

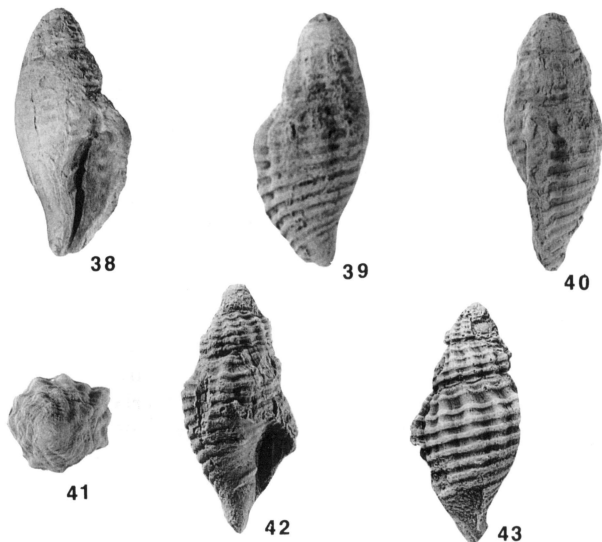
Table 4  
Measurements (mm) of *Praesargana condoni* (White, 1889).

	H	D	Hp	Dp	Ha	Hs	A	Dp/Hp	Hp/Hs
UCLA 59443	19.0	15.0	2.0	7.6	3.0	?	114°	3.8	?
LACMIP 11546	27.3	21.2	4.8	8.9	6.5	1.0	88°	4.9	4.8
LACMIP 11585	17.6	16.9	1.8	6.8	3.4	‡	110°	3.8	?
LACMIP 11586	23.7	21.6	3.0	10.5	5.0	1.7	115°	3.5	1.8

\* Specimen incomplete; ‡ shoulder overlapped. Abbreviations decypted in Introduction.

very angulate on some specimens but rounded on others. The spire height varies from nearly flat (Figures 27–29, 33) to conical (Figures 30–32). Additionally, on some specimens an abrupt enlargement of the whorl makes a bulge near the aperture (Figures 34, 36, 37).

ANDERSON (1958:168) claimed that the species occurs in considerable numbers near the Yolo-Napa County line at Putah Creek, but a search of the University of California, Berkeley, Museum of Paleontology and the California Academy of Sciences collections for specimens from that vicinity turned up only two specimens of the species from one locality, CASG loc. 2360, "Devils Gate," on Berryessa Creek, 12,000 ft (3700 m) below the top of the Chico group, on Hamilton Ranch "near the top of the big conglomerate." Anderson said that his specimens were collected from conglomerates, suggesting that *Praesargana condoni* occurs in the Venado Formation.



Explanation of Figures 38 to 43

All figures  $\times 1$ ; all specimens coated with ammonium chloride. Figures 38–43. *Cydas crossi* (Anderson, 1958). Figures 38–40: CAS cat. no. 61934.01 from CAS loc. 61934, holotype; Figure 38, aperture; Figure 39, back; Figure 40, right side. Figures 41–43: LACMIP cat. no. 11547 from LACMIP loc. 10735, hypotype; Figure 41, apical view; Figure 42, apertural view showing pseudofold on columella; Figure 43, back. Photographs 38–41 by De Leon; 42, 43 by Susuki.

Superfamily BUCCINACEA Rafinesque, 1815  
Family PERISSITYIDAE Popenoe & Saul, 1987  
Genus *Cydas* Saul & Popenoe, gen. nov.

Type species: *Volutoderma crossi* Anderson, 1958, from the West Coast Turonian.

**Diagnosis:** Medium-sized, fusiform perissityids with a sloping shoulder, broadly rounded periphery, and short anterior siphonal neck that has near its anterior end a well-developed siphonal fasciole. Whorls ornamented by rounded axial ribs on posterior half of whorls over-riden by flat-topped spiral cords. Outer lip expanded to form a rim and having a posterior, four medial, and an anterior denticle within, the central two medial denticles stronger; lip notched posteriorly at the shoulder between posterior and adapical medial denticles. Aperture elongate, narrow, sharply angled and constricted posteriorly. Parietal lip narrow and thin with one or two posterior denticles coinciding with spiral cords, two pseudofolds on columella just anterior to base of whorl; inner lip broader and thicker on columella, wrapped over to form a pseudumbilicus anterior to fasciole.

