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UPPER CRETACEOUS (CAMPANIAN) LAND SNAILS (GASTROPODA: STYLOMMATOPHORA) FROM WASHINGTON AND CALIFORNIA

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ABSTRACT

Condonella suciensis McLellan, 1927, from the Upper Cretaceous (Campanian) Nanaimo Group of Washington State, USA, described as a presumed marine gastropod of unknown taxonomic position and subsequently classified as an archaeogastropod, is a terrestrial pulmonate snail. *Condonella* McLellan, 1927, is assigned to Eucalodiidae and interpreted as a flat-coiling member of a clade in which most members are high-spired and cylindrical. *Straparollus lens* Gabb, 1864, from the Chico Formation (Campanian) in central California, USA, is recognized as a pulmonate land snail and assigned to Megomphicidae. A second megomphicid species from the Chico Formation, *Polygyroidea hiltoni*, is described as new.

INTRODUCTION

Material collected by Richard P. Hilton as part of his ongoing study of the paleontology of the Chico Formation (upper Cretaceous) near Roseville, Placer County, California (Fig. 1), includes two species of many-whorled, tightly coiling land snails assignable to Megomphicidae Baker, 1930. One, with a relatively flat spire, is a new species similar to the Recent *Polygyroidea harfordiana* (Cooper, 1870). The other, similar but with an elevated, conical spire, is identified as '*Straparollus*' *lens* Gabb, 1864, which has been *incertae sedis* and for which the holotype is lost. It is assigned tentatively herein to *Polygyroidea* Pilsbry, 1924.

Hilton & Antuzzi (1997) illustrated one of the specimens of the low-spired species as 'cf. *Condenella*' [*sic*]. This was a reference to *Condonella* McLellan, 1927 (type- and sole species *Condonella suciensis* McLellan, 1927), from the Upper Cretaceous (Campanian) Nanaimo Group of Sucia Island, Washington (Fig. 1), described as a presumed marine gastropod of unknown systematic position and subsequently classified as an archaeogastropod (e.g., Wenz, 1938, in Euomphalidae de Koninck, 1881; Knight, Cox, Keen, Smith, Batten, Yochelson, Ludbrook, Robertson, Yonge, & Moore, 1960, questionably in Euomphalidae). Based on an examination of the holotype of *C. suciensis*, redescribed and illustrated below, I interpret *Condonella* as a flat-coiling member of Eucalodiidae, a clade in which most members are high-spired and cylindrical. It is not congeneric with the two land snail taxa from the Chico Formation.

Megomphicidae is represented in Recent time by a few species in five genera, all in the far western United States and northwestern Mexico (Pilsbry, 1939, 1946, under the synonymous name Ammonitellidae). In the fossil record, the clade is more widespread, extending to the Rocky Mountains and Great Plains of North America (Roth, 1986; Evanoff, 1990). The oldest records are from the upper Cretaceous of Alberta, Canada. The present material extends the Cretaceous geographic range to California and somewhat expands the range of shell form known for the taxon. The earliest occurrence of *Polygyroidea* is exended back in time from late Oligocene-early Miocene to Cretaceous.

Eucalodiidae is represented in Recent time by numerous Mesoamerican species. The exact scope of Eucalodiidae depends on whether the family-group taxa Urocoptidae (-inae) Pilsbry & Vanatta, 1898, and Holospiridae (-inae) Pilsbry, 1946, are regarded as subsets of it. (Because the name Eucalodiidae Crosse & Fischer, 1872, is the earliest-proposed of these family-group names, it is the valid name for the taxon containing its type-genus, *Eucalodium*

