J. Paleont., 67(6), 1993, pp. 1085–1088

0022-3360/93/0067-1085$03.00

A NEW SUBGENUS OF NERITID GASTROPOD FROM THE UPPER CRETACEOUS OF BAJA CALIFORNIA, MEXICO

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NUMEROUS SPECIMENS of the neritid gastropod *Nerita* (*Bajanerita*) n. subgen. *californiensis* (White, 1885) are present in the Upper Cretaceous Rosario Formation at Punta Banda, Baja California, Mexico (Figure 1). Marincovich (1975) assigned these strata to a Late Campanian to Early Maastrichtian age. The strata contain extensive biostromal deposits of the caprinid rudistid bivalve *Coralliochama orcutti* White, 1885, that probably lived below mean wave base in a shallow-water, low-energy environment periodically affected by storm waves or currents (Marincovich, 1975). The nearby shoreline was apparently defined by steep wave-washed bedrock cliffs and local pocket beaches that formed along the margin of a forearc basin (Yeo, 1984). Scattered about in the sandstone matrix among the rudistid remains are the small-sized specimens of *N.* (*B.*) *californiensis,* which commonly weather out as resistant, complete shells on the surface of the rock. Saul (1970) concluded that the neritid and other shallow-water gastropods at Punta Banda accumulated in sediment-trapping depressions within the *Coralliochama* buildups. These gastropods had originally roamed over the algal pastures of these buildups. The color patterns preserved on many of the specimens of *N.* (*B.*) *californiensis* also provide evidence that the depth of water was shallow and within the photic zone. Furthermore, Sohl (1971) reported that Campanian and Maastrichtian gastropod assemblages of the Baja California region are mostly associated with rudist buildups, and warm-water rocky intertidal neritids are among the dominant faunal elements. Lowenstam and Epstein (1959), using oxygen-isotope studies of an ammonite, suggested that the Punta Banda rudistids lived at a marginally tropical temperature of about 19°C.

Apparently, *Bajanerita* was very environment specific and may have been adapted to living only in association with *Coralliochama.* If so, there is limited potential in finding more occurrences of *Bajanerita* because *Coralliochama* is confined to the Upper Cretaceous of Baja California, Mexico, and California, United States of America (Dechaseaux and Perkins, 1969). The greatest development of this genus is at Punta Banda. Elsewhere in the Rosario Formation, *Coralliochama* is present mostly as scattered shells (Yeo, 1984; Lescinsky et al., 1991). In southern California, *Coralliochama* cf. *C. orcutti* makes up patch reefs in upper Campanian strata of the Santa Ana Mountains, Orange County. In northern California, *Coralliochama orcutti* has been reported from lower Maastrichtian strata in the Cape San Martin area, Monterey County, northern California, and near Gualala, Mendocino County, northern California (Saul, 1986).

Lower and Upper Cretaceous rudistid buildups were common in the warm-water Caribbean and Old World Tethyan paleobiotic provinces (Kauffman and Sohl, 1974; Kauffman and Johnson, 1988), and *Bajanerita* may have ancestors there. A cursory review of the literature, however, revealed none. Lower Cretaceous (Albian) rudistid buildups have been reported from the Alisitos Formation, Baja California (Barrick, 1992), but no mention was made of associated mollusks.

Abbreviations are as follows: LACMIP = Natural History Museum of Los Angeles County, Invertebrate Paleontology Section; USNM = United States National Museum.

Most of the specimens used in this study were collected in 1948 by the late W. P. Popenoe of the University of California at Los Angeles (UCLA). These specimens were originally part of the UCLA collection, but this collection is now stored at LACMIP.

SYSTEMATIC PALEONTOLOGY

Phylum MOLLUSCA Cuvier, 1797
Class GASTROPODA Cuvier, 1797
Order ARCHAEOGASTROPODA Thiele, 1925
Family NERITIDAE Rafinesque, 1815
Genus NERITA Linné, 1758

Type species.—By subsequent designation (Montfort, 1810), *Nerita peloronta* Linné, 1758.

Subgenus BAJANERITA n. subgen.

Type species.—*Nerita* (*Bajanerita*) *californiensis* (White, 1885, Pl. 5, figs. 7, 8).

