey of Canada entitled « Late Upper Devonian (Famennian) Rhynchonelloid Brachiopods from Western Canada », five new genera will be fully described and detailed consideration given to the following genera : *Basilicorhynchus* CRICKMAY, 1952, *Greenockia* BROWN, 1952, *Moorefieldella* GIRTY, 1911, *Paraphorhynchus* WELLER, 1905, *Paurorhyncha* COOPER, 1942, *Pseudonudirostra* ROZMAN, 1960, *Pugnoides* WELLER, 1910, *Zilimia* NALIVKIN, 1937. Various species of the new genera and also of known genera will be described.

The new genera are briefly described in this paper. For the Canadian genera the type species are new and a short diagnosis is given.

This paper and the forthcoming Bulletin are complementary to a similar study of Western Canadian Middle Devonian and Frasnian rhynchonelloids by Dr. D. J. McLAREN of the Geological Survey of Canada, Ottawa.

The Director of the Geological Survey of Canada is gratefully acknowledged for giving permission to study the rhynchonelloid material from Canada.

Plaster replicas of type specimens stored in the Geological Survey of Canada type collections have been deposited in the Institut royal des Sciences naturelles de Belgique.

Eoparaphorhynchus n. gen.

Derivatio nominis. — ἠέως (Greek, fem.) = dawn; to indicate that this genus is older than the known genus *Paraphorhynchus* to which it bears some resemblance.

Type species. — *Eoparaphorhynchus maclareni* n. sp.

Diagnosis. — Variable size. Uniplicate. Well marked sinus and fold, not starting from the beak. Sinus wide. Commissure crenulate. Umbonal ventral region somewhat swollen. Number of costae variable, but low. Median costae starting from the beak, rarely divided. Parietal costae seldom present. External lateral costae restricted to the anterior part of the shell. Fine radial striation commonly or rarely observed, depending on species.

Dental plates subparallel in the posterior part of the shell, becoming convergent (1) anteriorly. Dorsal septum supporting a deep and narrow uncovered septalium. Outer plates of the hinge plate strong, flat to slightly concave. Strong crural bases. Crura becoming progressively crescent to triangular-shaped in transverse serial sections.

Discussion. — *Paraphorhynchus* is readily distinguishable by a well marked fine radial striation that is always present; in *Eoparaphorhynchus* this striation is faint and not always present. *Yunnanella* GRABAU, 1923 is immediately separable not only by the same character but also by the costae restricted to the anterior part of the shell. The species referred to this genus are restricted in Canada, Europe and Asia to the Lower Famennian.

Eoparaphorhynchus maclareni n. sp.

(Plate I, Figures 1 a-e, 2; Plate II, Figure A.)

Derivatio nominis. — The species is named for D. J. McLAREN of the Geological Survey of Canada, who first drew the attention on the stratigraphic significance of rhynchonellids in the Upper Devonian of Western Canada.

Types. — Holotype, GSC n° 15,578, and 30 paratypes, A to Z and AA to DD, GSC n°s 15,579 to 15,608 inclusive, in the type collections of the Geological Survey of Canada, in Ottawa.

Type locality. — Root River, 5 $\frac{3}{4}$ miles upstream, on north side, south end of prominent scarp, Northwest Territories, Canada, GSC loc. 33,384.

(1) «Convergence» and «divergence» are in relation to the median line of transverse serial sections.

Type horizon. — HUME's (1922) *Leiorhynchus* zone = D₄.

Description. — Medium to large-sized. Sinus and fold not starting from the beak. Sinus usually not deep, sometimes very shallow. Sinus wide at front. Umbonal ventral region commonly inflated, sometimes very strongly. Beak erect to slightly incurved. Ventral interarea limited ventrally by a beak ridge which tends to disappear or disappears away from the beak. Median costae of the sinus often projecting beyond the borders of the tongue. Greatest width at around $\frac{2}{3}$ of the length. Values of shoulder angle (2) varying between 105° and 115°. Median costae, 2 to 4 (seldom 5) on fold, begin at beak, simple but for one specimen out of hundred. Parietal costae very rare. Lateral costae, 2 to 6 on each flank, simple with very few exceptions; only internal lateral costae reach the umbonal region. Fine radial striation observed in more than 10 % of specimens.

Internal characters are those given under the description of the genus.

Discussion. — The species is known from the Northwest Territories, from the Mackenzie River, Root River, North Nahanni River, Redstone River, Blackstone River, Rabbit Lake area.

Sinotectirostrum n. gen.