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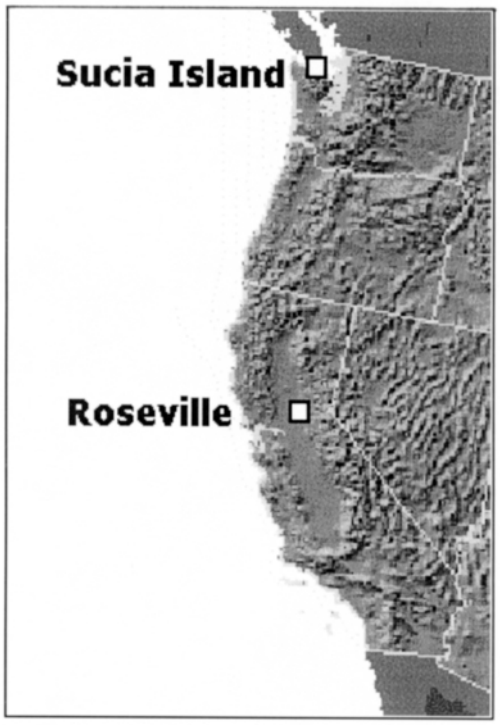


Figure 1. Map showing locations of Nanaimo Group on Sucia Island, Washington, and Chico Formation in Placer County, California.

Crosse & Fischer, 1868, in any case.) No modern analysis has yet addressed the question of the phylogenetic relations among these nominal groups. Pending such a study, in this paper I construe Eucalodiidae in the narrow sense, excluding the genera of Urocoptidae and Holospiridae (-inae). In this paper, *Condonella* is compared to *Eucalodium* and other closely similar genera (i.e., to members of Eucalodiidae in this restricted sense). Assignment of *Condonella* to Eucalodiidae extends the range of that taxon to the Cretaceous of the Pacific Coast of North America. It also expands the range of shell form known for the taxon to include planispiral coiling. A comparable condition in a group of otherwise high-spired species occurs in the Recent holospirine *Hendersoniella* Dall, 1905.

The following institutional abbreviations are used: ANSP, Academy of Natural Sciences of Philadelphia; SC, Sierra College (Rocklin, California); USNM, Department of Paleobiology, National Museum of Natural History, Smithsonian Institution, Washington, DC.

SYSTEMATIC PALEONTOLOGY

Gastropoda Cuvier, 1797
Stylommatophora Schmidt, 1855
Eucalodiidae Crosse & Fischer, 1872

Condonella McLellan, 1927

Condonella McLellan, 1927: 131. —Wenz, 1938: 198. —Knight et al., 1960: 196.

Type-species: *Condonella suciensis* McLellan, 1927, by monotypy.

Discoidally coiling, moderately large-shelled eucalodiid pulmonate snails with many (more than six at maturity) whorls; flat (or concave at some stages of growth) to very low-domed spire; sharp and high peripheral angle with a pinched-off keel; convex base; and wide, vaulted umbilicus delimited by acute angulation; sculpture of smooth, slender, collabral riblets; definitive aperture unknown.

McLellan (1927:131) originally diagnosed *Condonella* as follows: 'Shell small, discoidal, each whorl being coiled upon the preceding one; umbilicus broadly conical, converging towards the posterior side; anterior side convex; posterior side flat or somewhat concave; each whorl slightly and obliquely emarginate upon the preceding one; aperture sub-ovate to crescent-shaped.' In more usual malacological terminology, McLellan's 'anterior side' would be termed the base, and his 'posterior side' the spire, of the shell. McLellan's (1927:131) description of the new species *C. suciensis* ('[s]hell consisting of six whorls, increasing rather slowly in size; test thin, sub-nacreous [*sic*], and crossed obliquely by numerous fine transverse lines') adds little in the way of critical detail.

McLellan cited the opinions of W. H. Dall and T. W. Stanton that the holotype of *C. suciensis* resembled the freshwater basommatophoran genus *Planorbis* Müller, 1774, but rejected that assignment because the specimen was found in marine strata.

Condonella suciensis has the relatively uniform, thin shell walls that are characteristic of most nonmarine pulmonate gastropods. The plane of the aperture (through immature stages of growth; the definitive, adult aperture is not known) appears to have been approximately radial, a condition found in few marine gastropods other than Architectonicidae. The internal whorl partitions are not resorbed, as they would be in a terrestrial neritimorph snail (Solem, 1983).

