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A. O. Thomas

M. A. Stainbrook

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STATUS OF CERTAIN RHYNCHONELLID BRACHIOPODS FROM THE DEVONIAN OF IOWA

A. O. THOMAS AND M. A. STAINBROOK

At the first Annual meeting of the Iowa Academy of Science¹ at Iowa City, June 23, 1876, Professor Samuel Calvin read a paper on "New Species of Paleozoic Fossils." The Proceedings of the meeting do not give an abstract of the paper but in the American Naturalist, Vol. 11, pp. 57-58, a brief abstract says that "Prof. Samuel Calvin, of the State University of Iowa, described seven New Species of Paleozoic Fossils found mainly in Howard and Floyd counties, Iowa." One of these species was *Rhynchonella alta* which occurs in the Lime Creek shales of Floyd county, one of the two counties mentioned. It appears that Calvin distributed "a named photographed plate"² of these fossils but its fugitive character has been such that it has not been generally available to students. Calvin's description of the species was not published but we find paleontologists, for example, Williams,³ Walcott,⁴ and others to whom specimens had evidently been sent, accepting the name.

In the State Quarry beds, outcropping near Solon and also near North Liberty in Johnson county, Iowa, some seventy miles from the nearest Lime Creek beds, occurs a fauna rich in fish teeth,⁵ broken brachiopod shells, crinoid stems and some others of less importance. The only well preserved and readily recognized brachiopod from this formation is one that is congeneric with Calvin's *R. alta* and which bears considerable superficial resemblance to it. Specimens of this State Quarry shell were distributed by Calvin and others under the name *Rhynchonella pugnax* or *Pugnax*

¹ This was the first Academy of Science, 1875 to 1884. The present Academy was organized in 1887. A pamphlet printed by John P. Irish at Iowa City in 1880 gives the proceedings of the old Academy up to that year and a short abstract of some papers. See Proc. Ia. Acad. Sci., Vol I, pt. ii, p. 9, 1892. The date of the meeting at which Calvin read the paper has been given erroneously by several authors as 1877.

² Walcott, C. D., U. S. Geol. Surv. Monog. VIII., p. 156, 1884; Whiteaves, J. F., Contrib. Can. Pal., Vol. I, pt. iii, p. 231, 1891; Schuchert, C., U. S. Geol. Surv. Bull. 87, p. 335.

³ Williams, H. S., Amer. Jour. Sci., Vol. 25, 3rd Series, p. 100, 1883.

⁴ Walcott, C. D., opus cit.

⁵ Eastman, C. R., Iowa Geol. Surv., Vol. XVIII, Dev. Fishes of Iowa.

pugnus (Martin). This name was first applied to a European species which occurs abundantly in the Lower Carboniferous (Mississippian) of the British Isles and the Continent, but less commonly in the subjacent Upper Devonian beds of the same countries. Species identified as *R. pugnus* or *P. pugnus* and varieties have been reported from several Devonian localities in North America. In the opinion of the writers these need revision.

The fact that *R. alta* and *R. pugnus* are the names heretofore attached to rather similar shells from Iowa naturally has led to some confusion. By some authors *R. alta* is made synonymous with *R. pugnus*, by others, it is regarded as a variety. Thus Walcott and later Whiteaves in the works cited above make these synonymous while Williams⁶ makes *alta* a variety but actually figures *R. pugnus* from the State Quarry beds at Solon. On the other hand Hall and Clarke,⁷ the authors of the genus *Pugnax*, refer both the Lime Creek and State Quarry species to *Pugnax altus* Calvin and illustrate both forms with excellent figures which bring out clearly some of the differences between the Hackberry Grove and Solon species. Schuchert⁸ in his bibliography lists *R. alta* as a variety of *Pugnax pugnus* and limits it to the one locality, namely Solon. Weller⁹ regards the two as similar and assigns *Pugnax altus* to both the State Quarry and the Lime Creek. But it is needless to add further examples from the literature of the obviously badly confused identification of these two quite distinct forms. Calvin clearly recognized their differences but unhappily he lacked consistency in the use of the names. In the Cerro Gordo list¹⁰ he correctly enters the Lime Creek species as *Pugnax altus* but in the Buchanan county list¹¹ of the Independence shale fossils he enters a brachiopod which he considered identical with the Lime Creek species as *Rhynchonella (Pugnax) pugnus* var. *alta* and speaking of its occurrence he says, "the *Rhynchonella (Pugnax) pugnus*, found in both the Lime Creek and the Independence shales, is a small acuminate variety, quite distinct from that occurring in the State Quarry beds of Johnson county, Iowa." The distinctness of the two in Calvin's opinion is further brought out in the Johnson county report¹² where he says "the fauna of the State Quarry

⁶ Williams, H. S., Bull. G. S. A., Vol. I, p. 495, pl. 12, figs. 5-7, 1890.