Diagnosis.—Neritiform with three very wide, squarish prominent teeth on inner lip, many small equal-sized teeth on unthickened outer lip, a smooth body whorl, a smooth labial deck area, an impressed suture, and variable color patterns.

Description.—Small sized, broader than high, up to 7.3 mm height and 9 mm width; neritiform with slightly elevated spire; thin-shelled, 3–4 whorls; suture between spire and body whorl impressed; rounded smooth body whorl with closely spaced growth lines, prosocline near suture; color pattern ranging from an intricate divaricate pattern of elliptical splotches of white surrounded by brown areas to distinct axial bands of white and brown showing prominent zigzags.

Aperture fairly large, subquadrate; inner lip with three very wide, squarish prominent teeth that nearly fill the inner lip area; inner lip deck with thin to moderately thick, smooth callus; outer lip unthickened, with approximately 10 small equal-sized teeth.

Discussion.—White (1885) did not provide any description of his species, *Nerita californiensis.* A full description is herein provided under the description of the new subgenus. White (1885, Pl. 5, figs. 7, 8) provided only inked sketches of certain views of the two syntypes. Illustrations in Saul (1970, figs. 4, 5) are copies of White's original inked sketches. Photographs of these syntypes are herein provided (Figure 2.1, 2.3). His species has received little attention since its naming.

The two syntypes of *Nerita californiensis* were originally catalogued together as USNM 13411. White (1885) did not designate a holotype, so according to the rules of the ICZN (1985), a lectotype (USNM 13411a) can be designated. It is his (Pl. 5, fig. 8) specimen, herein shown in Figure 2.1. His (Pl. 5, fig. 7) specimen, herein shown in Figure 2.3, is the paralectotype (USNM 13411b).

The lectotype shows the features of the aperture of White's (1885) species. White's (1885, Pl. 5, fig. 8) inked sketch of what is now the lectotype makes the aperture look too elliptical because the view shows the specimen tipped down slightly.

The aperture of the paralectotype is filled with matrix. An important goal of this study is to show that the paralectotype,

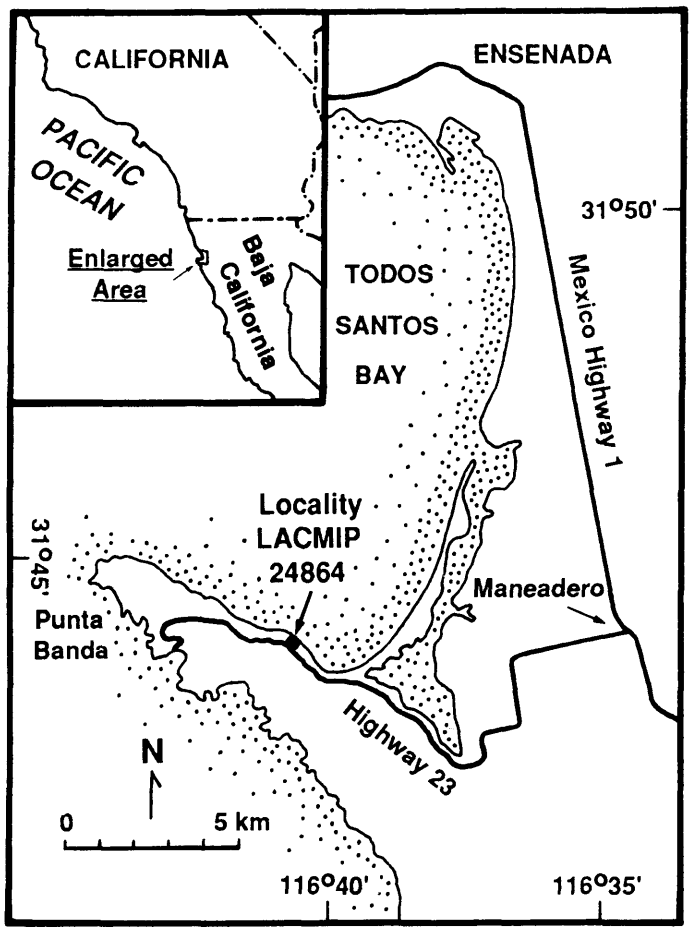

FIGURE 1—Index map to locality, LACMIP 24864, Rosario Formation, Punta Banda, Baja California, Mexico (after Marincovich, 1975, text fig. 1).

which has a divaricate color pattern preserved, is the same species as the lectotype. Numerous specimens with this same type of color pattern were found in the LACMIP collection. The apertures of a few of these specimens were carefully cleaned, and they are identical to the aperture of the lectotype. One of these specimens is illustrated in Figure 2.4–2.6. A few additional specimens show a zigzag color pattern, and their apertures are also identical to that of the lectotype. One of these specimens is shown in Figure 2.7, 2.8.

