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## NEW EARLY EOCENE MARINE GASTROPODS FROM BAJA CALIFORNIA SUR, MEXICO

RICHARD L. SQUIRES AND ROBERT DEMETRION

Department of Geological Sciences, California State University,  
Northridge 91330 and Department of Geological Sciences,  
University of Southern California, Los Angeles 90007

**ABSTRACT**—Three gastropod species are described from a previously unknown shallow-marine molluscan fauna in the lower Eocene Bateque Formation, southwest of San Ignacio, Baja California Sur, Mexico. *Velates batequensis* n. sp., a commonly occurring neritid in the Bateque, is the only ribbed *Velates* known from the Western Hemisphere. The fairly rare *Platyoptera pacifica* n. sp. is the earliest record of this strombid genus and its first occurrence on the west coast of North America. The very rare *Cypraedia* sp. is also the first occurrence of this cypraeid-like genus on the west coast of North America.

### INTRODUCTION

**T**HE GASTROPODS discussed in this paper were collected from the Bateque Formation, about 75 km southwest of San Ignacio, Baja California Sur, Mexico (Figure 1). The base of the formation is not exposed in this area, and the formation is unconformably overlain by Miocene volcanics of the Isidro Formation. For a generalized geologic map of the area, see McLean et al. (1985). The Bateque Formation is 190 m thick along a measured section where the new mollusks were found. It consists mostly of very fine sandstone interbedded with fossiliferous lenses locally rich in stromatolites, coralline algae, miliolid and discocyclinid foraminifera, three-dimensionally preserved calcareous sponges (Squires and Demetrian, 1989), colonial scleractinians, branching cheilostome bryozoans, thick-shelled gastropods and bivalves, spatangoids, and sea urchin spines. The absence of indications of significant transport suggests that the specimens of all these typically shallow-marine taxa were displaced only a short distance.

Gastropods discussed in this paper were found between 96 and 145 m above the bottom of the section at California State University, Northridge (CSUN), locality 1220b. The locality is on the north side of a minor canyon, at an elevation of 120 m, on the west side of Mesa La Salina, approximately 1.25 km southeast of the intersection of 113°00'W and 26°45'N, San Jose de Gracia, Baja California Sur, Mexico, 1:50,000 quadrangle map (number G12A64), issued in 1983 under the authority of

the Direccion General de Geografia. Microfossil samples from the stratigraphic interval associated with this locality yielded planktonic foraminifera indicative of the early Eocene *Globorotalia aragonensis* or *G. pentacamerata* Zone of Stainforth et al. (1975), which are equivalent to the P8 or P9 planktonic foraminifera Zone as used by Berggren et al. (1985) (M. V. Filewicz and R. W. Fulwider, personal commun.).

Abbreviations are as follows: CSUN, California State University, Northridge; IGM, Instituto de Geología, Universidad Nacional Autónoma de México; LACMIP, Natural History Museum of Los Angeles County, Invertebrate Paleontology Section.

### SYSTEMATIC PALEONTOLOGY

Order ARCHAEOGASTROPODA Thiele, 1925  
Family NERITIDAE Rafinesque, 1815  
Genus VELATES Montfort, 1810

*Type species*.—By original designation, *Velates conoidea* Lamarck, 1804 = *Nerita perversa* Gmelin, 1791.

VELATES BATEQUENSIS n. sp.  
Figure 2.1–2.5

*Diagnosis*.—A ribbed *Velates* with about six spiral ribs on the body whorl that are noded where they intersect about 20 col-labral costae.

