

## A New Species of *Atrypa* from the Devonian of Montana

FRANK E. KOTTELOWSKI, Indiana University

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The Upper Devonian limestones in the Rocky Mountains contain a species of small brachiopods which has been called *Atrypa missouriensis*. This western species is not *A. missouriensis* Miller as described by Miller (1894, p. 315), Fenton and Fenton (2, p. 15), and Greger (1936, p. 43). G. Arthur Cooper noted (personal communication to Charles Deiss) that "this species of *Atrypa* is not *A. missouriensis* that one can identify by examining D. K. Greger's description of that species. The specimens are very likely a new species which is abundant in the Devonian of Wyoming and Montana." The purpose of this paper, therefore, is to describe the western *A. aff. missouriensis*, differentiate it from the true *A. missouriensis*, and to name the species *A. multicostellata* sp. nov. after the numerous small costellae on the shell.

### *Atrypa multicostellata* sp. nov.

Plate I, figures 1-7.

1877. *Atrypa reticularis*, Meek in King's Rept. U. S. Geol. Expl. 40th Par., vol. IV, p. 38, pl. III, fig. 6a, in Nevada ls fr White Pine, Nevada.
1884. *Atrypa desquamata*, Walcott, U. S. Geol. Survey Mon. VIII, p. 150, pl. XIV, figs. 4-4a, lower horizon of the Devonian ls fr Atrypa Peak, Nevada.
1899. *Atrypa missouriensis*, Girty, U. S. Geol. Survey Mon. 32, pt. 2, p. 502-504, pl. LXVI, figs. 2a-2c. fr. Devonian in Yellowstone Nat. Park.
1908. *Atrypa missouriensis*, Kindle, Bull. Am. Paleontology, vol. 4, no 20, p. 29, pl. 1, figs. 7-7b, in Jefferson limestone near Princeton, Montana.
1940. *Atrypa cf. missouriensis*, Merriam, Geol. Soc. Am., Spec. Paper no. 25, pl. 7, figs. 15-16, in upper Nevada limestone, Nevada.
1947. *Atrypa missouriensis*, Laird, Jour. Paleontology, vol. 21, no. 5, p. 457, pl. 64, figs. 19-22, in lower part of Jefferson limestone in northwestern Montana.
1894. not *Atrypa missouriensis*, Miller, Geol. Survey Indiana, 18th Ann. Rept., p. 315, pl. 9, figs. 19-21, in Callaway limestone near Otterville, Missouri.

*Holotype*—Indiana University Paleontological Collections, no. 5096.  
*Paratypes*: no. 5097, 5098, 5099.

*Description*—The shell is small, circular to subcircular, with the pedicle beak protruded; the length is slightly greater than or equal to the width. The hinge line is  $14^{\circ}$  to  $35^{\circ}$  less than a straight angle and is 80 percent of the maximum width which is at the middle of the shell. The shell is biconvex, its maximum thickness at the umbos; the pedicle valve is larger than the brachial valve and is thickest at the umbo from which the valve slopes gently to the anterior margin but steeply to the lateral margins. The brachial valve is a flat even convex arc although the umbonal region is thick in some specimens.

The pedicle beak protrudes  $1\frac{1}{2}$  mm. but is not incurved. The brachial beak is small, slightly incurved, and minutely protruded. The cardinal area is apsacline with respect to the plane of commissure. The pedicle valve cardinal area is small, triangular, 5 mm. wide,  $1\frac{1}{2}$  mm. high, and is bounded by minute ventral ridges; the delthyrium is a small triangle under the pedicle beak and is connected to the hinge margin by the pseudodeltidium, which is a small irregular ridge. The brachial cardinal area is minute.

The surface of the valves is covered by 30 to 75 fine costellae which increase by bifurcation anteriorly from the middle of the valves. The costellae average 19 in 5 mm. Growth lines are indistinct and few, or are absent. There is a shallow small medial sinus on the brachial valve posterior to, and on the umbo. On the pedicle valve in the umbonal region there is a small sharp medial fold. A few specimens have 2 to 5 evenly-spaced growth lines, and a wide minute medial sinus on the anterior margin of the pedicle valve.

*Dimensions*—Length 6 to  $16\frac{1}{2}$  mm., average (26 specimens) 10.6 mm.; width 6 to  $16\frac{1}{2}$  mm., average 10.3 mm.; thickness 3 to  $9\frac{1}{2}$  mm., average (21 specimens) 5.6 mm.; commissure arc averages  $254^{\circ}$ .

