

**A New Genus of Aporrhaid Gastropod from Upper
Paleocene Rocks in Southern California**

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The family Aporrhaidae Gray, 1850, is a group of marine gastropods characterized by a highly modified apertural margin. It apparently originated near the end of the the Triassic and was an important component of the late Me-
sozoic marine-gastropod fauna (Roy, 1994). The end-Cre-
taceous mass-extinction removed about 76% of the apor-
rhaid genera (Roy, 1996).

On the Pacific slope of North America, early Tertiary (Paleogene) aporrhoids represent a very minor component of the molluscan fauna. Aporrhoids previously reported from this region are *Araeodactylus* (?) *costatus* (Gabb, 1869), *Tessarolax* (?) *inconspicua* (Gabb, 1869), *Drepanocheilus exilis* (Gabb, 1864), and *Drepanocheilus* (?) *transversus* (Gabb, 1869). All of these species, which are illustrated by Stewart (1927), are late Paleocene in age and from California (Stewart, 1927; Weaver, 1953; Zinsmeister, 1983). The latter species is also known from upper? Paleocene rocks in Baja California, Mexico (Zinsmeister & Paredes, 1988). *Tessarolax* (?) *inconspicua* is based on poorly preserved material and might not even be an aporrhaid. *Drepanocheilus exilis* and *Drepanocheilus* (?) *transversus* are also based on incomplete specimens, and future collecting might possibly reveal them to be conspecific.

Recent collecting in upper Paleocene rocks in southern California revealed a single specimen of a very rare apor-
rhaid that represents a new genus. This new gastropod, *Spinigeropsis*, differs from most other aporrhoids by hav-
ing digitations on both sides of the shell rather than only on one side. The specimen of the new gastropod was found at LACMIP locality 16869 in the upper part of the Santa Susana Formation in the Palisades Highlands area just east of Santa Ynez Canyon in the east-central Santa Monica Mountains, Los Angeles County, southern C
ornia (Figure 1). This locality is in a richly fossiliferous lens within a very fine-grained sandstone approximately 20 m stratigraphically below an algal-limestone interval. This locality and others in the immediate area are in rocks of late Paleocene age (Thanetian Stage) which were deposited in a protected bay (no deeper than 40 to 70 m) with warm-water, algal-limestone buildups associated with shoals on the bay floor (Squires & Kennedy, 1998).

The following institutional acronym is used: Natural History Museum of Los Angeles County, Section of In-
vertebrate Paleontology, Los Angeles (LACMIP).