The shell structure is not nacreous, as intimated by McLellan, but consists of (1) an outer,

radial crossed-lamellar layer with first order lamellae parallel to the direction of growth; (2) a middle, concentric crossed-lamellar layer with first order lamellae at right angles to the first; and (3) an inner, concentric crossed-lamellar layer (terminology after MacClintock, 1967).

Several Recent taxa of terrestrial pulmonate snails have medium-sized flat shells with tightly coiling, slender whorls, but none closely resembles *C. suciensis*. Keels delimiting the shoulder and umbilicus are unknown in, for instance, Megomphicidae and Systrophiidae. In *Coxia* Ancey, 1887 (Trochomorphidae) and *Polygyra* Say, 1818 (Polygyridae; e.g., *P. septemvolva* Say, 1818), coiling is even more strongly planispiral than in *C. suciensis*, leaving more of the preceding whorls exposed at the base of the shell (cf. Emberton, 1988:figs. 4, 5).

The species most similar to *C. suciensis* in whorl shape and sculpture are Recent Mesoamerican members of Eucalodiidae and are high-spired taxa with terete or cylindrical shells. In some, such as *Dissotropis* Bartsch, 1906, and *Coelocentrum* Crosse & Fischer, 1872, the axis of the shell is hollow until closed off by the constricting last whorl. In *Dissotropis castaneus* Thompson, 1968 (CAS 55555 examined), the shoulder is angulate, sharply delimiting the abaxial side of the whorl from the top (which in this cylindrically coiling species is situated entirely underneath the base of the preceding whorl) (cf. Thompson, 1968:fig. 15d). In *Dissotropis* and *Coelocentrum* the whorls are weakly convex or straight-sided up until the ultimate whorl (of adult conchs), which contracts toward the base producing a profile very much like that of *Condonella suciensis* (Thompson, 1968:figs. 20, 24, 26c, 28; Thompson & Correa, 1994:figs. 38, 39).

Most Eucalodiidae have sculpture of fine, smooth, regularly spaced, close-set ribs extending from suture to suture and over the base of the whorls (Fig. 2). These ribs tend to be shallowly sinuous (convex-forward or straight below the suture and concave-forward lower on the whorl) or adaperturally concave. In *C. suciensis* the ribs are shallowly convex-forward below the shoulder and concave-forward lower on the whorl.

Based on these conchological similarities, I interpret *Condonella* as a eucalodiid in which the coiling program omits translation along the coiling axis with growth. A parallel case of a discoidally coiling species in a clade with predominantly cylindrical shells is *Hendersoniella* Dall, 1905, a Recent genus of Urocoptidae Holospirinae with a few east-central Mexican species (Thompson & Correa, 1991).

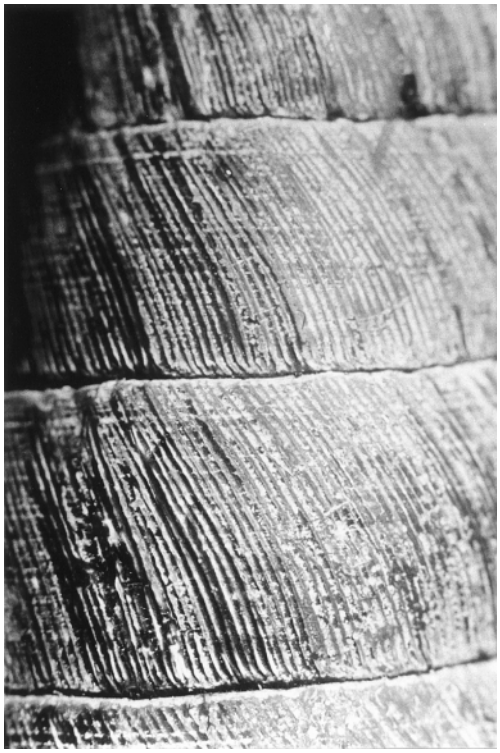


Figure 2. *Eucalodium* species. Detail of sculpture. Photograph by Allyn G. Smith, courtesy of California Academy of Sciences. Approximate height of whorls between sutures 3.5 mm.