Derivatio nominis. — *Sinus* (Latin, masc.) = fold; *tectum* (Latin, neut.) = roof; *rostrum* (Latin, neut.) = beak.

Type species. — *Sinotectirostrum medicinale* n. sp.

Diagnosis. — Medium to large-sized. Uniplicate. Well marked sinus and fold, not starting from the beak. Sinus wide. Commissure crenulate. Shell completely covered with simple, wide, strongly marked, roof-shaped, regular costae starting from the umbo; very rarely a median or lateral costa may be divided. Number of costae variable, but high. Parietal costae always present, one to 3 (rarely 4) on each side, not indenting the borders of the tongue. Shoulder angle commonly between 95° and 105°. Beak small, clearly defined.

Dental plates slender, divergent in the posterior part of the shell, becoming subparallel or slightly convergent anteriorly. Dorsal septum supporting a deep, amphora-shaped septalium. Septalium covered in its anterior part (3). Outer plates of the hinge plate strong, flat to slightly concave. Crura, supported by strong crural bases, becoming progressively crescent-shaped in transverse serial sections; they are slightly bent at their distal end.

(2) Shoulder angle = angle formed by planes tangential to the borders of the umbo in ventral views.

(3) The partial or complete absence of this covering in some specimens is due only to the fragility of this structure (see Plate II, Figure B).

Discussion. — SARTENAER (1961 a) deals with the genus *Camarotoechia* HALL et CLARKE, 1893. The restriction of the systematic and stratigraphic significance of the genus results in a fragmentation of *Camarotoechia* auctorum. *Camarotoechia* differs from *Sinotectirostrum*, by shape, size, costae and an uncovered septalium.

The species referred to this genus are restricted, in Canada, to the Lower Famennian.

Sinotectirostrum medicinale n. sp.

(Plate I, Figures 3 a-b; Plate II, Figure B.)

Derivatio nominis. — (*Ars*) *medicinalis* (Latin) = medicine; on account of the common occurrence of the species around Medicine Lake, Jasper National Park, Alberta.

Types. — Holotype, GSC n° 13,797 [= Pl. V, fig. 16-18 in MCLAREN, 1958, identified as *Camarotoechia* sp. E (n. sp.)], and 17 paratypes, A to R, GSC n°s 15,648 to 15,665 inclusive, in the type collections of the Geological Survey of Canada, in Ottawa.

Type locality. — Proposal Mountain, south end of Medicine Lake, Jasper National Park, Alberta, Canada, GSC loc. 18,241.

Type horizon. — Middle part of member B of the Alexo formation (= unit 42 in MCLAREN, 1955, p. 47).

Description. — Medium to large-sized. Well marked sinus and fold not starting from the beak. Sinus very wide at front, usually deep. Fold usually high. Sides of the sinus commonly not very steep and, thus, wide in ventral views. Antero-lateral margins vertical or slightly concave. Beak small, erect to suberect, clearly detached. Ventral interarea clearly defined and elongated. Greatest width between 50 % and 60 % of length from beak. Values of shoulder angles low, usually 95° to 100°. Roof-shaped costae with sharp ridges common. Median costae, 4 to 14 (usually 6 to 9) on fold, simple (except in 2 specimens), regular, begin at beak. Parietal costae, 1 to 4 on each side (usually 1 to 3), not indenting the borders of the tongue. Lateral costae, 7 to 20 (usually 10 to 16) on each flank, simple with very few exceptions, regular, starting from the umbo.

Internal characters are those given under the description of the genus.

Discussion. — The species is known from the northern part of the Alberta Rocky Mountains : Winnifred Pass, Fiddle Creek, Morro Peak, Pallisade Mountain, Medicine Lake, Nigel Peak.

Trifidorostellum n. gen.

Derivatio nominis. — *Trifidus*, *a*, *um* (Latin) = three-forked; to indicate that the genus was first discovered in the Three Forks formation; *rostellum* (Latin, neut.) = little beak.

Type species. — *Leiorhynchus dunbarensis* HAYNES, 1916.

Diagnosis. — Small to large-sized. Uniplicate. Dorsal umbo inflate and commonly projected posteriorly beyond the pedicle valve. Sinus deep, fold high, beginning a very short distance from the beak. Sinus widens and deepens abruptly forwards. Beak small, acute, clearly defined and slightly incurved; owing to the inflation of the dorsal umbo, it is commonly almost in contact with the brachial valve. Foramen small and round. Costae simple in the type species; in other species, the median costae are sometimes divided. Number of median and lateral costae variable, but low. No parietal costae. Median costae start from the beak. External lateral costae confined to the anterior part of the shell. Costae wide. Tongue usually recurved. Width is the greatest dimension. Length and thickness have similar values. Angle of the cardinal commissure at the beak varying between 145° and 175°.