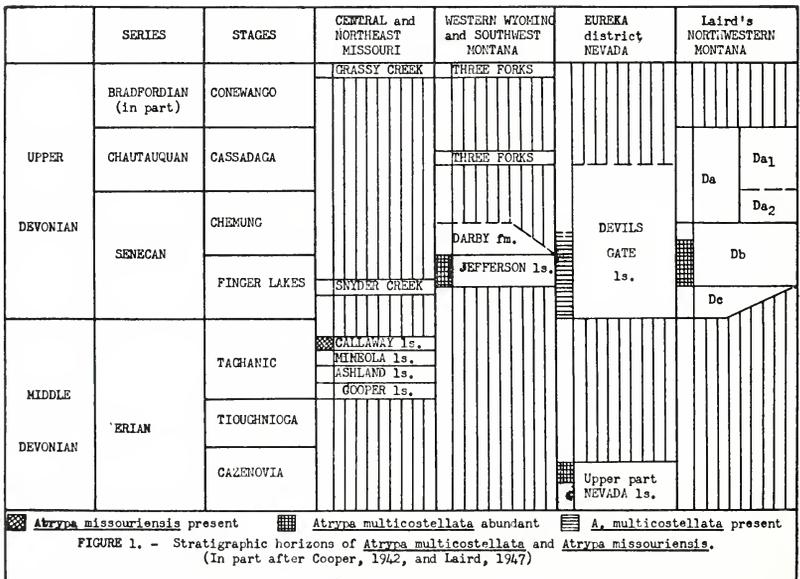
*Occurrence*—All 42 specimens were collected by Edward D. McKay, Dick S. Horton and the writer in the lower part of the Jefferson limestone (Kcttlowski, 4, p. 16, unit 11), 6 miles south of Red Lodge, Montana, in sec. 16, T. 20 N., R. 8 S., Carbon County. The shells were filled in by calcite, most of the internal structures destroyed, and only the prismatic layer, or casts and molds of that layer, preserved. The specimens occurred at all angles to the bedding in a light brown, fine-grained limestone matrix. Fragments and specimens of *A. multicostellata* are abundant in these beds, associated with only a few *Spirifer* fragments.

*Comparisons*—Miller's figures and descriptions of *A. missouriensis* (1894, p. 315, pl. 9, figs. 19-21) are so general that some writers consider the species unrecognizable. The original specimens, however, were redescribed by Fenton and Fenton (2, p. 15-17) and further collections and a description were made by Greger (3, p. 43-44). The descriptions and figures of Kindle, Merriam, and Laird are of *A. multicostellata*. *A. multicostellata* has smaller and more abundant costellae, 19 in 5 mm. as compared with the 7 to 11 in 5 mm. of *A. missouriensis*. *A. multicostellata* is smaller than *A. missouriensis* whose measurements are (Greger 3, p. 44): "length 28 mm.—breadth 33 mm.—thickness 19 mm.". It is not likely that *A. multicostellata* is an immature specimen of *A. mis-*

*souriensis* as no larger specimens are recorded in the literature than the largest specimens collected near Red Lodge. The Red Lodge collections were made from several localities and not even fragments of larger specimens were observed. *A. missouriensis* has a flatter hinge line that approaches a straight angle; it has stronger and more abundant growth lines; and its width is greater than its length especially for the larger specimens. *A. multicostellata* lacks a wide anterior sinus on the pedicle valve but has a small medial sinus on the umbonal region of its brachial valve; also the pedicle beak of *A. multicostellata* protrudes proportionally further, and is more pointed than the pedicle beak of *A. missouriensis*.

Comparison of Greger's figures (Pl. II, figs. 1-12) of *A. missouriensis* against the figures of Merriam (Pl. I, figs. 8-11), Laird (Pl. I, figs. 12-13) and the specimens from Red Lodge (Pl. I, figs. 1-7) indicate the differences between *A. missouriensis* and *A. multicostellata*.

*Stratigraphy*—*A. multicostellata* is abundant in the lower part of the Jefferson limestone in south central Montana and northwestern Wyoming. Laird (1947, p. 453) found the brachiopod in northwestern Montana in his unit Db which he correlates with the lower Jefferson limestone. *A. multicostellata* apparently occurs in the *Spirifer jasperensis* fauna below the middle of the Minnewanka formation in Alberta (Warren 8, p. 133). The Jefferson limestone is considered by Cooper (1, Pl. I) to be of the upper part of the Finger Lakes stage which is lower Upper Devonian (Fig. 1). *A. missouriensis*, however, occurs in the Callaway limestone of Missouri which is of the middle upper part of the Taghanic stage of upper Middle Devonian. Thus *A. missouriensis* appears to occur



only in the midwest and is slightly older than *A. multicostellata* of Montana. Merriam (1940, p. 83), however, found *A. multicostellata* most abundant in the upper part of the Nevada limestone in the *Heliolites* horizon which is correlated by Cooper (1, Pl. I) with the Cazenovia stage of lower Middle Devonian. *A. multicostellata* does persist in Nevada into the Devil's Gate formation which is Upper Devonian. On the basis of *A. multicostellata* the upper part of the Nevada limestone may be Upper Devonian.