⁷ Pal. N. Y., Vol. VIII, pt. ii, pp. 203, 204, pl. LX, figs. 1-5, 1894.

⁸ Opus cit.

⁹ Jour. Geol., Vol. XVII, p. 266, 1909.

¹⁰ Iowa Geol. Survey, Vol. VII, p. 165, 1897.

¹¹ Iowa Geol. Surv., Vol. VIII, pp. 223-224, 1898.

¹² Iowa Geol. Surv., Vol. VII, p. 78, 1897.

beds is unique. The deposit near Solon furnishes *Pugnax pugnus* (Martin), *Melocrinus calvini* Wachsmuth and Springer, and a very peculiar Stromatoporoid, none of which is found in the other Devonian formations."

The Lime Creek specimens in the Calvin Collection at the University all bear the label "*Pugnax altus*" in Professor Calvin's handwriting. The specimens collected by him from the State Quarry beds at Solon and North Liberty are labelled "*Rhynchonella pugnus*" except one tray containing a score or more specimens from the State Quarry beds at Solon. This is labelled "*Rhynchonella alta* Calvin, Solon, Iowa." The lot is a part of one of his earlier collections made in the seventies or eighties. In no case is there a mixture of the two species in the trays.

In 1910, Weller¹³ illustrated the internal characters of the rostral portion of the valves of *Pugnax pugnus* (Martin) from the Mountain Limestone of Ireland. In 1914 he placed two American Mississippian species in this genus.¹⁴ Neither of these is *P. pugnus* and no undoubted examples of this species are thought to occur in the American Mississippian or Devonian.

In order to settle the generic status of these Iowa Devonian rhynchonellids the junior author undertook the task of grinding away the beaks gradually and of making drawings of the brachial supports at intervals. The series of drawings are here presented. From them an ideal restoration of the brachidium and other internal characters can be made out and it is apparent that our species belong to the genus *Pugnoides*. A description of each of the two species follows.

PUGNOIDES ALTUS (CALVIN)

Plate I, Figs. 1 to 16.

1876. *Rhynchonella alta* Calvin. Read before the Iowa Academy of Science and a named photographic plate distributed.

Shell below medium size, acuminate, subpentagonal in outline, length and width about equal, greatest width posterior to the middle.

Pedicle valve strongly produced in front, the extended part being nearly at right angles to the plane of the valve; mesial sinus broad, beginning at a short distance in front of the umbo, and bordered laterally by high steep sides which gradually de-

¹³ Bull. G. S. A., Vol. 21, p. 508.

¹⁴ Ill. Geol. Surv., Monog. I, pp. 202-205.

crease in height anteriorly and become suppressed before reaching the margin; in most specimens the sinus narrows gradually to the front, becoming rather acuminate in extreme specimens. Postero-lateral angles prominent—viewed brachially, as in figures 1-4, there is but little slope from the beak to the angles—but viewed ventrally, as in figures 5-8, the postero-lateral edges form an obtuse angle at the beak which is pointed and incurved over that of opposite valve; pedicle opening round and small. Posterior part of valve smooth; near the midlength of the sinus there arise two (rarely three) plications which become stronger anteriorly, whose courses are subparallel and which meet those of the opposite valve in such a way as to make the anterior part of the linguiform extension sharply denticulate. Just in front of each postero-lateral angle and near the margin of the valve are two short angular plications. Internally the dental lamellae are short and the valve lacks a median ridge.



Fig. 1. A series of five cross-sections of the rostral part of the shell of *Pugnoides altus* showing the dental lamellae of the pedicle valve and the median septum, crural cavity, and crura of the brachial valve ($\times 2\frac{1}{2}$).

Brachial valve high, midline gently curving; the sides of the valve slope rapidly to the margins; in a side view the outline of the valve is sub-triangular; the high mesial region is accentuated on the front half by the presence of a sharp angular plication on each side of which is another plication equally angular but less strong. On the postero-lateral areas arise two or three low plications which are directed sharply outward to the posterior margin where they alternate with the shorter plications of the pedicle valve. Surface of valve smooth. Internally is a well developed septum which is divided to form a short crural cavity.

Position and localities: Lime Creek shales; very common at Bird Hill; also found at the exposures west of Rockford, and at Hackberry Grove. A single specimen of smaller size and with somewhat different arrangement of the plications is in the Calvin Collection from the Independence shale at Independence. Two specimens, one larger than any found in the Lime Creek beds, have been collected at exposure No. 3, of the Independence shale near Brandon. These have four plications on the fold.