Dental plates slender and short. No dorsal septum. No septalium. Outer plates of the divided hinge plate narrow, slender and inclined towards each other; they support diverging crural bases passing to delicate diverging crura. The crura may acquire a groove in their lower part resulting in a typical walking-stick shape in serial transverse sections. Teeth enter the sockets at some distance from the cardinal commissure; this can be seen in serial sections.

Discussion. — SARTENAER (1961 b) has redefined the genus *Leiorhynchus* HALL, 1860, to which the type species of *Trifidorostellum* was originally assigned. *Leiorhynchus* is easily distinguished by its shape: inflate, helmet-shaped contour of the brachial valve in cardinal view, longitudinal curvature of the brachial valve; the weakly developed sinus and fold, which start further away from the beak; low relief of costae; short crural trough, etc...

The species referred to this genus are restricted in Canada and the U. S. A. to the Lower Famennian (upper part).

Trifidorostellum dunbarensis (HAYNES).

(Plate I, Figure 4 a-e; Plate II, Figure C.)

Holotype. — N° 2,704 in Carnegie Museum, Pittsburgh, Pennsylvania, U. S. A. (Pl. VIII, fig. 8 in HAYNES, 1916).

Type locality. — Near Dunbar's mine, north of Three Forks, Montana, U. S. A.

Type horizon. — According to HAYNES (1916) : « Limestone layers at the top of member number 5 » of the Three Forks formation.

Rugaltarostrum n. gen.

Derivatio nominis. — *Ruga* (Latin, fem.) = wrinkle, fold; *altus, a, um* (Latin) = high; *rostrum* (Latin, neut.) = beak.

Type species. — *Leiorhynchus madisonense* HAYNES, 1916.

Diagnosis. — Small to large-sized. Uniplicate. Sinus deep and wide, widening rapidly. Tongue and fold high. Sinus and fold not starting from the beak, but usually not very far from it. Beak acute and well defined. Number of costae variable, but low. Divided median costae rare in some species, common in others. Parietal costae sometimes present. Lateral costae absent or rare, mostly restricted to the anterior part of the shell. All costae wide. Shell transversally developed. Both valves convex-concave near the cardinal commissure. Fine radial striation sometimes visible.

Dental plates slender, divergent to parallel in the posterior part of the shell becoming progressively convergent anteriorly. Dorsal septum supporting a wide, cup-shaped, uncovered septalium. Outer plates of the hinge plate inclined towards each other, becoming progressively narrower anteriorly, developing into crural bases passing to crescent to triangular-shaped crura in transverse serial sections, strongly curved at their distal end. Teeth enter the sockets in a manner similar to what has been observed in the genus *Trifidorostellum*.

Discussion. — *Leiorhynchus* to which the type species of *Rugaltarostrum* was originally assigned, differs from that genus by the same characters as those given under the discussion of *Trifidorostellum*. *Rugaltarostrum* and *Calvinaria* STAINBROOK, 1945, have many similarities; *Calvinaria* differs by its low crural trough and its residual umbonal cavities.

The species referred to this genus are restricted in Canada and in the U. S. A. to the Lower Famennian (upper part).

Rugaltarostrum madisonense (HAYNES).

(Plate I, Figures 5 a-e; Plate II, Figure D.)

Holotype. — N° 2701 in Carnegie Museum, Pittsburgh, Pennsylvania, U. S. A. (Pl. VII, Fig. 11-12 in HAYNES, 1916).

Type locality. — Three Forks, Montana, U. S. A.

Type horizon. — According to HAYNES (1916) : « green shale and associated limestone layers of member number 5 » of the Three Forks formation.

Ptychomaletoechia n. gen.

Derivatio nominis. — ἡ πτυχή (Greek, fem.) = fold, costa; ὀμαλός, ἴσος (Greek) = regular; ὁ τοίχος (Greek, masc.) = wall.

Type species. — *Rynchonella Omaliusi* GOSSELET, 1877.

Diagnosis. — Small to large-sized. Uniplicate. Well marked sinus and fold not starting from the beak. Beak prominent, erect to suberect. Sinus wide, Shell completely covered with simple costae reaching the umbo. Number of costae variable, but high. Parietal costae rare in some species, common in others. Parietal costae indenting or not indenting the borders of the tongue, depending on the species.

