



The youngest rostroconch mollusc from North America, *Minycardita capitanensis* n. sp.

MICHAEL J. VENDRASCO¹, RICHARD D. HOARE² & GORDEN L. BELL, JR³

¹Department of Biological Science, California State University, Fullerton, Fullerton, CA 92834-6850, USA.

E-mail: mvendrasco@fullerton.edu

²Department of Geology, Bowling Green State University, Bowling Green, OH 43403, USA. E-mail: dhoare@bgsu.edu

³Guadalupe Mountains National Park, 400 Pine Canyon Drive, Salt Flat, TX 79847, USA. E-mail: Gorden_Bell@nps.gov

Rostroconchs are an extinct class of mollusc that lived worldwide through most or all of the Paleozoic Era (Runnegar 1978). They were most diverse in the early Paleozoic (Pojeta 1985), perhaps due to a lower rate of evolution in the rostroconch clade that survived the end-Ordovician mass extinction event (Wagner 1997). Rostroconchs have a univalved larval shell and a pseudo-bivalved adult shell. Their ecology appears to have ranged from infaunal to rarely epifaunal, and from deposit to suspension feeding (Pojeta *et al.* 1972, Pojeta & Runnegar 1976, Runnegar 1978, Pojeta 1987). A single but well-preserved, essentially complete rostroconch specimen was recovered from the region surrounded by the famous Capitan Reef of the Permian of West Texas (Newell *et al.* 1953). In particular, the specimen is from the upper scaphopod bed of the Reef Trail Member of the Bell Canyon Formation exposed in the Guadalupe Mountains National Park (Rigby & Bell 2005: fig. 2). The fusulinid biostratigraphic zonal indicator *Paraboultonia splendens* Skinner & Wilde, 1954 occurs both below the upper scaphopod bed and above it, indicating that this horizon was deposited during the latest Guadalupian (late middle Permian) (Rigby & Bell 2006), and thus is the youngest known deposit in North America to contain a rostroconch. Most known Permian rostroconchs have been recovered from rocks in North America, and only one occurrence stands out as clearly younger than this one: *Pseudoconocardium* Zavodowsky, 1960 from the Late Permian of Siberia, a large rostroconch that differs significantly in shape and ornamentation from rostroconchs of the late Paleozoic in North America (Hoare *et al.* 2002). Permian rostroconchs are rare, having been described from only sixteen localities worldwide (listed in Hoare & Plas 2003). In contrast, rostroconchs were relatively abundant during the preceding Pennsylvanian (Hoare *et al.* 2002). Thus the occurrence described herein represents the youngest known record of the North American rostroconch lineages, and is one of the last snapshots of a major molluscan clade.

The specimen described here was recovered from the Reef Trail Member of the Bell Canyon Formation at or near United States Geological Survey (USGS) Locality 7663 (=GUMO [Guadalupe Mountains National Park] GEO 00006), at 31°49'45"N, 104°52'18"W on the Guadalupe Pass 7.5' quadrangle (Rigby & Bell 2005, 2006). The bed, from which the rostroconch was recovered, is a densely fossiliferous skeletal debris flow that probably originated from the margin of the Capitan Reef (Rigby & Bell 2006). A deep water habitat of approximately 520 m about 1.5 km from the shelf margin has been reconstructed for this locality (Newell *et al.* 1953; Rigby & Bell 2006).

The specimen was photographed using a Zeiss Discovery V12 dissecting microscope with Zeiss planapochromatic 0.63x lens, objective slider, and a Zeiss Axiocam HRC (Carl Zeiss, Oberkochen). Most images were taken with the iris diaphragm fairly closed; a few images were z-stacked with *Heliconfocus* (Heliconsoft, Ukraine). Images of the specimen were also taken via a Zeiss EVO 40XVP scanning electron microscope (SEM) at the Santa Barbara Museum of Natural History (SBMNH); the specimen was uncoated and variable pressure secondary electron detector was used under variable pressure. Measurements were made using *ImageJ* (National Institutes of Health, Bethesda, Maryland). Rostroconch terminology used herein was defined and illustrated by Pojeta & Runnegar (1976), Pojeta (1987), Hoare (1989: fig. 3), and Wagner (1997: fig. 2). The rostrum (tube) is on the posterior side of the specimen and the protoconch is dorsal.

The specimen is housed in the reference collections at the headquarters of the Guadalupe Mountains National Park (GUMO), Salt Flat, Texas, USA.

Rostroconchia Pojeta, Runnegar, Morris, & Newell, 1972

Conocardioda Neumayr, 1891

Conocardoidea Miller, 1889

Pseudobigaleaidae Hoare, Mapes, & Yancey, 2002

***Minycardita* Hoare & Plas, 2003**

Type species. *Minycardita sectilis* Hoare & Plas, 2003, by original designation.