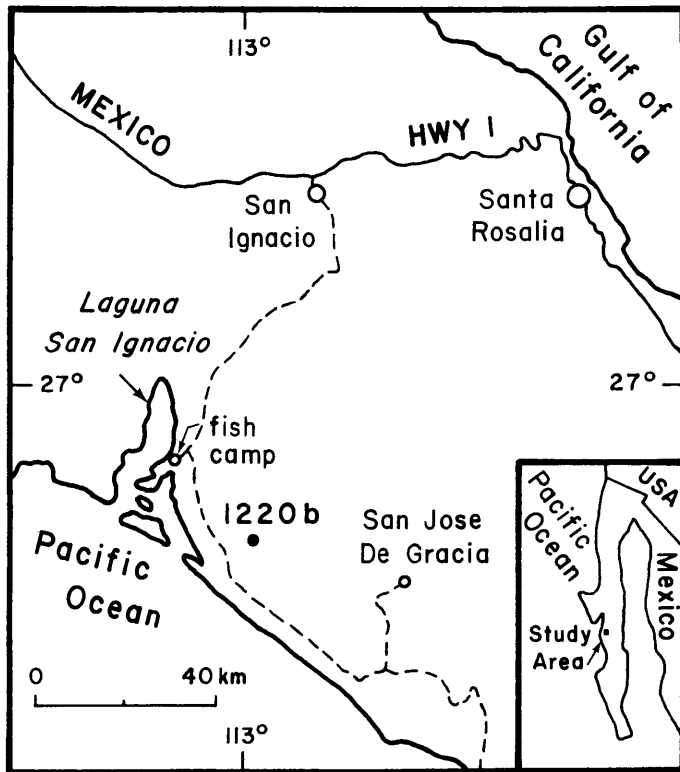


FIGURE 1—Index map to California State University, Northridge (CSUN), collecting locality 1220b, Bateque Formation, Baja California Sur, Mexico (after Squires and Demetron, 1989).

= LACMIP ~~1220a~~

**Description.**—Small to medium sized, shell height 3–43 mm; naticiform, rounded body whorl (height less than 15 mm) to strongly angulate body whorl in more mature specimens; 3–4 whorls; suture shallow, covered by callus in later whorls; spire low, enveloped by later whorls; body whorl enlarging rapidly, with about 20 equidistant collabral costae that extend from suture to base of body whorl, interspaces with several raised growth lines, collabral costae obsolete in specimens of shell height greater than 30 mm; anteriorly to shoulder 5–8 weaker spiral ribs intersect collabral costae and form a reticulated pattern of somewhat elongate nodes strongest in median area of body whorl, spiral ribs obsolete in specimens of shell height greater than about 30 mm; deck broad, swollen and covered by thick callus, in juveniles the callus extends up to ablabral margin, in adults callus extends onto body whorl where it partially conceals the ribbing; inner lip with seven unequal teeth, grouped from anterior to posterior into an anterior group of three teeth (anteriormost the weakest), a single middle tooth, and a group of three teeth (posteriormost the weakest); outer lip smooth.

**Remarks.**—Shell height in specimens of *Velates* is measured parallel to the axis of coiling, as shown by Woods and Saul (1986, fig. 4).

*Velates batequensis* n. sp. is the only ribbed *Velates* known from the Western Hemisphere. Plaziat (1984), in his worldwide review of the genus *Velates*, reported that the other ribbed species of *Velates* are known in a small group of morphologically related forms from the Eocene of the Paris Basin, France, and from one species from the Eocene of Pakistan. The Paris Basin group is best represented by the name *Velates equinus* (Bezançon, 1870). The other Paris Basin forms have been assigned various species names; namely, *V. sainti* (Raincourt, 1876), *V. archiaci* (Op-

penheim, 1896–1897), *V. spiratus* Doncieux, 1908, and *V. granulatus* Doncieux, 1908. As noted by Plaziat (1984), at one time or another they have all been put into synonymy with *V. equinus* or strongly suggested to be equivalent to *V. equinus*. *Velates batequensis* n. sp. is very closely allied to *Velates equinus* (Bezançon, 1870, p. 320–321, Pl. 10, fig. 5; Cossmann, 1888, p. 93, Pl. 3, figs. 43, 44; Cossmann and Pissarro, 1910–1913, Pl. 6, fig. 40–2) from lower Eocene (Ypresian Stage) and middle Eocene (Lutetian Stage) strata, Paris Basin, northern France. A comparison between *V. batequensis* and nine specimens (shell height 3–6 mm) of *V. equinus* from the University of California Museum of Paleontology, Berkeley, Cloez collection revealed that *V. batequensis* differs in the following features: larger shell, angulate adult body whorl, 5–8 (usually 6) spiral ribs rather than 4–5, stronger and unequally spaced inner lip teeth, and posteriormost inner lip tooth not bifid.

The ribbed *Velates* from Pakistan (formerly western India) is *V. noorpoorensis* (d'Archiac and Haime, 1853, p. 279, Pl. 25, fig. 8) from the upper Ranikot Formation that Quadri and Shuaib (1986) assigned to the Paleocene. According to Cox (1931, p. 36), *V. noorpoorensis* = *V. haliotis* (d'Archiac and Haime, 1853, p. 279, Pl. 25, figs. 9, 9a), which also was figured by Cossmann and Pissarro (1909, p. 77, Pl. 6, figs. 13–15) and by Plaziat (1984, p. 261, figs. 53d, 53e). The largest reported specimen of *V. noorpoorensis* is 16 mm in height (Cossmann and Pissarro, 1909). *Velates batequensis* differs from *V. noorpoorensis* in the following features: larger shell, angulate adult body whorl, 5–8 (usually 6) spiral ribs rather than 3–4, and coarser collabral costae.