One hundred and fourteen specimens of *Nerita* (*Bajanerita*) *californiensis* were used in this study. All of these specimens, except the lectotype and paralectotype, are in the LACMIP collection. Approximately one-half of the 114 specimens show color patterns, with the divaricate pattern twice as common as the zigzag pattern. This variation in color pattern is not unusual because living and fossil neritids commonly show a variation and polymorphism in color bands (Keen, 1960; Kase, 1984).

Keen (1960) recognized nine subgenera of *Nerita*, including *Nerita* sensu stricto. Wagner and Abbott (1978) assigned the type species of two of the subgenera, *Heminerita* Martens, 1887, and *Puperita* Gray, 1857, to genus *Puperita*. A comparison of *Bajanerita* to the remaining seven subgenera of *Nerita* revealed that the new subgenus is most similar to *Nerita* sensu stricto but differs from it in having more (three rather than one or two) and much wider inner lip teeth, many more outer lip teeth, and an unthickened outer lip.

Upon comparing the other subgenera of *Nerita* to *Bajanerita*, the following differences were noted. *Amphinerita* Martens, 1887, differs in having much weaker teeth on the inner lip and usually having oblique striae on the body whorl. *Chingua* Clark and Durham, 1946, differs in having a nondentate inner lip, beaded spiral ribs, and a much lower to flattened spire. The freshwater-dwelling *Fluvinerita* Pilsbry, 1932, differs in having a nondentate inner lip and a narrower inner lip area. *Ritena* Gray, 1858, differs in having irregularities on the inner lip deck area, subequal teeth on the thickened outer lip, spiral ribs on the body whorl, and a more elevated spire. *Semineritina* Cossmann, 1925, differs in having many more but weaker teeth on the inner lip, a nondentate outer lip, and a much lower spire. *Theliostyla* Mörch, 1852, differs in having a sinuous inner lip with more but weaker teeth, a granulate deck, and a much lower to flattened spire.

Nerita (*Bajanerita*) *californiensis* shows some affinity to *Neritina loganensis* Erickson (1974, p. 163–164, Pl. 14, figs. 7–9) from the Upper Cretaceous (Maastrichtian) Fox Hills Formation, North Dakota. The affinity is particularly strong in terms of the presence of three teeth on the inner lip. *Nerita* (*Bajanerita*) *californiensis* differs from *N. loganensis* in having wider teeth, posterior tooth on inner lip not stronger than the other teeth, teeth not tilted either slightly posteriorly nor anteriorly, a dentate outer lip, aperture more open posteriorly, and suture more impressed.

The external appearance of the new subgenus, including its variable color pattern, superficially resembles genus *Mesoneritina* Yen, 1946, known from Lower Cretaceous strata of North America (Keen, 1960) and possibly Japan (Kase, 1984). *Mesoneritina*, however, has a nondentate inner lip and does not possess an impressed suture.

The geologic range of genus *Nerita* is from Late Cretaceous to Recent. The earliest known subgenus is *Semineritina*, which Keen (1960) reported as first appearing in Upper Cretaceous (Turonian) rocks and ranging into the Eocene. Previously, the only other subgenera reported from the Cretaceous are *Amphinerita* and *Theliostyla*. Keen (1960) reported these as first appearing in Upper Cretaceous rocks and ranging into the Recent. Keen (1960) reported true *Nerita* as ranging from Paleocene to Recent.

Other than *Nerita* (*Bajanerita*) *californiensis*, the only species of genus *Nerita* reported from Cretaceous deposits of the Pacific coast of North America is *Nerita* (*Semineritina*) *apparata* (Cragin, 1893) from the Lower Cretaceous (Albian) Alisitos Formation at Punta China, Baja California, Mexico (Allison, 1955). This species is present also in the Albian Edwards Limestone in Texas (Allison, 1955). In addition to the morphologic differences listed above between *Semineritina* and *Bajanerita*, *N.* (*S.*) *apparata* has oblique striae on the body whorl.