The only taxon previously assigned to Eucalodiidae in the fossil record of North America north of Mexico is '*Eucalodium*' *eophilum* Cockerell, 1915, from the Willwood Formation of the Bighorn Basin, Wyoming. Elsewhere (Hartman & Roth, 1998; further studies in preparation) I have maintained that '*E.*' *eophilum* should be assigned to a yet-unnamed genus of Oreohelicidae.

Condonella suciensis McLellan, 1927
Figs 3–5

Condonella suciensis McLellan, 1927: 131, pl. xvii, figs. 1–3. —Wenz, 1938: 198–199, fig. 351. —Knight et al., 1960: 195–196, fig. 110:1a-1c.

Type locality: WASHINGTON: San Juan County: Sucia Island, 'about 300 feet [90 m] above the base of the fossil-bearing shales.' Cedar District Formation, upper Cretaceous.

Type material: Holotype, USNM 73460.

The holotype and only known specimen of *Condonella suciensis* (Figures 3–5) is an internal mold in

Figures 3–5. *Condonella suciensis* McLellan. Holotype, USNM 73460. Top, apertural, and basal views. Diameter 13.7 mm.

two pieces with small amounts of original shell adhering; it is 13.7 mm in greatest diameter and 6.0 mm in height from spire to base and consists of 6.25 whorls.

The spire is flat to slightly sunken, with the highest point on a whorl generally being the thickened, slightly pinched-off keel at the shoulder. The suture is slightly to markedly impressed and somewhat irregular. Low, smooth, close-set riblets cross the posterior plane of the whorl, from just outboard of the suture to just inboard of the shoulder keel, where they tend to fade out; they do not crenulate the free edge of the keel. The riblets are straight or weakly convex-forward; they range from approximately symmetrically triangular in cross-section to slightly steeper on their apertural than their abapertural slope. Similar riblets pick up again below the shoulder keel and extend to the keel that delimits the umbilicus. At first, they are shallowly convex-forward for about 40% of the height of the whorl, then they become shallowly concave-forward until they reach the basal keel. Very little of the keel surrounding the umbilicus is preserved, but like the shoulder keel it appears to be smooth and not crenulated by the riblets. Riblets appear again within the umbilicus and curve concavely forward until they meet the basal keel of the preceding whorl.

A second fragment of the holotype consists of a piece of the last preserved whorl and shows that the interior of the shell is smooth, with slight sinuations transverse to the direction of growth. No internal lamellae or barriers are evident.

Distribution: Upper Cretaceous: Cedar District Formation.

Remarks: The type locality of *C. suciensis* is 'about 300 feet [90 m] above the base of the fossil-bearing shales' in the unit of the Nanaimo Group mapped by McLellan (1927:map) as 'Haslam fossiliferous shale' on the south side of Fossil Bay, southern Sucia Island. McLellan stated that *C. suciensis* was found in strata that were rich in marine fossils. Ward (1978) assigned these strata to the Cedar District Formation (of the Nanaimo Group); they include the stratotype of the *vancouverense* zone of Muller & Jeletzky (1970) (upper Campanian).

The holotype remains the only specimen known. No other material is present in the Nanaimo Group collections of the Burke Museum, University of Washington (L. Nesbitt, personal communication, 1998). I would not expect a terrestrial species ever to prove common in these neritic deposits.

Megomphicidae Baker, 1930

Polygyroidea Pilsbry, 1924

Polygyroidea Pilsbry, 1924: 134.—Pilsbry, 1930: 305–307.—Pilsbry, 1939: 563–567.
Type-species: *Daedalochila harfordiana* Cooper, 1870, by monotypy.