Lovering (5, p. 28) noted that the fauna of the Jefferson limestone in the Cooke City district, Montana, is characterized by *A. missouriensis* (*A. multicostellata* ?) and *Spirifer engelmanni*. Stipp (6, p. 278) collected *Atrypa* aff. *A. missouriensis* (*A. multicostellata* ?) from the Jefferson limestone in Shoshone Canyon, Wyoming. Tomlinson (7, p. 128) found *A. missouriensis* (*A. multicostellata* ?) in the Jefferson limestone in western Wyoming and southwest Montana.

*Acknowledgments*—Professor J. J. Galloway, Indiana University, critically read the paper. George Ringer, Indiana University, photographed the specimens. G. Arthur Cooper, U. S. National Museum, identified the specimens as “a species of *Atrypa* . . . probably a new species which is abundant in the Devonian of Wyoming and Montana.”

#### Additional Literature Cited

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#### Plate I.—ATRYPA MULTICOSTELLATA SP. NOV.

##### Figure

- 1- 7. Lower part of Jefferson limestone, near Red Lodge, Montana.
  1. Pedicle view of large specimen.
  2. & 4. Pedicle views.
  3. Pedicle view of holotype.
  5. Pedicle view of small specimen.
  6. Lateral view of holotype.
  7. Posterior view of holotype.

- 8-11. Devonian unit Db, Pentagon Mountain, Montana (Laird, 1947, pl. 64, figs. 19-22).  
8 & 10. Brachial views.  
9 & 11. Pedicle views.
- 12-13. Upper Nevada limestone, *Heliolites* horizon, Roberts Mountain, Nevada. (Merriam, 1940, pl. 7, figs. 15-16).  
12. Pedicle view.  
13. Anterior view.

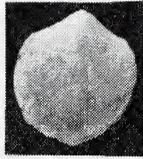
Plate II.—*ATRYPA MISSOURIENSIS* MILLER

## Figure

- 1- 6. Callaway limestone, east of Otterville, Cooper County, Missouri, on the La Mine River (Greger, 1936, pl. II, figs. 1-6).  
1-3. Views of three pedicle valves.  
4-6. Anterior views of these individuals.
- 7-12. Callaway limestone, *Spirifer annae* zone, near Bellama Springs, Callaway County, Missouri (Greger, 1936, pl. I, figs. 1, 4, 6, 7, 9, 10.). All pedicle views.



1



2



3



4



5



6



7

1 CM.



8



9



12



10



11



13

1 CM.

1 CM.

PLATE I

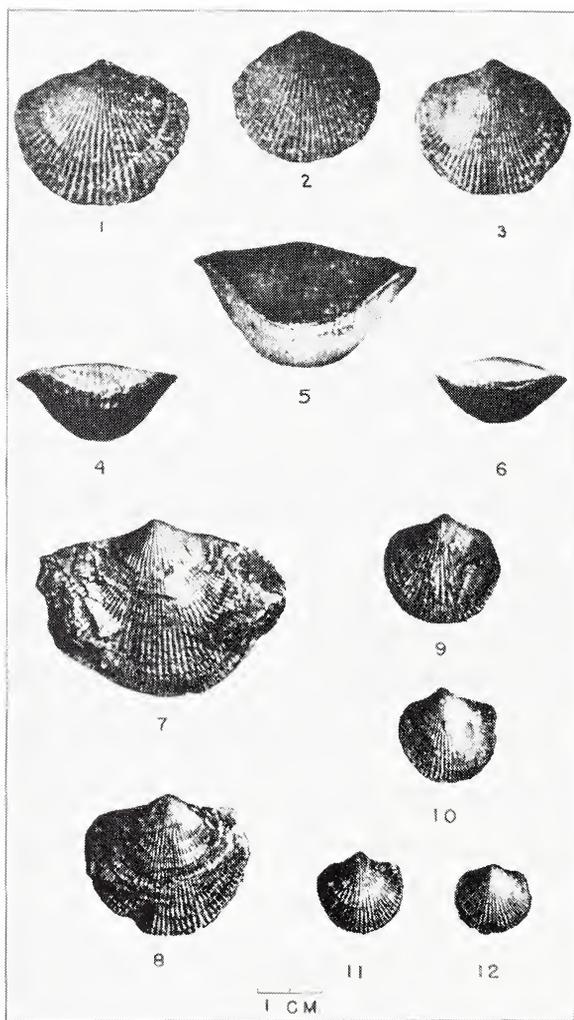


PLATE II