Woods and Saul (1986) reported a possible new species of *Nerita* (*Theliostyla*) from the upper Paleocene? Sepultura Formation near Punta Rosario, southwest Baja California, Mexico. Various species of *Nerita* (*Theliostyla*) are present also in Eocene strata of the Pacific coast of North America (Givens, 1974; Squires, 1987, 1992).

Etymology.—The new subgenus is named for the state of Baja California, Mexico, and for the genus *Nerita*.

Occurrence.—Upper Campanian to Lower Maastrichtian Rosario Formation, Punta Banda, Baja California, Mexico.

Repository.—Lectotype, USNM 13411a; paralectotype, USNM 13411b; hypotypes, LACMIP 11670 to 11672; all from locality LACMIP 24864.

ACKNOWLEDGMENTS

G. L. Kennedy (Natural History Museum of Los Angeles County) informed the author about the existence of the specimens in the LACMIP collection and provided for their loan. J.

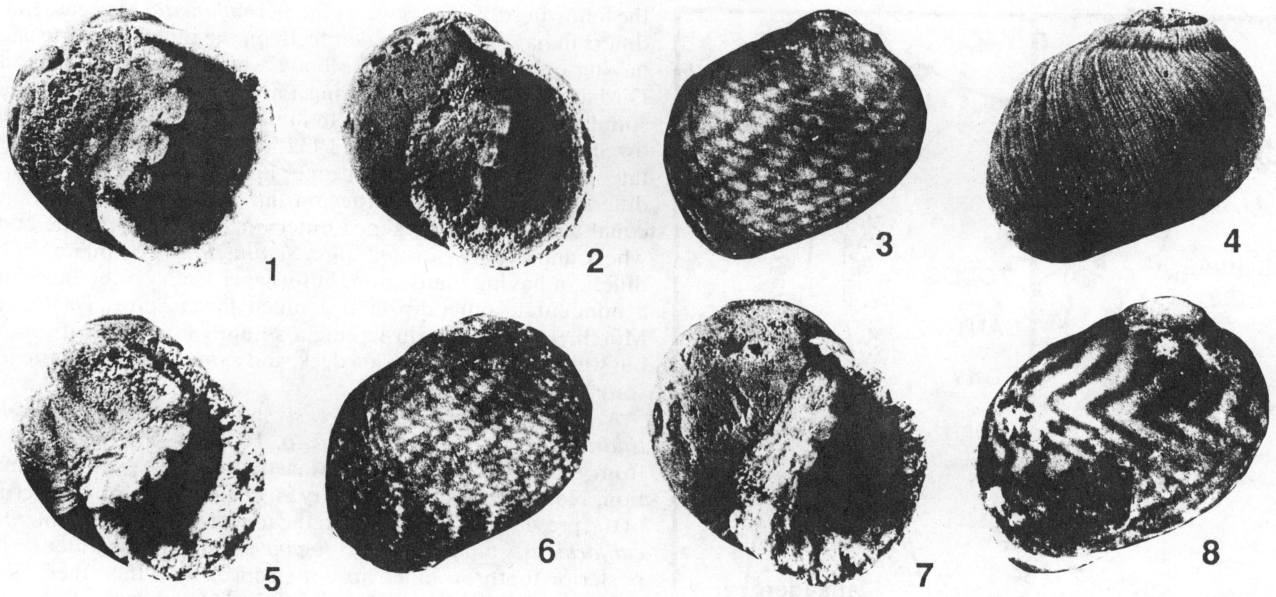

FIGURE 2—1–8, *Nerita* (*Bajanerita*) *californiensis* (White, 1885), locality LACMIP 24864. All specimens, except those showing color patterns, coated with ammonium chloride. *1*, lectotype, USNM 13411a, apertural view, ×5.6; *2*, hypotype, LACMIP 11670, apertural view, ×5.6; *3*, paralectotype, USNM 13411b, abapertural view showing divaricate color pattern, ×6; *4–6*, hypotype, LACMIP 11671, ×5.8; *4*, abapertural view; *5*, apertural view; *6*, abapertural view showing divaricate color pattern; *7*, *8*, hypotype, LACMIP 11672, ×5.9; *7*, apertural view; *8*, abapertural view showing zigzag color pattern.