Megomphicid land snails with discoidal to conic shells; narrow, closely coiled, whorls that are striate but not costulate on the shoulder; periphery rounded; base smooth with wide, but not sharply delimited, umbilicus; definitive aperture lunate-triangular, oblique, peristome unexpanded, somewhat thickened within, with a compressed, obliquely entering parietal lamella and nodular teeth on outer and basal lips. Last whorl without internal radial series of spirally directed lamellae. Jaw simple, with fine vertical striae. Reproductive system resembling those of *Polygyrella* Bland in Binney & Bland, 1869, and *Ammonitella* Cooper, 1868, but possessing penial caecum above entrance of epiphallus.

Polygyroidea is represented in the Holocene by one species, *P. harfordiana* (Cooper, 1870) (Fig 6, 7), with a geographic range restricted to a few localized enclaves on the western side of the central Sierra Nevada, California. One fossil species is known, *Polygyroidea montivaga* Pierce, 1992, from the Cabbage Patch Beds, late Oligocene-early Miocene (Arikareean age) of western Montana, USA.

Conchologically, *Polygyroidea* resembles *Polygyrella* (type-species, *Helix polygyrella* Bland & Cooper, 1861). But *Polygyrella* has close-set radial ribs extending across the shoulder of the whorl, a definitive aperture with a single triangular parietal lamella and no outer lip teeth, and one or two internal radial series of short, spirally directed lamellae (Pilsbry, 1939:558, fig. 370).

Polygyrella is represented in the Holocene by one species, *P. polygyrella* (Bland & Cooper, 1861), with a geographic range of northwestern Idaho, adjacent Montana, southwestern Washington, and northeastern Oregon, USA. It has a much more extensive fossil record than *Polygyroidea*. *Polygyrella* from the John Day Formation, probable Arikareean age of central Oregon, have been referred to *P. polygyrella* (Hanna, 1920).

Other species include *Polygyrella amplexa* (Meek & Hayden, 1857) from the Judith River Formation, upper Cretaceous (Campanian), Montana; *P. venerabilis* (Russell, 1937), from the Belly River Formation, upper Cretaceous (Campanian), Alberta; and *P. parvula* (Whiteaves, 1885) from the St. Mary River Formation, upper Cretaceous (Campanian or Maastrichtian), Alberta (Roth, 1986). Specimens similar to *P. parvula* have been found in the Willwood Formation in late Paleocene (Clarkforkian age) strata, Park County, Wyoming (Hartman & Roth, 1998). An undescribed species occurs in the White River Formation in the Douglas area, eastern Wyoming, in Oligocene (Orellan age) strata (Evanoff, 1990; Evanoff & Roth, in preparation) and another in the Clarno Formation, middle Eocene of central Oregon (Roth, in preparation). Indeterminate species assignable to the genus occur in several Montana and Wyoming localities of Eocene age (D. W. Taylor in Ross, 1959; Taylor, 1975).

Not all of the fossils now assigned to *Polygyrella* show the diagnostic features of radial ribs and internal series of lamellae. For instance, Roth (1986) was unable to detect internal lamellae in *Polygyrella* sp., cf. *P. polygyrella* from the Climbing Arrow Formation, probable Duchesnean Age of the Three Forks Basin, Montana, although grooves corresponding radial ribs were present. As Pierce (1992) intimated, a reappraisal of the fossil record of Megomphicidae should consider whether such taxa may be better assigned to *Polygyroidea*.

[The name *Polygyrella* usually has been cited as dating from Binney (1863), but as pointed out by Bogan & Spamer (1989), the application of Article 8(b) of the International Code of Zoological Nomenclature is determinative in this case.]

Polygyroidea hiltoni, new species
Figs 8–10

cf. *Condenella* [*sic*] Hilton & Antuzzi, 1997: 142, fig. 11.

Diagnosis: A large *Polygyroidea* with 8.75 or more whorls; periphery compressed toward shell axis, squarish in profile; and smooth surface, lacking radial grooves or prominent growth lines.