Diagnosis. *Minycardita* is unique among members of Pseudobigaleaidae in having an elongate, swollen main body chamber, sub-circular in dorsal view, that is bordered by weak primary carinae (the two ridges from the apex to the postero-lateral edges on both sides of the shell).

Remarks. Classification within the Pseudobigaleaidae at the genus and species level can be difficult because the representative genera (*Hadropipetta* Hoare, Mapes, & Yancey, 2002; *Baiosoma* Hoare, Mapes, & Yancey, 2002; *Minycardita* Hoare & Plas, 2003; and *Exalloschema* Hoare, Mapes, & Yancey, 2002) each contain only one or two species that are themselves known from only a few well-preserved specimens. In addition, there appears to be high levels of intraspecific variation within these species [e.g., variation in relative body length, angle of primary carina, ornamentation, and connection of rostrum (tube) to posterior surface in *Baiosoma pala* (Hoare, Steinker, & Mapes, 1988): fig. 7-13]. *Baiosoma* and *Minycardita* share a number of characters, including: rostral clefts (tension cracks around the base of the rostrum), the same range of concavity of posterior margin, the same relative proportion of height to length, and same chamber shape and size in side view. However, in addition to the characters listed in the diagnosis, *Minycardita* also differs from *Baiosoma* in having a denticulate ventral portion of anterior gape, ornamentation of more prominent radial ridges with less distinct comarginal growth lines, smaller and shallower concavity around posterior rostrum, smaller diameter of rostrum relative to overall height where it attaches at the posterior face, and typically more convex (versus straight) ventral surface just in front of the carina.

***Minycardita sectilis* Hoare & Plas, 2003**

Minycardita sectilis: Hoare & Plas, 2003: 875, fig. 1.9–14.

Baiosoma sp.: Hoare & Plas, 2003: 873–875, fig. 1.15–19.

Remarks. The two incomplete specimens of “*Baiosoma* sp.” in Hoare & Plas (2003) are herein considered to be members of *M. sectilis* because they share all the distinguishing character states of *Minycardita* listed above, are roughly the same size, were found from the same locality as the other specimens of *M. sectilis*, and cannot be distinguished from the holotype and paratype of *M. sectilis*. One specimen (Hoare & Plas 2003: fig. 1.16–18) appears to share with *Baiosoma pala* (Hoare, Steinker, & Mapes, 1988), the type and only described species of that genus, a straight ventral surface just anterior to the carina, different from other specimens of *Minycardita*. However, this specimen has a number of character states found in *Minycardita* but not in *Baiosoma*, including a swollen body chamber, distinct radial ridges, small diameter rostrum, and smaller, shallower concavity around rostrum on posterior surface of main body chamber.

***Minycardita capitanensis* n. sp.**

(Fig. 1)

Type material. Holotype (GUMO 15309: Fig. 1), 5.03 x 2.51 x 3.13 mm (L x W x H).

Type locality. USGS 7663, Reef Trail Member of the Bell Canyon Formation, Texas, USA, 31°49'45"N, 104°52'18"W (Late Guadalupian, Permian).

Etymology. Named for the ancient Capitan Reef where this animal had lived.

Description. Small (5.1 mm long, including rostrum); body chamber swollen but with small flat region in middle of each side, curving with strong concavity into narrow rostrum with gently converging sides (Fig. 1C–D); primary carina rounded (Fig. 1B); rostral face shallowly concave, smooth (Fig. 1G); rostrum long with subcircular opening (Fig. 1G, I),