Dental plates divergent to parallel in the posterior part of the shell becoming progressively convergent anteriorly; sometimes they are somewhat convex towards the general cavity of the shell. Dorsal septum supporting a deep cupule- to amphora-shaped, uncovered septalium. Outer plates of the hinge plate flat to slightly concave; the junction of the outer plates with the borders of the septalium usually marked by a distinct ridge. Articulation strong. Cura supported by strong crural bases, becoming progressively crescent- to triangular-shaped in transverse serial sections; they are slightly to strongly bent at their distal end.

Discussion. — The type species has usually been assigned to *Camarotoechia*. As redefined by SARTENAER (1961 a), *Camarotoechia* is easily separable by shape, costae, etc ...

The species referred to this genus are restricted in Europe, North America and Asia to the Lower Famennian.

Ptychomaletoechia omaliusi GOSSELET).

(Plate I, Figures 6 a-e; Plate II, Figures E, F.)

Lectotype. — Pl. IV, fig. 6a-d in GOSSELET, 1877 in the State University of Lille, France.

Type locality. — « Tranchée de Senzeilles », Belgium.

Type horizon. — Assise de Senzeilles.

ABSTRACT.

Five new Famennian (Upper Devonian) genera are proposed. Two are from Western Canada: *Eoparaphorhynchus* with type species *E. maclarenii* n. sp. and *Sinotectirostrum* with type species *S. medicinale* n. sp. Two are from Western U. S. A.: *Trifidorostellum* with type species *Leiorhynchus dunbarensis* HAYNES and *Rugaltarostrium* with type species *Leiorhynchus madisonense* HAYNES. One is from Belgium: *Ptychomaletoechia* with type species *Rynchonella Omaliusi* GOSSELET.

RÉSUMÉ.

Cinq nouveaux genres famenniens (Dévonien Supérieur) sont proposés : deux dans l'Ouest du Canada, *Eoparaphorhynchus* et *Sinotectirostrum* avec, respectivement, *E. maclareni* n. sp. et *S. medicinale* n. sp. comme espèces-types; deux dans l'Ouest des Etats-Unis d'Amérique, *Trifidorostellum* et *Rugaltarostrum* avec, respectivement, *Leiorhynchus dunbarensis* HAYNES et *L. madisonense* HAYNES comme espèces-types; un en Belgique, *Ptychomaletoechia*, avec *Rhynchonella Omaliusi* GOSSELET comme espèce-type.

REFERAT.

Rinkhonelloidnye brakhiopody pozdnego verkhnego devona (famen-skogo iarousa). — V rabote opisyaivaioutsia piat novykh famenskikh verkhnedevonskikh rodov. Dva iz nikh iz zapadnoi Kanady : *Eoparaphorhynchus* s tipitchnym vidom *E. maclareni* n. sp. i *Sinotectirostrum* s tipitchnym vidom *S. medicinale* n. sp. Drougie dva iz zapada Soedinennykh Chtatov : *Trifidorostellum* s tipitchnym vidom *Leiorhynchus dunbarensis* HAYNES i *Rugaltarostrum* s tipitchnym vidom *Leiorhynchus madisonense* HAYNES. Odin rod iz Belgii : *Ptychomaletoechia* s tipitchnym vidom *Rhynchonella Omaliusi* GOSSELET.

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EXPLANATION OF PLATES.

PLATE I.

(Except where otherwise stated, all figures are natural size.)

Figures 1, 2. — *Eoparaphorhynchus maclareni* n. gen., n. sp.

- 1 a-e, ventral, dorsal, frontal, apical and lateral views of Holotype, GSC n° 15,578; Root River, 5 $\frac{3}{4}$ miles upstream on north side, south end of prominent scarp, Northwest Territories, Canada, GSC loc. 33,384; outcrop of 90 feet thickness; HUME's (1922) *Leiorhynchus* zone = D4; collector: D. J. McLAREN, 1957. Faint radial striation may be seen on the flank of the brachial valve on figure 1 e.
- 2, fragment of pedicle valve ($\times 3$) of Paratype, GSC n° 15,592, showing the faint radial striation; Mackenzie River, left bank, 10 $\frac{3}{4}$ miles above mouth of North Nahanni River, Northwest Territories, GSC loc. 7,149 c; 65 to 75 feet above the base of the section; collector: G. S. HUME, 1921.

Figure 3. — *Sinotectirostrum medicinale* n. gen., n. sp.