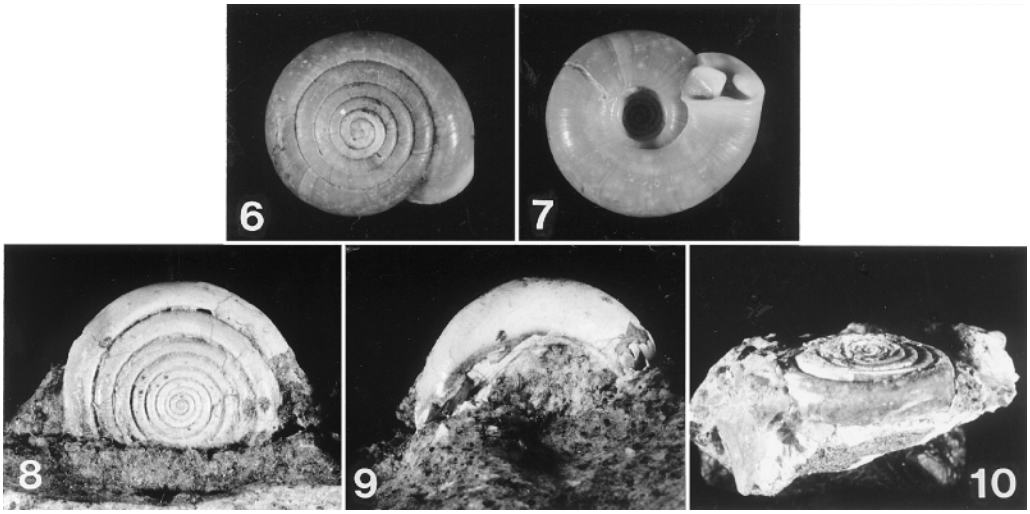
Description: Shell (Figs 8–10) large for the genus (diameter of holotype 12.3 mm), discoidal, consisting of 8.75 or more whorls, widely umbilicate, with low-convex or nearly flat spire of closely coiled whorls. Suture well impressed. Holotype missing most of outer shell layer, but apparently lacking radial grooves outboard of suture. Surface glossy, without prominent growth lines. Periphery somewhat compressed toward shell axis, squarish in profile. Last half whorl slightly compressed apico-basally and apparently deviating outward from prior coiling trajectory. Definitive aperture unknown. Umbilicus prominent, not set off by keel or angulation, contained about 2.5 times in shell diameter.

Dimensions of holotype: Diameter 12.3 mm, height 4.9 mm, whorls 8.75.

Type material: Holotype: SC MG-158. Paratype: SC MG-172.

Type locality: CALIFORNIA: Placer County: Granite Bay, SE of Roseville (Hilton & Antuzzi, 1997). Chico Formation, upper Cretaceous (Campanian). Richard P. Hilton coll.

Remarks: The holotype (Figs 8, 9) is an undistorted specimen consisting of original shell material but lacking much of the outer shell layer. It remains partly imbedded in a matrix of light gray, arkosic, silty sandstone containing grains of dark gray slate and numerous shell fragments. Deposition evidently took place in a low-energy, nearshore marine environment. The matrix is part of a massive turbidite (Hilton & Antuzzi, 1997:137) containing fossil shell



Figures 6, 7. *Polygyroidea harfordiana* (Cooper). Recent, CALIFORNIA: Mariposa County: S bank of Alder Creek, 0.15 km above confluence with South Fork of Merced River (author's collection, BR 1529); top and basal views.
Figures 8–10. *Polygyroidea hiltoni*, new species. **8, 9**. Holotype, SC MG-158; top and basal views. Diameter 12.3 mm. **10.** Paratype, SC MG-172; lateral view. Diameter 9.8 mm.

hash including the remains of marine bivalves, gastropods, cephalopods, and crinoids. Contained clasts indicate a steep, cliff-lined shore not far to the east (Hilton & Antuzzi, 1997). Analogy with the habitat of Recent *Polygyroidea harfordiana* suggests the presence of cool-temperate forest and perhaps talus slopes receiving an accumulation of dead and decaying plant detritus.

Paratype MG-172 (Fig. 10) is a mostly decorticated specimen 9.8 mm in diameter and 4.8 mm in height. Whorl number is not precisely determinable but seems to be about eight. As with the holotype, a definitive aperture is not preserved.