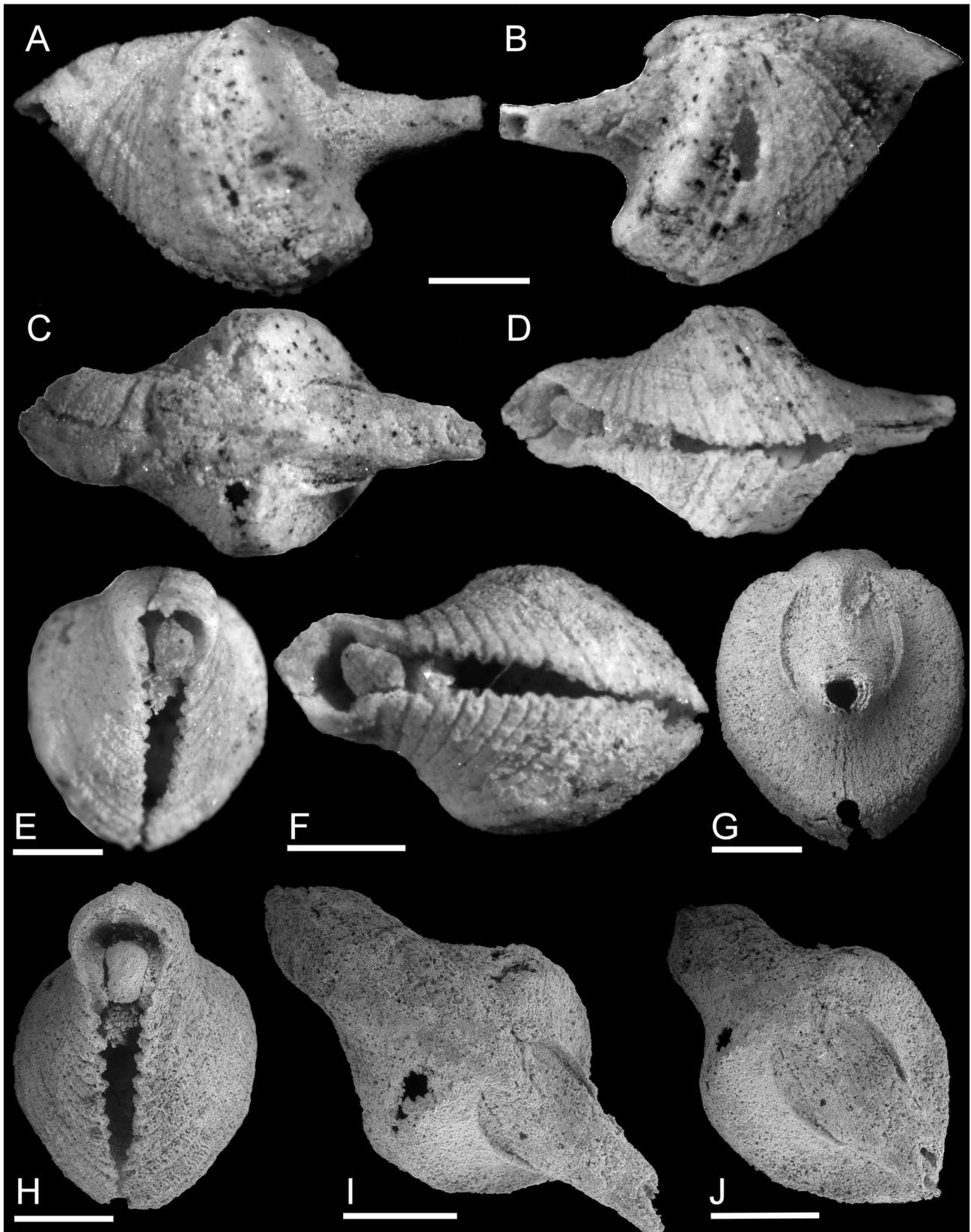


FIGURE 1. Holotype of *Minycardita capitanensis* n. sp., GUMO 15309. Images A–F were taken through the dissecting microscope, G–J via SEM. A, left-lateral view. B, right-lateral view. C, dorsal view. D, ventral view. E, anterior view. F, oblique-ventral view. G, posterior view. H, anterior view. I, dorsal view. J, postero-dorsal view. Scale bars 1 mm; scale bar for A–D is the same, in the middle of these four images.

parallel to hinge line; rostrum bordered by prominent rostral clefts (Fig. 1G, J); anterior snout much wider than rostrum, parallel-sided in dorsal view (Fig. 1C); anterior edge of snout deflected ventrally (Fig. 1A); anterior gape smooth-edged, tear-shaped, ventrally extending as narrowing denticulate opening into body (Fig. 1D–F); eight costae on body, nine costae on snout; anterior portion of snout without costae; two major and numerous fine comarginal growth lines on body and snout; protoconch (Fig. 1B) with small bulbous apex, rounded dorsally.

Differential diagnosis. *Minycardita capitanensis* n. sp. differs from the Wolfcampian *M. sectilis*, the type species and only other species in this genus, by having a more flat-sided body, greater concavity of posterior face (the region where posterior rostrum meets main body chamber), more horizontal rostrum (instead of one angled slightly downward as in *M. sectilis*), and greater lateral tapering of body chamber to anterior gape, seen in dorsal view.

Distribution. Only known from type locality.

J. Hearst and F. Margaritondo picked and sorted the acidized concentrate from the locality. D. L. Geiger took the photographs. H. Chaney allowed the use of the SEM at the SBMNH. M. K. Nestell verified the fusulinid identification. C. Z. Fernandez provided advice on taxonomy and comments on an early draft. J. Pojeta, Jr. and an anonymous reviewer made numerous comments that greatly improved the paper. RDH acknowledges the continuing support of the Department of Geology, Bowling Green State University.

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