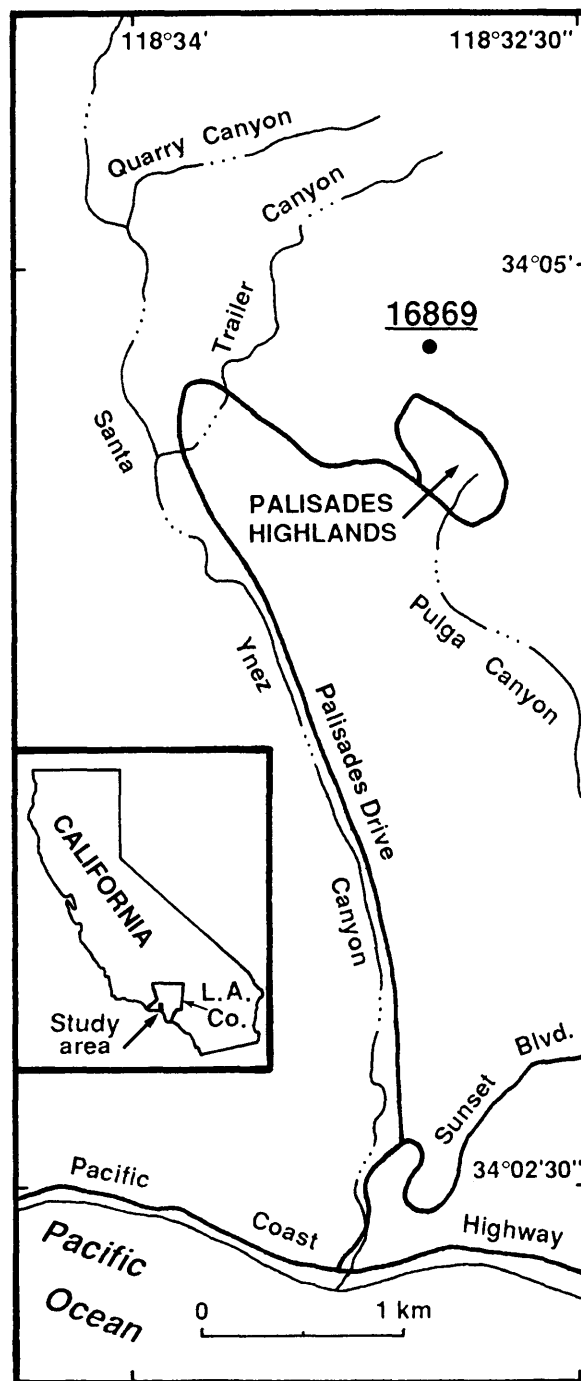
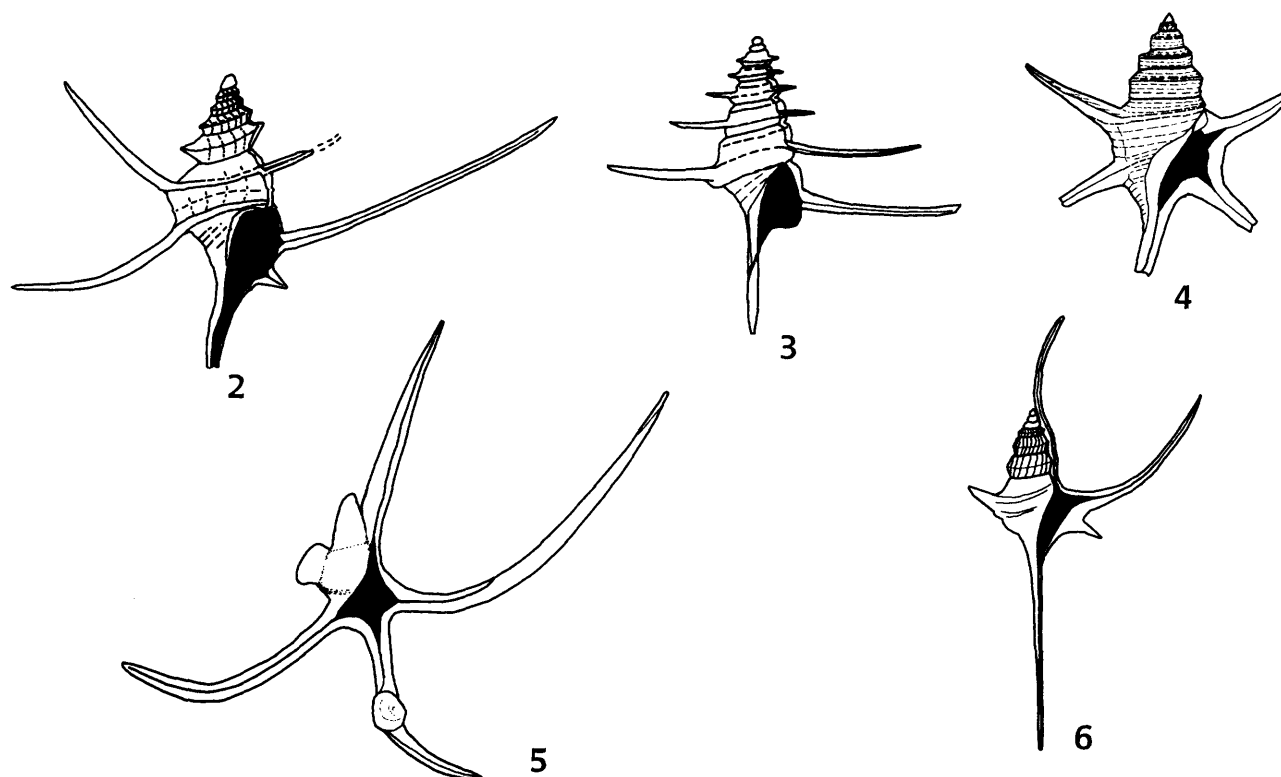


Figure 1. Index map showing type locality of new species in the upper part of the Santa Susana Formation, Palisades Highlands, east-central Santa Monica Mountains, Los Angeles County, southern California (from Squires & Kennedy, 1998).