At over 12 mm in diameter, *Polygyroidea hiltoni* is larger than *P. harfordiana*, which ranges from 8.3 to 11.5 mm in adult diameter. However, its early whorls are smaller than those of *P. harfordiana*, with a diameter of 1.3 mm at whorl 1.0, compared to 2.1 mm for the latter. *Polygyroidea montivaga* is smaller (6.7–8.0 mm in diameter), with 5.9 to 6.5 whorls and a relatively narrower umbilicus (Pierce, 1992). It shares with *P. hiltoni* a periphery that is compressed toward the shell axis and squarish in profile.

Etymology: The species is named for Richard P. Hilton, Sierra College, California.

Polygyroidea(?) ***lens*** (Gabb, 1864)
Figs 11–13

Straparollus lens Gabb, 1864: 120–121, 226, pl. 20, figs. 77a–77d.—Stoliczka, 1868: 255.—Gabb, 1869: 224.—Pilsbry, 1946: 436–437.—Richards, 1986: 150.
Ventridens lens (Gabb), Stewart, 1927: 293, 442–443, pl. 24, fig. 13.—Henderson, 1935: 14, 36, 156, 157.

Diagnosis: A large *Polygyroidea*(?), nearly as tall as wide, with elevated, convexly conic spire, ten or more whorls, and umbilicus contained about four times in the diameter of the base.

Description: Shell (Figs 12–13) large for the genus, convexly conic; roughly equidimensional,

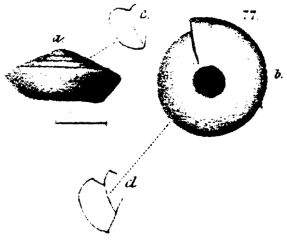
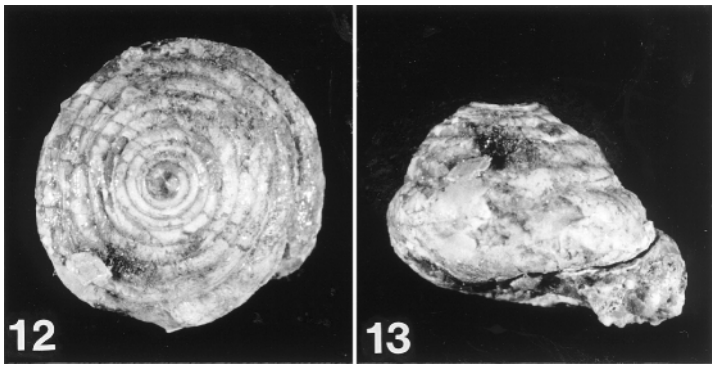


Figure 11. *Polygyroidea*(?) *lens* (Gabb). Original figures, after Gabb (1864:pl. 20, figs. 77a-77d), of holotype, present whereabouts unknown.



Figures 12, 13. *Polygyroidea*(?) *lens* (Gabb). Referred specimen, SC MG-162. Top and lateral views. Diameter 14.5 mm.

with spire nearly as high as diameter of shell. Shell consisting of 10 or more closely coiling whorls. Suture well impressed. No radial grooves apparent outboard of suture. Surface not well preserved but evidently smooth, without prominent growth lines. Whorl profile convex, periphery inflated. Last 0.2 whorl slightly compressed apico-basally. Definitive aperture unknown. Base flattened; umbilicus prominent, conic, not set off by keel or angulation, contained about four times in shell diameter.

Dimensions of lectotype: Diameter 7.3 mm, height (incomplete) 3.6 mm, according to Stewart (1927: 443); whorls 6.6 (based on Stewart, 1927:pl. xxiv, fig. 13).

Type material: Lectotype: ANSP 4260; designated by Stewart (1927) (Figure 11). Cited as missing by Richards (1968) and not now locatable (E. Benamy, personal communication 30 October 1997).

