Polygyrid Land Snails, *Vespericola* (Gastropoda: Pulmonata), 3. Three New Species From Northern California

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Abstract. Three new species of polygyrid land snails from northern California are described: *Vespericola sasquatch*, from stream drainages tributary to the Salmon River, Siskiyou County; *Vespericola embertonii*, from Reeves Canyon, Mendocino County; and *Vespericola rhodophila*, from coastal Sonoma County.

INTRODUCTION

This is the third in a series of studies by us on the systematics of the western American polygyrid land snail genus *Vespericola* Pilsbry, 1939. In the first article of the series (Roth & Miller, 1993), we separated *Vespericola pilosus* (Henderson, 1928) from *Vespericola columbianus* (Lea, 1838), of which it had been considered a subspecies and showed that the distribution of *V. pilosus* is restricted to the San Francisco peninsula, California. We also demonstrated that *Vespericola orius* (Berry, 1933) is a species, not a subspecies of *V. columbianus*, and we described a new species, *Vespericola marinensis* Roth & Miller, 1993, from Marin County, California.

In the second article of the series (Roth & Miller, 1995), we redescribed *Vespericola megasoma* (Pilsbry, 1928), adding details of its reproductive anatomy, and restricted its type locality to the east bank of Prairie Creek, near the south end of Prairie Creek Redwoods State Park, Humboldt County, California. We also described the reproductive anatomy of *Vespericola eritrichius* (Berry, 1939) and *Vespericola karokorum* Talmaadge, 1962. Additionally, we described a new species, *Vespericola klamathicus* Roth & Miller, 1995, from drainages adjacent to those of *V. karokorum* in the Klamath Mountains, California.

In a subsequent article (Cordero & Miller, 1995), one of us (WBM) assisted Alicia M. Cordero in describing the reproductive anatomy of *Vespericola shasta* (Berry, 1921), and in describing two new species, *Vespericola rothi* Cordero & Miller, 1995, and *Vespericola scotti* Cordero & Miller, 1995, from areas relatively close to but outside the distribution of *V. shasta*.

In this third article by Roth & Miller we describe three new species.

MATERIALS AND METHODS

Shell height and diameter are vernier caliper measurements and exclude the expanded lip of mature shells. Whorls were counted by the method of Pilsbry (1939:xi, fig. B). The density of peristomial setae was estimated by counting the number of setae per square millimeter on the shoulder of the body whorl, 0.25 whorl behind the aperture of adult specimens, at 30× magnification under a dissecting microscope with an ocular reticle. Three counts were taken per specimen and the mean (to the nearest integer) recorded.

Specimens for dissection and whole mounts of genitalia were prepared by the methods described by Roth & Miller (1993).

The following abbreviations are used: ANSP, Academy of Natural Sciences of Philadelphia; BR, senior author’s collection, San Francisco, California; CAS, California Academy of Sciences; LACM, Los Angeles County Museum of Natural History; SBMNH, Santa Barbara Museum of Natural History.

SYSTEMATICS

**POLYGYRIDAe** Pilsbry, 1895

*Vespericola* Pilsbry, 1939


**Type species:** *Polgyra columbiana pilosa* Henderson, 1928 [= *Vespericola pilosus* (Henderson)], by original designation.

*Vespericola sasquatch* Roth & Miller, sp. nov.

(Figures 1–5)

**Diagnosis:** A large *Vespericola* with depressed-globose, almost imperforate shell, 5.8–6.25 whorls, erect, distant peristomial setae with forked bases, and usually a small parietal lamella. Penis medium-sized, slender, with anterior 50% enclosed in sheath; with short, conical, pointed verge 0.5–0.8 mm long; spermathecal duct massive, gradually tapering to a constriction at spermatheca.
**Vespericola sasquatch** Roth & Miller, sp. nov. Shell, holotype, SBMNH 143179, CALIFORNIA: Siskiyou County: along small stream entering Salmon River from north, 4.3 km E of Etna-Somesbar Road/California Highway 96 intersection at Somesbar (sec. 1 or 2, T. 11 N, R. 6 E, Humboldt Base and Meridian; USGS Forks of Salmon quadrangle [7.5-minute series, Topographic]). B. Roth, E. J. Kools coll., 17 May 1984. Top, apertural, and basal views. Diameter 16.0 mm.