Figures 2-6. Morphologies of aporrhaid genera similar to the new genus. All are apertural views; Figure 3 from Wenz (1940), Figure 4 from Cossmann (1904), Figure 5 from Saul (1989), and Figure 6 adapted from Loch (1989). Figure 2. *Spinigeropsis* Squires & Saul, gen. nov., $\times 2.4$. Figure 3. *Spinigera* s. s., $\times 1$. Figure 4. *Spinigera* (*Diempterus*), $\times 1$. Figure 5. *Tessarolax*, $\times 0.5$. Figure 6. *Teneposita*, $\times 1$.

Systematic Paleontology

Class GASTROPODA Cuvier, 1797

Superorder CAENOGASTROPODA Cox, 1959

Family APORRHAIIDAE Gray, 1850

Genus *Spinigeropsis* Squires & Saul, gen. nov.

Type species: *Spinigeropsis calafia*, sp. nov.; late Paleocene, southern California.

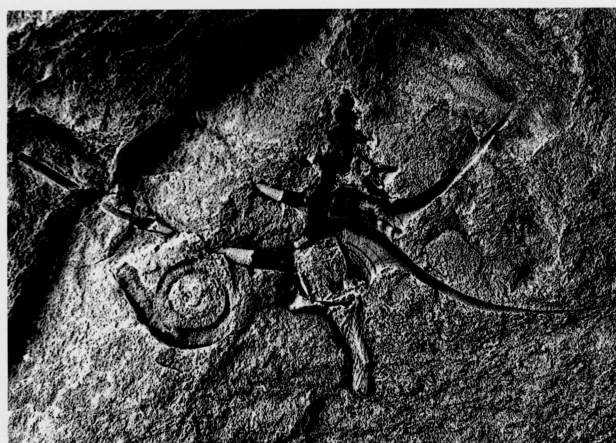
Diagnosis: Small aporrhaid with two opposing digitate varices (on left and right sides of shell), both extending onto spire; digitations at intersections of varix and strong anterior and posterior spiral cords; on spire whorls a short digitation on each side; on body whorl two very long, narrow, delicate, and spinelike digitations on outer lip and opposite whorl side; rostrum moderately short and bent.

Discussion: Previously known aporrahids that have unwebbed digitations on both sides of the shell (Figures 3-7) are *Spinigera* (*Spinigera*) d'Orbigny, 1850, *Spinigera* (*Diempterus*) Piette, 1876, *Tessarolax* Gabb, 1864, and *Teneposita* Loch, 1989. Of these four aporrahids, *Spinigeropsis* most closely resembles *Spinigera* (*Diempterus*) from Jurassic strata of Europe. Roy (1994) reported the

geologic range of *Diempterus* as Middle Jurassic (Bathonian Stage) to Late Jurassic (Kimmeridgian Stage). *Spinigeropsis* differs from *Diempterus* by having axial ribs and varices on the spire, short digitations on the spire, a more posteriorly directed digitation on the left-side shoulder of the body whorl, and a seemingly more equant aperture. *Spinigeropsis* differs from *Spinigera* s.s. by having no digitations on uppermost spire, shorter digitations on middle part of spire, two rather than just a single digitation on left side of body whorl, posteriorly directed digitations, and a bent and much shorter rostrum. Roy (1994) reported the geologic range of *Spinigera* s.s. to be Middle Jurassic (Bajocian Stage) to Early Cretaceous (Hauterivian Stage). *Spinigeropsis* differs from the Late Cretaceous genera *Tessarolax* and *Teneposita* by having varices on the spire, two digitations on the left side of the body whorl rather than one, a shorter rostrum (especially compared to *Teneposita*), and not having a posterior canal that extends beyond the apex. In addition, the length of the spire and body whorl of *Spinigeropsis* is much smaller than that of *Tessarolax* but slightly larger than that of *Teneposita*. Roy (1994) reported the geologic range of *Tessarolax* to be Early Cretaceous (Hauterivian Stage) to Late Cretaceous (Maastrichtian Stage). Loch



7



8

Figures 7, 8. Specimen coated with ammonium chloride. Figures 7, 8. *Spinigeropsis calafia* Squires & Saul, gen. & sp. nov., LACMIP holotype 12873, LACMIP loc. 16869, height 16.5 mm, $\times 2.4$. Figure 7. Apertural view (rubber peel of an external mold). Figure 8. Abapertural view (external mold).