Thompson (United States National Museum) arranged for the loan of the primary type specimens. L. R. Saul (Natural History Museum of Los Angeles County) shared her knowledge of Cretaceous gastropods. N. F. Sohl (U.S. Geological Survey, Reston, Virginia) provided some key literature. L. T. Groves (Natural History Museum of Los Angeles County) provided access to that institution's collection of modern neritids.

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ACCEPTED 17 JULY 1992

J. Paleont., 67(6), 1993, pp. 1088–1090

0022-3360/93/0067-1088$03.00

CLARIFICATION OF THE NAME-BEARING TYPE FOR "*MESOHIPPUS*" *VALIDUS* OSBORN (MAMMALIA, PERISSODACTYLA)

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IN 1904 OSBORN named a new species of *Mesohippus*, *M. validus*, based on a specimen consisting of a skull, jaws, and portions of the limbs. Osborn identified this specimen as American Museum of Natural History (AMNH) catalog number 680 and provided a brief description, some measurements, and an illustration.

In 1918 Osborn again recognized the species as valid, but referred it to the genus *Miohippus*. The description of the type was essentially the same in this paper and the original illustration was reprinted, but Osborn now identified AMNH 1218 as the type. AMNH 1218 had also been cited in Osborn's previous paper (1904), but was identified as a specimen either ancestral to (p. 176) or actually representing (p. 177) *Mesohippus intermedius*. Osborn again assigned AMNH 680 to *M. validus*, but now cited it as a referred specimen only.

The change of catalog number in Osborn's two papers has resulted in confusion over which specimen is actually the type. The catalog at the American Museum identifies AMNH 1218 as the type of *Mesohippus validus* and AMNH 680 as a referred specimen. The type collection of fossil horses at the museum, however, includes AMNH 680, but not AMNH 1218, which is stored in the general collection. An unsigned, typewritten note accompanying AMNH 680 identifies that specimen as the type of the species and states that AMNH 1218 is a referred specimen only.

The catalog at the American Museum probably reflects the thinking of W. D. Matthew, whereas the type collection probably represents the viewpoint of Morris Skinner. The catalog cards for both AMNH 680 and AMNH 1218 were written in Matthew's handwriting and the type collection was originally organized by Skinner. That Skinner believed AMNH 680 to be the type is supported by an annotation written in his handwriting next to Figure 33(5) in his personal copy of Osborn, 1918 (preserved in the Osborn Library at the AMNH). In this note, Skinner indicated that AMNH 1218 should be regarded as a "paratype or cotype" rather than as a holotype. Nevertheless, a note by Skinner dated 1971 and preserved with AMNH 680 states that Osborn (1904) probably based his published illustration (Plate V, H) of *Mesohippus validus* on both AMNH 680 and AMNH 1218 and "may have given the wrong number for his type." Skinner thus recognized the possibility that AMNH 1218 might be the type specimen. Prothero and Shubin (1989, p. 168) also identified AMNH 680 as the type, but specifically indicated that Osborn's (1918) listing of AMNH 1218 as the type specimen was incorrect.

Although Osborn (1904) attributed catalog number AMNH 680 to the type specimen of *Mesohippus validus*, the description of the type in both of Osborn's papers (1904 and 1918) essentially matches AMNH 1218, but is largely inconsistent with AMNH 680. The type of *Mesohippus validus* is supposed to consist of a skull, jaw, and limb elements, whereas AMNH 680 pertains to a skull only. AMNH 1218, however, consists of a skull, jaw, and limb elements as Osborn specified, but also includes a second skull. According to the original field labels still preserved with AMNH 1218, all of the elements cataloged under that number were found in association.

Osborn's published measurements of the type also match the physical dimensions of the skull and jaw cataloged under AMNH 1218, but differ from those of AMNH 680. According to Osborn (1904), the length of the cheek tooth series (P^1–M^3) in the type of *Mesohippus validus* is 104 mm. This is very close to my own measurement of the length of the cheek tooth series in AMNH 1218 (102.10 mm), but quite different from my measurement for AMNH 680 (91.25 mm). Similarly, the length of the molar series published by Osborn (47 mm) compares closely to my measurement of AMNH 1218 (46.15 mm), but differs from my