*Velates batequensis* n. sp. is similar to the cosmopolitan *V. perversus* (Gmelin, 1791). See Vokes (1935, p. 382–383, Pl. 25, figs. 1–5, Pl. 26, figs. 1, 2), Woods and Saul (1986, p. 643–647, figs. 5.17, 5.20, 5.22–5.25, 6.1–6.3, 6.8), and Squires (1987, p. 23–24, figs. 15–19) for a discussion of the morphology of *V. perversus*. On the west coast of North America, *V. perversus* is known from the “Capay Stage” and “Domengine Stage,” equivalent to middle lower Eocene to lower middle Eocene (Ypresian to lower Lutetian Stages) (Squires, 1987). In Europe and India, it is known from Thanetian (upper Paleocene) up to the Bartonian (upper middle Eocene) Stage (Davies, 1975, p. 100). Abundant specimens of *V. perversus*, ranging in height from 4–90 mm and forming a growth series, were also found in the Bateque Formation. *Velates batequensis* n. sp. differs from *V. perversus* in the following features: collabral and spiral ribbing present on the shell during early stages of growth (up to 30 mm shell height). Specimens of *V. perversus* have a smooth shell from early juvenile to late adult.

**Etymology.**—The specific name is for the Bateque Formation.

**Material.**—Sixty-six specimens showing good preservation.

**Occurrence.**—West Coast “Capay Stage,” equivalent to middle lower Eocene (Ypresian Stage); Bateque Formation, Baja California Sur, Mexico, locality CSUN 1220b.

**Repository.**—Holotype, IGM 5051 = plastotype, LACMIP 8052; paratypes, IGM 5052 to 5054 = plastotypes, LACMIP 8053 to 8055; locality CSUN 1220b.

Order MESOGASTROPODA Thiele, 1925

Family STROMBIDAE Rafinesque, 1815

Genus PLATYOPTERA Conrad, 1854

**Type species.**—By monotypy, *Platyoptera extenta* Conrad, 1854.

PLATYOPTERA PACIFICA n. sp.