(1989) reported the geologic range of *Teneposita* to be Late Cretaceous (late Campanian Stage to possibly early Maastrichtian Stage).

Etymology: The new genus is named for being similar to *Spinigera*.

Spinigeropsis calafia Squires & Saul, sp. nov.

(Figures 2, 7, 8)

Diagnosis: As for the genus.

Description: Shell small, fusiform, consisting of $6\frac{1}{2}$ whorls; spire moderately high (about 30% of total shell height), apical angle 40° . Protoconch not preserved. Upper two spire whorls smooth (decorticated?), next two spire whorls cancellate with anterior one (antepenulti-

mate whorl) medially carinate; antepenultimate and all subsequent whorls with two varices, one on left side of shell and an opposite one on right side (outer lip side) of shell; digitations becoming stronger on each succeeding whorl, especially on body whorl. Penultimate whorl medially carinate with a short digitation on each varix. Body whorl tricarinate; cords on carinae, anterior and posterior cords strong, subequal middle cord about half as strong; posterior carina bearing two elongate and somewhat posteriorly directed, spinelike digitations at varices; medial carina with no digitations; anterior carina bearing two very elongate, slightly curved and laterally directed, spinelike digitations at varices. Neck of body whorl with several spiral ribs. Aperture quadrate, inner lip smooth with a thin border. Outer lip coincident with right varix bearing two spinelike digitations. Rostrum moderately short, slightly bent to right and bearing coarse growth lines.

Holotype: LACMIP 12873, 16.5 mm high (including spire and body whorl), 30 mm wide (including digitations).

Type locality: LACMIP loc. 16869, upper part of Santa Susana Formation, Santa Ynez Canyon area, east-central Santa Monica Mountains, Los Angeles County, southern California, latitude $34^\circ 4' 43''$ N, longitude $118^\circ 33' 03''$ W, U.S. Geological Survey, 7.5-minute Topanga Quadrangle, 1952 (photorevised, 1981).

Geologic age: Late Paleocene ("Martinez Stage," equivalent to Thanetian Stage).

Distribution: Known only from the type locality.

Discussion: A single specimen was found, and although it is mostly an external mold, it shows most of the long, delicate digitations on the body very well, whereas portions of the others are partly concealed by rock matrix.

The new species bears the closest resemblance to *Spinigera* (*Diempteris*) *lonqueueana* (Piette, 1876), the type species of subgenus *Diempteris*. Wenz (1940:fig. 2708) illustrated this French species and reported its geologic age as Late Jurassic (Kimmeridgian Stage). The new species differs from *S. (D.) lonqueueana* by having digitations on the spire, two digitations rather than one on the body whorl, cancellate ornamentation on the upper spire, a more anteriorly placed aperture, and the bases of the digitations on the outer lip much closer together.

As mentioned earlier, the only other aporhoids known from the Paleogene rock record of the Pacific coast of North America are *Araeodactylus* (?) *costatus* (Gabb, 1869:167, pl. 28, fig. 48; Stewart, 1927:366, pl. 25, fig. 6), *Tessarolax* (?) *inconspicua* (Gabb, 1869:151, pl. 26, fig. 29; Stewart, 1927:365–366, pl. 23, fig. 2), *Drepanocheilus exilis* (Gabb, 1864:129, pl. 29, fig. 231) and *Drepanocheilus transversus* (Gabb, 1869:165, pl. 27, fig. 45; Zinsmeister & Paredes, 1988:pl. 1, fig. 9). *Araeodactylus*

(?) *costatus* differs from the new species by having an alate outer lip, no varices, and no axial ribs on the spire. *Tessarolax* (?) *inconspicua* differs from the new species in that it has no digitations and no varices. The two species of *Drepanocheilus* are also markedly different from the new species in that they possess an alate outer lip with a single digitation and spire ornamentation dominated by axial ribs.

Etymology: The new species is named for the state of California.

Acknowledgments. The specimen of the new species was found by Charles D. Burt, and William Rader facilitated the gift of the specimen to LACMIP. Lindsey T. Groves (LACMIP) helped in obtaining hard-to-find literature.

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