**Discussion:** *Cydas* displays a typical perissityid pattern of apertural denticles. It is most similar to *Pseudocymia* Popenoe & Saul, 1987, but in *Cydas* the outer lip denticles are separated into three groups and the middle two of the medial group are the strongest, the shoulder is obscure, and the spiral cords are straplike. The posterior notch at the shoulder of the outer lip is suggestive of *Columbellaria* Rolle, 1861, but the notch is less well developed in *Cydas* and the inner lip is not expanded onto the last whorl.

The genus is named for Cydas of Gortyna, son of Antitalces, and is of masculine gender.

*Cydas crossi* (Anderson, 1958)

(Figures 38–43)

*Volutoderma crossi* ANDERSON, 1958:174, pl. 16, figs. 3, 3a.

**Diagnosis:** As for the genus.

**Description:** Shell of medium size, rounded fusiform; spire and last whorl of approximately equal height; apical angle about 35°; spire with five, moderately convex whorls slightly concave just below suture; body whorl ornamented with about 12 straplike spiral cords separated by interspaces as

Table 5  
Measurements (mm) of *Cydas crossi* (Anderson, 1958).

	H	D	Hp	Dp	Ha	A	La	Dp/Hp
CAS 61934.01	34.2*	13.9	7.0	10.8	13.6*	33°	21	1.5
LACMIP 11547	33.0*	15.5	7.4	11.5	15.5	38°	—	1.5

\* Specimen incomplete. Abbreviations decrypted in Introduction.

wide as spirals, posterior spiral separated from posterior suture and succeeding abapical spiral by interspace twice its width; axial sculpture of about 12 low, rounded ribs and a varix per whorl; ribs gently arched and slightly concave to the aperture; varices, not well preserved in available specimens but developed at radial intervals of about 300°; aperture elongate, sharply angled posteriorly, contracted anteriorly; inner lip narrow, thin parietally, thicker and wider on columella, bearing one or two denticles near posterior end, and two short, slightly oblique columellar pseudofolds just anterior to whorl base; anterior tip of columella flexed slightly to the left, bearing a fasciole near its tip; outer lip expanded into a rim, bearing within a posterior, four medial, and an anterior denticle; two central medial denticles stronger; lip notched posteriorly at shoulder; labral profile nearly paralleling shell axis, but with a broad and shallow sinus concave toward the aperture.

**Holotype:** CASG cat. no. 61934.01 (= CASG 10675).

**Hypotype:** LACMIP cat. no. 11547 from LACMIP loc. 10735 (= CIT 1212), Little Cow Creek, 2 miles (3.2 km) northeast of Frazier Corners, Shasta Co., California.

**Dimensions:** See Table 5.

**Type locality:** CASG loc. 61934 (= CASG 1293D), "SW ¼ sec. 4, T32N, R3W, Frazier Corners, Shasta Co." (ANDERSON, 1958).

**Distribution:** Known only from the Frazier Siltstone Member of the Redding Formation in the vicinity of the type locality.

**Geologic age:** Late Turonian, associated with *Subprionocyclus* sp.

**Remarks:** Only two specimens of this species are available. Neither is complete; both lack an adequately preserved protoconch. The holotype is weathered; its shell surface is eroded, and the shell was riddled by endobionts, but the shell surface of the less complete hypotype is well preserved. The aperture of the holotype is complete enough to display a perissityid denticle pattern. The posterior "siphonal" notch is shallow, but its placement on the shoulder resembles the placement of the siphon in the Columbellinidae. Some of the early volutes, as for example the species herein assigned to *Carota*, also have an outer lip notch at the shoulder.

*Cydas crossi* resembles *Pseudocymia aurora* Popenoe & Saul, 1987, but *C. crossi* is more slender, has a less angulate

shoulder, fewer denticles within the outer lip, and the denticles are more clearly divided into posterior, medial, and anterior groups. *Cydas crossi* resembles *Murphitys michaelsi* Saul, 1987, in overall shape but is higher spired, more slender, has spiral cords that are more straplike and regular, and has two short pseudofolds on its columella rather than the two folds of *Murphitys*.

In shape and sculptural components, *Cydas crossi* resembles the type species of *Trachytriton* Meek, 1864, *Trachytriton vinculum* (Hall & Meek, 1856), from the late Campanian-early Maastrichtian of Colorado, Montana, South Dakota, and Wyoming. *Cydas crossi* differs from *T. vinculum* in having a perissityid-like distribution of denticles within the aperture, stronger spiral sculpture consisting of fewer more nearly equal, straplike spiral cords, about half the number of axial ribs, and more irregularly developed varices, both as to strength and frequency.