Figure 2.6, 2.7

**Diagnosis.**—A *Platyoptera* with cancellate ornamentation.

**Description.**—Medium sized, shell height up to 46 mm; in-

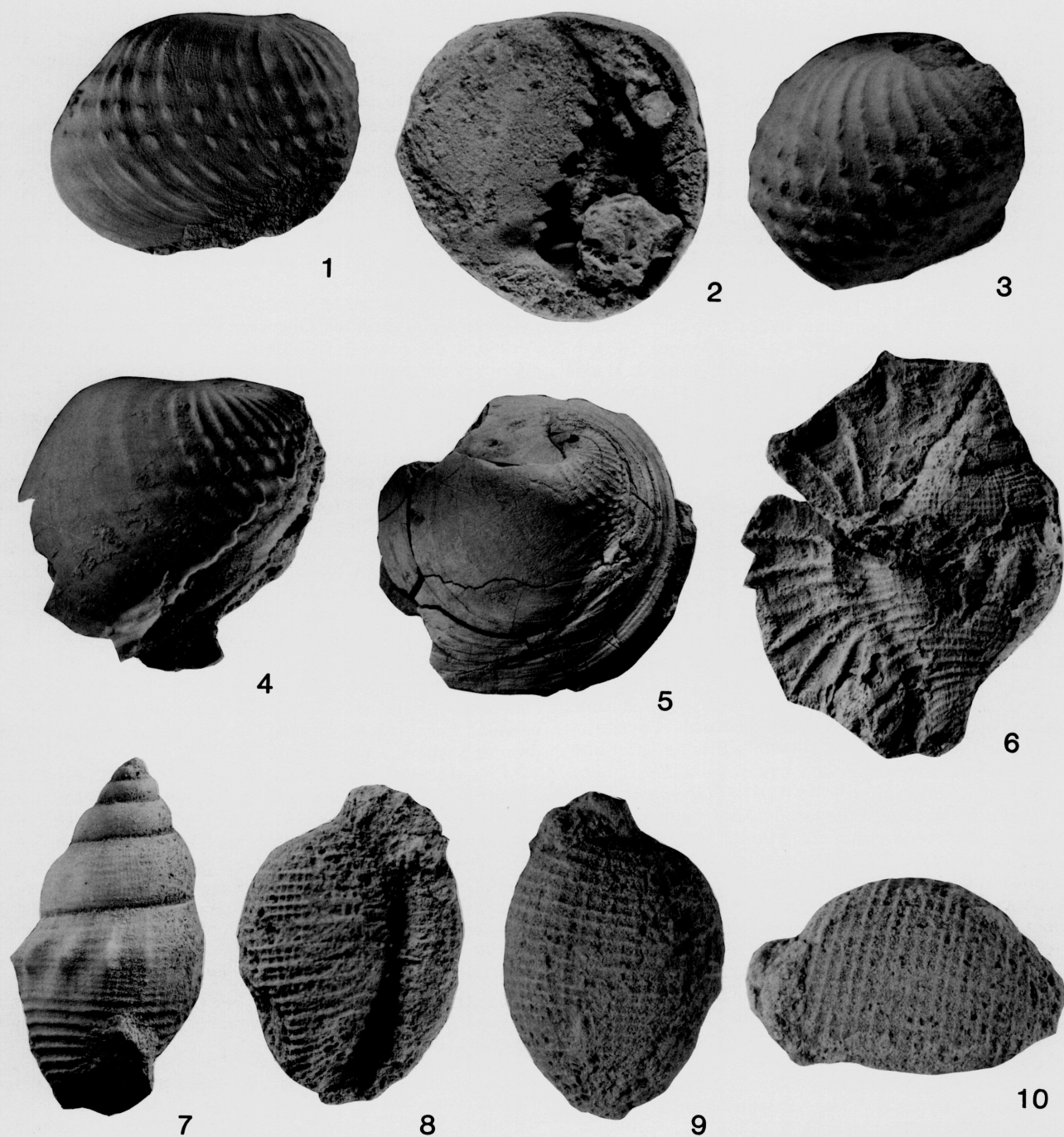


FIGURE 2—1-5, *Velates batequensis* n. sp., locality CSUN 1220b. 1, 2, holotype, IGM 5051 = plastotype, LACMIP 8052; 1, abapertural view,  $\times 4$ ; 2, apertural view,  $\times 5$ ; 3, paratype, IGM 5052 = plastotype, LACMIP 8053, abapertural view,  $\times 6$ ; 4, paratype, IGM 5053 = plastotype, LACMIP 8054, abapertural view,  $\times 2.2$ ; 5, paratype, IGM 5054 = plastotype, LACMIP 8055, abapertural view,  $\times 1.1$ . 6, 7, *Platyoptera pacifica* n. sp., locality CSUN 1220b. 6, holotype, IGM 5055 = plastotype, LACMIP 8056, latex peel of external mold, abapertural view,  $\times 1.7$ ; 7, paratype, IGM 5056 = plastotype, LACMIP 8057, internal mold, outer lip missing, abapertural view,  $\times 1.5$ . 8-10, *Cypraedia* sp., hypotype, IGM 5057 = plastotype, LACMIP 8058, locality CSUN 1220b,  $\times 2.6$ . 8, apertural view; 9, abapertural view; 10, lateral view.

flated fusiform, spire about 50 percent of height; about six convex whorls; sculpture not preserved in posteriormost spire whorls, antepenultimate, penultimate, and body whorl covered with closely spaced cancellate ornamentation, body whorl shoulder with at least five elongate nodes that become stronger adaperturally; outer lip extended into a broad, large wing extending from base of canal to spire apex, with about 16 fairly widely

spaced digitations that are extensions of spiral ribs on the body whorl, digitations strongest near base of canal, digitations bend obliquely in the regions of base of canal and spire, interspaces between digitations show "U"-shaped growth lines.

*Remarks.*—This gastropod is fairly rare in the Bateque fauna. It is unusual to find the very distinctive winged outer lip intact on specimens of this genus, and its presence on one of the

Bateque specimens (holotype, IGM 5055) makes this specimen even more of a rarity.

The Bateque material of this gastropod is preserved mainly as internal molds, but one partial external mold shows several of the diagnostic features of the genus. These are the inflated fusiform shell independent of the outer lip, the outer lip extended into a large wing with numerous digitations, an angulated body whorl, and spiral ribbing on the teleoconch. In *Platyoptera*, the outer lip wing extends beyond the body whorl, above and over the spire, as well as below and over the canal. On the Bateque specimen, the outer lip wing extends at the very least to the spire apex and to the base of the canal, but poor preservation prevents determination as to whether or not the wing actually extends beyond these regions. There is, however, a very faint indication that it may continue over the spire.