- a-b, apical and lateral views of Holotype, GSC n° 13,797; Proposal Mountain, south end of Medicine Lake, Jasper National Park, Alberta, Canada, GSC loc. 18,241; middle part of member B of the Alexo formation (unit 42 in McLAREN, 1955, p. 47); collector: D. J. McLAREN, 1949.
(See also figures 16-18 in McLAREN, 1958.)

Figure 4. — *Trifidorostellum dunbarensis* (HAYNES, 1916).

- a-e, apical, ventral, dorsal, lateral and frontal views of Holotype, CM n° 2,704; near Dunbar's mine, north of Three Forks, Montana, U. S. A.; « Limestone layers at the top of member number 5 » of the Three Forks formation; collector: P. E. RAYMOND. Ventral, dorsal and frontal views are not exactly oriented with the plane of commissure horizontal; the ventral view is oriented as in the figure 8, pl. VIII in HAYNES (1916).

Figure 5. — *Rugaltarostrum madisonense* (HAYNES, 1916).

- a-e, dorsal, ventral, frontal, apical and lateral views of Holotype, CM n° 2,701; Three Forks, Montana, U. S. A.; « green shale and associated limestone layers of member 5 » of the Three Forks formation; collector: P. E. RAYMOND.

Figure 6. — *Ptychomaletoechia omaliusi* (GOSSELET, 1877).

- a-e, dorsal, ventral, apical, frontal and lateral views of Topotype A. Senzeilles 6,839b n° 17; « Tranchée de Senzeilles », on the railroad from Charleroi to Vireux, between the railroad station of Senzeilles and the northwestern wall of the tunnel of Senzeilles (Senzeille sheet; scale: 1/20,000), Belgium; at 278 m south-east of the southeastern wall of the « pont rouge » viaduc; at 53.90 m from the base of the Famennian; I.R.Sc.N.B. loc. Senzeilles 6,839 b 236 b; collector: P. SARTENAER, 1950.

PLATE II.

Camera lucida drawings of serial transverse sections; distances are in mm forward from the crest of the umbo.

A. — *Eoparaphorhynchus maclareni* n. gen., n. sp.

Paratype AA, GSC n° 15,605; Same locality and zone as for holotype, GSC loc. 6,493; collector : E. M. KINDLE, 1919.

B. — *Sinotectirostrum medicinale* n. gen., n. sp.

Paratype R, GSC n° 15,665; Beaver Ridge, between Medicine Lake and Beaver Lake, Jasper National Park, Alberta, Canada, GSC loc. 19,597; Alexo formation; collector : D. J. MCLAREN, 1951.

C. — *Trifidorostellum dunbarensis* (HAYNES, 1916).

Hypotype H, GSC n° 15,523; T5N, R1 + 2W (Devils Fence 15' Quadrangle), Montana, U. S. A.; Three Forks formation; collector : O. D. BLAKE.

D. — *Rugaltarostrum madisonense* (HAYNES, 1916).

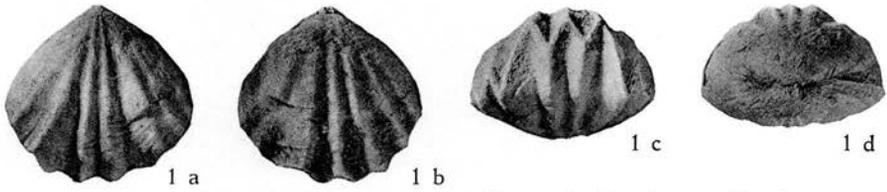
Hypotype M, GSC n° 15,677; Northeast side of Root River, Camsell Range, Northwest Territories, Canada, GSC loc. 7,172; HUME's (1922) *Leiorhynchus* zone = D4; collector : G. S. HUME, 1921.

E. — *Ptychomaletoechia omalusi* (GOSSELET, 1877).

Topotype B, Senzeilles 6,839b n° 18; Same locality, formation and collector as for topotype A.

F. — *Ptychomaletoechia omalusi* (GOSSELET, 1877).

Topotype C, Senzeilles 6,839b n° 19; Same locality, formation and collector as for topotypes A and B.



Eoparaphorhynchus maclareni.



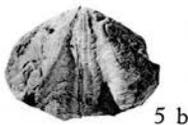
Sinotectirostrum medicinale.



Eoparaphorhynchus maclareni.



Trifidorostellum dunharensis.



Rugaltarostrum madisonense.



Ptychomaletoechia omaliusi.