#### Family BUCCINIDAE Rafinesque, 1815

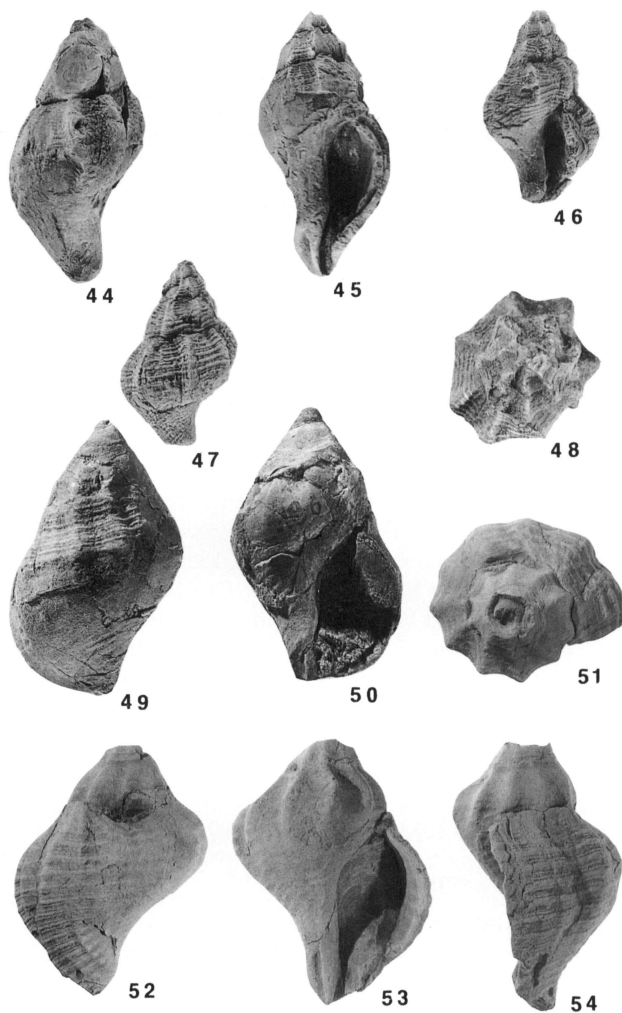
##### Genus *Eripachya* Gabb, 1869

Type species: *Neptunea ponderosa* Gabb, 1864, subsequent designation Cossmann, 1901, from the Campanian of California.

**Diagnosis:** Medium-sized, broadly fusiform buccinids having plumply convex whorls; suture sinuous, impressed. Spiral ornamentation of alternate width ribs; collabral sculpture of strong, nearly straight ribs strongest at periphery and dying out before the suture and the siphonal neck. Aperture eye-shaped, rounded posteriorly, attenuated and gently twisted anteriorly; siphonal canal narrow, moderately long; columella strongly twisted; siphonal neck bearing a narrow false umbilicus bounded by a low but well-marked fasciole; inner lip smooth, overlain by thin callus, concave in its parietal portion, gently sinuous in its columellar position; outer lip thin, lirate within.

**Range:** Turonian to Campanian.

**Discussion:** *Eripachya* has long been misunderstood. COSSMANN (1901) indicated that it was poorly characterized because the specimens were not well preserved, and he doubted that the other two species included by GABB (1869) in *Eripachya*, *Neptunea perforata* Gabb, 1864, and *Neptunea hoffmanni* Gabb, 1864, were congeneric. STEWART (1927) placed these latter species in the cancellariid genus *Paladmete* Gardner, 1916, but ANDERSON (1958) referred them back to *Eripachya* which they do not resemble. The specimen of the type species, *E. ponderosa*, figured



Explanation of Figures 44 to 54

Unless otherwise indicated, figures are  $\times 1$ ; all specimens coated with ammonium chloride.

Figures 44–48. *Eripachya vaccina* sp. nov. Figures 44, 45: LACMIP cat. no. 11548, from LACMIP loc. 10760, holotype; Figure 44, back; Figure 45, aperture.

Figures 46–48: LACMIP cat. no. 11549, from LACMIP loc. 10776, paratype; Figure 46, aperture; Figure 47, back; Figure 48, apical view,  $\times 1.5$ .