Gabb (1864:121; pl. 20, fig. 77d) mentioned a second specimen, with angular whorl summits, as possibly distinct from *S. lens*, and figured its whorl cross-section; but because he had only one such specimen, 'and that somewhat mutilated,' he did not formally describe it. That specimen arguably would constitute a paralectotype, but it, too, is lost (Stewart, 1927).

Type locality: CALIFORNIA: Placer County: Texas Flat. Chico Formation, upper Cretaceous (Campanian). Texas Flat, later called 'Rock Corral' (Turner, 1894), was one of the earliest sampled Cretaceous fossil localities in California. It is located in what is today the community of Granite Bay. Hilton & Antuzzi (1997) make it clear that Texas Flat is close to or among the sections of the Chico Formation that they sampled.

Referred material: SC MG-162. CALIFORNIA: Placer County: Granite Bay, SE of Roseville (Hilton & Antuzzi, 1997). Chico Formation, upper Cretaceous (Campanian). Richard P. Hilton coll.

Remarks: Stewart (1927:443) based his assignment of '*Straparollus*' *lens* to *Ventridens* W. G. Binney, 1863, on an opinion received from H. A. Pilsbry. Pilsbry (1946:437) stated that the species 'is apparently a land snail, with the size, closely coiled whorls and general figure of *Ventridens lawae* [(W. G. Binney, 1892)] or *lasmodon* [(Phillips, 1841)], but the base is not preserved sufficiently to show the aperture, or whether laminae are present.'

The present specimen from Granite Bay (Figs 12–13) consists of a convexly conic, almost equidimensional shell filled with a matrix of grayish-tan siltstone. Considerable original shell is preserved, but is greatly pitted and eroded so that little of the original shell surface remains. The specimen is slightly distorted by oblique compression and measures 14.5 mm in greatest diameter and 11.1 mm in height. The embryonic whorls are missing, so it is not possible to count the number of whorls exactly, but I estimate that the shell had 10 or slightly more whorls.

The whorls are closely coiled, about as in Stewart's (1927) apical view of the lectotype of *Straparollus lens*. At 6.6 whorls, its diameter would have been about 6 mm. A definitive aperture is not present, although the base of the last preserved 0.2 whorl is gently compressed upward; this appears to be real and not diagenetic. A similar apico-basal compression occurs just behind the definitive aperture of *Polygyroidea harfordiana*.

The diameter of the umbilicus is 27% of the greatest diameter of the base. This is the same ratio shown in the basal view of the lectotype as illustrated by Gabb (1864:pl. 20, fig. 77b; Fig. 11 herein). Gabb's (1864:pl. 20, fig. 77a) lateral view of the lectotype shows an obtuse apical angle of about 120°. The spire of the Granite Bay specimen is convexly conic (beehive-shaped),

and would have had a similarly obtuse apical angle at an early stage of growth.

An adhering fragment, apparently from the periphery of a late-phase whorl, shows fine, inconspicuous collabral striations and a few weak, discontinuous incised spiral striae. It strongly resembles the sculpture of *Polygyrella amplexa* as illustrated by Meek (1876:pl. 42, fig. 16a). However, I am not completely certain that this fragment belongs to this specimen.

I conclude that *Straparollus lens* was based on a juvenile specimen conspecific with specimen MG-162 from Granite Bay. The evidence for assignment of the species to *Polygyroidea* is less persuasive than that for *P. hiltoni*, and requires expanding our concept of the genus to include conic as well as discoidal shells. However, another megomphicid genus, *Polygyrella*, shows a similar range of shapes, and the assignment should not particularly tax the imagination.

ACKNOWLEDGMENTS

I am grateful to Dick Hilton for bringing the land snails from the Chico Formation to my attention and for the recognition that *Condonella* might be a land snail taxon; to Elana Benamy for searching the ANSP collection for the holotype of *Straparollus lens*; to Mark Florence for the loan of the holotype of *Condonella suciensis*; to Liz Nesbitt, who searched the collection of the Burke Museum for material assignable to *C. suciensis*; and to Terrence J. Frest and Harold G. Pierce for help or advice on this project.

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