Only the type species, *Platyoptera extenta* (Conrad, 1854, p. 289, Pl. 16, fig. 3, and reprint 1939, p. 19, Pl. 3, fig. 3; Harris and Palmer, 1946–1947, p. 312–315, Pl. 41, figs. 1–4; Dockery, 1977, p. 54–55, Pl. 4, figs. 13a, 13b, Pl. 5, figs. 1, 2a, 2b, 5–8) has been previously recognized in this genus. It has been reported only from the Moodys Branch Formation in Mississippi, Louisiana, and Alabama, and from the basal Yazoo Formation in Mississippi (Dockery, 1977). Dockery (1986) reported the boundary between the upper middle Eocene (Bartonian Stage) and the upper Eocene (Priabonian Stage) to lie within the Moodys Branch Formation. He reported the overlying Yazoo Formation to be equivalent to the upper Eocene (Priabonian Stage).

*Platyoptera pacifica* n. sp. differs from *P. extenta* in the following features: canellate ornamentation on the teleoconch, nodes on the body whorl shoulder, and slightly fewer and wider spaced outer lip digitations.

*Platyoptera pacifica* n. sp. is the earliest record of this genus and its first occurrence on the west coast of North America.

See Harris and Palmer (1946–1947) for a discussion of how early workers regarded the taxonomic placement of *Platyoptera*. As noted by Harris and Palmer (1946–1947), *Platyoptera* shows affinities with a few genera of the family Aporrhaidae, such as *Phyllocheilus* Gabb (1868) from the Middle Jurassic to early Paleocene (Danian) (Wenz, 1940) and *Maussenetia* Cossmann (1904) from the Late Cretaceous (Maastrichtian) to Paleocene (Wenz, 1940; Davies, 1971). These genera, however, have only a few digitations on the outer wing whereas *Platyoptera* has numerous digitations.

*Etymology*.—The specific name is for the Pacific Ocean.

*Material*.—Five internal molds were found. In one of these, holotype, IGM 5055, the associated external mold shows the complete abapertural view of the specimen, including the extended outer lip wing.

*Occurrence*.—West Coast "Capay Stage," equivalent to middle lower Eocene (Ypresian Stage). Bateque Formation, Baja California Sur, Mexico, locality CSUN 1220b.

*Repository*.—Holotype, IGM 5055 = plastotype, LACMIP 8056; paratype, IGM 5056 = plastotype, LACMIP 8057; CSUN locality 1220b.

Family PEDICULARIIDAE H. Adams and A. Adams, 1854  
Genus CYPRAEDIA Swainson, 1840

*Type species*.—By monotypy, *Cypraedia cancellata* Swainson, 1840.

CYPRAEDIA sp.  
Figure 2.8–2.10

*Remarks*.—This gastropod is very rare in the Bateque fauna. Although only an internal mold was found, the diagnostic characteristics of the genus are clearly present. They are the inflated ovate shell, involute spire, narrow aperture with adapical outer

lip portion projecting and curved inward, and the very diagnostic pervasive cancellate ornamentation created by numerous equidistant spiral ribs (about 23) crossed by more numerous but weaker collabral ribs. On the ventral side there is a tendency for the spiral ribs to alternate in strength.

Due to the internal-mold preservation, positive identification is not possible at this time. Although comparisons are difficult to make, the Bateque specimens seem to most closely resemble *Cypraedia girauxi* Cossmann and Pissarro (1910–1913, Pl. 65, fig. 162–24; Cossmann, 1913, Pl. 3, fig. 162–24) from upper Eocene (Bartonian) strata, Vendrest, Paris Basin, France. Schilder (1932) reclassified this species as *Cypraedia elegans girauxi*.

The geologic range of *Cypraedia* is from Upper Cretaceous (Maastrichtian) to middle Oligocene (Wenz, 1941; Davies, 1971). Although the genus was widespread, the Bateque Formation specimen represents the first report of this genus on the west coast of North America.

The classification of *Cypraedia* follows that of Schilder and Schilder (1971).

*Material*.—Only a single internal mold was found.

*Occurrence*.—West Coast "Capay Stage," equivalent to middle lower Eocene (Ypresian Stage). Bateque Formation, Baja California Sur, Mexico, locality CSUN 1220b.

*Repository*.—Hypotype, IGM 5057 = plastotype, LACMIP 8058, locality CSUN 1220b.

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