Figures 49–54. *Eripachya ponderosa* (Gabb, 1964). Figures 49, 50, ANSP cat. no. 4186 from Tuscan Springs, Tehama Co., Calif., lectotype; Figure 49, back; Figure 50, aperture. Figures 51–54: CAS cat. no. 53344.01 from CAS loc. 53344, hypotype; Figure 51, apical view; Figure 52, back view; Figure 53, aperture; Figure 54, right side. Photographs 44–47, 49, 50 by Susuki; 48, 51–54 by De Leon.

by STEWART (1927:pl. 20, fig. 9) is somewhat crushed into a less bucciniform shape. *Eripachya* resembles the late Cenozoic *Lirabuccinum* Vermeij, 1991, but *Lirabuccinum* has a shorter and straighter columella, more numerous collabral ribs, and its spiral ribbing is relatively even. The

spiral sculpture of *Eripachya* has a graded or bundled aspect with wider riblets grouped together, grading into finer interspace riblets somewhat like that of *Kelletia kelleitii* (Forbes, 1852).

*Eripachya vaccina* Saul & Popenoe, sp. nov.

(Figures 44–48)

**Diagnosis:** A slender *Eripachya* with about eight collabral ribs per whorl.

**Description:** Shell of medium size, robust, broadly fusiform, pleural angle of about  $49^\circ$ ; spire approximately three-fifths the total height of the shell, with about six plumply convex whorls about twice as wide as high; siphonal neck slightly longer than the spire with a well-marked fasciole; suture undulating, slightly appressed. Protoconch unknown. Sculpture of fine spiral cords and strong collabral ribs; spiral ornamentation of five or six low, flat, narrow primary cords on penultimate whorl, and about 15 on body whorl and neck, separated by interspaces wider than the primaries, and alternating with narrow threadlike secondary spirals; seven or eight sharp-crested collabral ribs per whorl separated by flatish interspaces, twice the width of the ribs; ribs on body whorl diminishing anterior to the periphery, not present on base or siphonal neck, disappearing at about the mid-length of whorl. Aperture eye-shaped, angulate at the suture, broad posteriorly, attenuated anteriorly; siphonal canal narrow, of moderate length, twisted abaperturally and to the left anteriorly, bearing above its tip a narrow and shallow umbilical chink bounded by a low but well-marked fasciole; inner lip smooth, without folds, parietal lip short, columellar portion nearly straight, bent at the fasciole and with a free edge forming a pseudoumbilicus with the fasciole; outer lip unknown.

**Holotype:** LACMIP cat. no. 11548.

**Paratype:** LACMIP cat. no. 11549 from LACMIP loc. 10776 (= CIT loc. 1197), Stinking Creek, Shasta Co., California.

**Type locality:** LACMIP loc. 10760 (= CIT loc. 1438), north side Little Cow Creek, Shasta Co., California.

**Dimensions:** See Table 6.

**Geologic age:** ?Early Turonian, horizon of *Tragodesmocerat*.

**Distribution:** Redding Formation, Bellavista Sandstone Member of the Redding area, Shasta Co., California.

**Remarks:** *Eripachya vaccina* is a rare form; only two incomplete specimens are in the LACMIP collection. Both specimens lack a protoconch, the outer lip, and the parietal portion of the inner lip. *Eripachya vaccina* is more slender, has a longer anterior siphonal canal, and is ornamented with fewer secondary spirals than the type species, *E. ponderosa*. The holotype of *E. vaccina* shows no lirae on the outer lip but is broken back too far to be sure that lirae

were not present. Additionally the shape of the parietal portion of the inner lip is undeterminable, as is the presence of a posterior siphonal notch at the suture.

**Etymology:** The specific name *vaccina*, Latin, meaning of cows, refers to the type locality on the north side of Little Cow Creek.

*Eripachya ponderosa* (Gabb, 1864)

(Figures 49–54)

*Neptunea ponderosa* GABB, 1864:88, pl. 18, fig. 38.

*Eripachya ponderosa* (Gabb): GABB, 1869:149; COSSMANN, 1901:147, fig. 40; STEWART, 1927:425, pl. 20, fig. 9; WENZ, 1941:1185, fig. 3373; ANDERSON, 1958:172.