PUGNOIDES SOLON THOMAS AND STAINBROOK

Plate I, Figs. 17 to 32.

1921. *Pugnoides solon* T. and S. Science, New Series, Vol. LIV, p. 308.

A strong shell of somewhat less than medium size, pentagonal in outline, wider than long, greatest width near the midlength.

Pedicle valve produced in front into a broad extension which is deflected until at right angles to the plane of the valve; the deflected part is wider than long and is of nearly the same width throughout. Mesial sinus very broad and scarcely defined until a short distance above the deflected portion; at the geniculation the sinus is flanked by the sharply elevated but short bounding plications. Anteriorly the sinus bears two, three, or four plications (rarely one or five), the greater number of shells have three; these are barely evident posterior to the deflected part. On the sides of the valve, near the margin, are three or four short, strongly elevated plications which give the sides a denticulated appearance. Beak closely incurved over that of the opposite valve; foramen small, terminal.

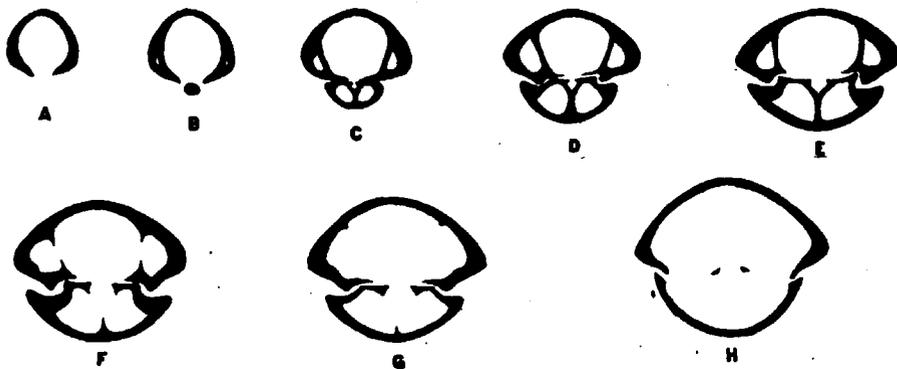


Fig. 2. A series of eight cross-sections of the rostral part of the shell of *Pugnoides solon* showing the dental lamellae of the pedicle valve and the median septum, crural cavity, and the crura of the brachial valve ($\times 2\frac{1}{2}$).

Brachial valve broadly convex from the umbo to the front margin; sides sloping gradually, their surfaces convex; fold broad, flattened anteriorly and marked by two to five, (rarely six), short, somewhat angular, but stout plications which terminate in a strongly serrate edge. Lateral slopes marked by three or four plications which arise about halfway between the beak and the margin; they are more rounded than those on the lateral slopes of the opposite valve.

Valves smooth except as noted; partly exfoliated shells under a strong lens show fine crowded radial lines and in some cases equally fine concentric lines. Internally the critical features of the genus are brought out in the series of sections here illustrated.

The species differs from *P. altus* in its generally coarser, broader, and less acuminate appearance; in the variable number of plications on the fold and sinus; and in the shorter and more rectangular deflected extension of the pedicle valve; and in having on the whole less angular plications.

Position and Localities: Limited to the State Quarry limestone at the old State Quarry near North Liberty and at various small outcrops to the west and south of Solon in Johnson county, Iowa.

PLATE I

- Figs. 1-16. *Pugnoides altus* (Calvin)
- 1-4. Brachial view of four typical specimens; number 1 has four plications on the fold, three is the usual number.
 - 5-8. Pedicle view of four specimens. Note the short plications on the lateral slopes.
 - 9-12. Four specimens showing the tapering, linguiform extension of the pedicle valve.
 - 13, 16. Two specimens viewed from the side showing the trigonal shape and the incurved beaks.
 - 14, 15. Two examples viewed posteriorly; note the sharply angular plications on anterior part of the fold.
- Figs. 17-32. *Pugnoides solon*. Thomas and Stainbrook.
- 17-20. Brachial view of four specimens showing the shape of the shell and the stout, short plications.
 - 21-24. Pedicle view of four specimens.
 - 25-28. Anterior view of four individuals showing the thickness of the shell, the zigzag front margin, and the variable number of plications on the fold and sinus. Number 28 has but one in the sinus.
 - 29, 32. Lateral view of two specimens showing the plications of the lateral slopes.
 - 30, 31. Posterior view of two examples showing the thickness of the shell, the plications on the fold, and the elevated ends of the lateral plications of the pedicle valve.