**Description:** Shell of medium size, robust, bucciniform, apical angle of about 80°; spire approximately two-thirds the total height of the shell, with about six plumply convex whorls about twice as wide as high; suture undulating, and appressed; siphonal neck broad, barely longer than the spire, with a low well-developed fasciole. Sculpture of narrow spiral cords and strong collabral ribs; five or six primary spiral cords on penultimate whorl, 15 on body whorl and neck, low, flat, narrow, each bordered by graded sets of finer ribs; ten, moderately sharp-crested collabral ribs on early whorls, becoming broader, well rounded on body whorl, about as wide as interspaces, diminishing anteriorly to the periphery, disappearing on base of whorl. Aperture eye-shaped, broad posteriorly with a small narrow posterior channel at the suture, attenuated anteriorly; siphonal canal moderately narrow, short, tip flexed backward and to left; inner lip smooth, without folds, parietal portion thin, rounded; columellar portion thicker, nearly straight, with a free edge forming a narrow, shallow umbilical chink anterior to the fasciole; outer lip thin, lirate within.

**Lectotype:** ANSP cat. no. 4186, here designated.

**Hypotype:** CASG cat. no. 53344.01 (= CSMB cat. no. 12793) from Tuscan Springs, Tehama Co., California.

**Dimensions:** See Table 6.

**Type locality:** Tuscan Springs, on Little Salt Creek, Tehama Co., California.

**Distribution:** A rare species, known predominantly from the type locality. Some small poorly preserved specimens from the Schultz Member of the Williams Formation in the Santa Ana Mountains (UCLA loc. 7199), Orange Co., may be this species.

**Geologic age:** Campanian.

**Remarks:** STEWART (1927) figured ANSP cat. no. 4186 and referred to it as the holotype because he considered it to be the specimen GABB (1864) had figured. Gabb, however, did not designate type specimens, and he mentions more than one specimen, but other specimens in the box

Table 6

Measurements (mm) of *Eripachya vaccina* sp. nov. and *E. ponderosa* (Gabb, 1864).

	H	D	Hp	Dp	Ha	A	R	Dp/ Hp
<i>E. vaccina</i>								
LACMIP								
11548	33.0*	17.5	6.4	11.7	12.0*	49°	8	1.8
LACMIP								
11549	24.7*	14.3	5.5	9.0	12.8	46°	8	1.6
<i>E. ponderosa</i>								
CAS 5334401	36.0*	28.7	9.0	14.6	12.0*	77°	11	1.6
UCLA								
28733**	34.6	23.2†	9.6	12.8	13.5	60°†	11	1.3

\* Specimen incomplete; † specimen crushed; \*\* plastercast of ANSP 4186. Abbreviations decrypted in Introduction.

with Stewart's figured specimen were "*Fulgur*" *hilgardi* White, 1889. Gabb did not differentiate "*Fulgur*" *hilgardi* from *Eripachya ponderosa*, and his specimens of *E. ponderosa* from Pentz are apparently "*F.*" *hilgardi*. As STEWART (1927) did in several instances designate lectotypes, his reference to ANSP 4186 as holotype is an error and cannot be taken as designation of the lectotype. To avoid possible confusion, Stewart's figured specimen ANSP 4186 is therefore herein designated the lectotype.

*Eripachya ponderosa* differs from *E. vaccina* in being stouter, having a shorter anterior canal, and having one more secondary spiral thread in each interspace.

*Eripachya ponderosa* of DAILEY & POPENOE (1966) is early Maastrichtian in age, lacks axial sculpture, and is an undescribed species.

Family MELONGENIDAE Gill, 1871

Genus *Palaeatractus* Gabb, 1869

Type species: By monotypy, *Palaeatractus crassus* Gabb, 1869 from the Turonian of California.

**Diagnosis:** Small, thick-shelled, pyriform, ornately sculptured melongenids with a slightly twisted columella, simple outer lip, and thick inner lip.

**Discussion:** These are small shells, considerably smaller than such forms as *Pyrifusus* Conrad, 1858, or *Sycostoma* Cox, 1931, with which WENZ (1941) has associated *Palaeatractus*. The genus is, however, similar in overall shape to these larger forms but has stronger sculpture and a more bent canal than *Sycostoma*, and lacks the subsutural welt and concave band of *Pyrifusus*. The sculpture and shape of *Palaeatractus* recall that of the pseudolivine *Pegocomptus* Zinsmeister, 1983, and the volute *Volutocorbis* (*Retipirula*) *crassateta* (Gabb, 1869) (ZINSMEISTER, 1977), but *Palaeatractus* has no pseudolivine groove on the body whorl, no folds on the columella, and has finer sculpture.