**Figures 1–3**

**Figures 4, 5**

**Vespericola sasquatch** Roth & Miller, sp. nov. Drawings made from projections of stained whole mounts. Structures seen in transparency are shown by dotted lines. Scale line = 1 mm. Figure 4. Anterior part of reproductive system, paratype. SBMNH 78125. CALIFORNIA: Siskiyou County: along small stream entering Salmon River from north, 4.3 km E of Etna-Somesbar Road/California Highway 96 intersection at Somesbar (sec. 1 or 2, T. 11 N, R. 6 E, Humboldt Base and Meridian; USGS Forks of Salmon quadrangle [7.5-minute series, Topographic]). B. Roth, W. B. Miller coll., 10 April 1992. Figure 5. Penis and penial sheath cut open to show verge and pilasters, paratype, SBMNH 77923. same locality as the preceding. B. Roth, E. J. Kools coll., 17 May 1984. Abbreviations: at, atrium; cp, cut edge of penis; cs, cut edge of penial sheath; ep, epiphallus; go, genital orifice; ov, oviduct; pe, penis; pi, pilaster; pr, penial retractor; ps, penial sheath; pt, prostate; re, retentor; sd, spermathecal duct; sp, spermatheca; ut, uterus; va, vagina; vd, vas deferens.
Description of shell: Shell (Figures 1–3) large for the genus, depressed-globose, almost imperforate, of 5.8–6.25 whorls; base inflated. Spire low-domed, its sides weakly convex; whorls somewhat flattened, suture moderately impressed. Embryonic whorls 1.5–1.6; initial 0.2 whorl smooth; remainder of embryonic shell with crowded, irregular, papillate, radiating rugae. Early teleoconch whorls with fine, slightly retractive growth rugae and distant, erect or forwardly convex, acicular setae in convex-forward, protractive, descending rows. Most setae forked at base, furcae pointing aperturally; many setae with broad, finlike basal extension abaperturally. Periostracum between setae radially wrinkled, somewhat scaly on first four whorls, smoother on whorls five and six. Periphery rounded. Base regularly setose, setae smaller than on spire, extending into umbilical crevice. Last whorl not markedly descending, constricted behind lip. Aperture broadly auriculate, peristome concave in profile, oblique, at angle of about 40° to vertical; lip expanded and strongly reflected, moderately thickened submarginally, most strongly turned backward at base. Inner end of basal lip reflected over narrow, obliquely entering umbilical crevice. Parietal callus granulose, free edge convex, with only a very small re-entrant below upper limb of peristome. Small, white, straight parietal lamella usually present, set on upper third of parietal callus, outer edge on line between upper and lower limbs of peristome. Shell tan, peristome pinkish tan.

Dimensions of holotype: Diameter (exclusive of expanded lip) 16.0 mm, height 9.3 mm, whorls 6.25.

Measurements and counts of material at hand: Range of adult shell diameter 13.5–16.0 mm (mean of five specimens including holotype, 15.0 mm); height 8.0–10.2 mm (x = 9.28 mm); height/diameter ratio 0.58–0.66 (x = 0.618); number of whorls 5.8–6.25 (x = 6.13).

Description of soft anatomy: The holotype and five paratypes were dissected.

Living animal pinkish buff, darker and grayer on body-stalk. Mantle over lung clear buff, 25–40% maculated with black.

Atrium (Figure 4) of moderate length for the genus. Penis elongate-conical, with anterior, basal half enclosed in diaphanous sheath adnate to base. Penial retractor muscle inserted on epiphallus. Narrow retenor muscle extending from penial retractor muscle at attachment on epiphallus to summit of penial sheath, from which other thin retenor fibers connect with parts of epiphallus and vas deferens. Sheathed part of penis about 4.0 mm long; protruding part 2.8–4.5 mm long. Short peduncular section of about 0.5 mm present between base of sheath and junction with atrium. Apex of penis containing short, conical, pointed verge, 0.5–0.8 mm long, through which seminal duct opens into penial chamber (Figure 5).

Spermathecal duct massive, tightly appressed to free oviduct (which is smaller in diameter and branches from it), with one deep convolution below spermatheca, cylindrical-conic, about 6.0 mm long, about 2.0 mm in diameter at junction with oviduct, gradually tapering to 1.0 mm constriction at base of spermatheca. Spermatheca varying from oblong-ovate to teardrop-shaped, about 4.0 mm long, with bluntly pointed tip.

Type material: Holotype: SBMNH 143179 (shell and dissected anatomy), CALIFORNIA: Siskiyou County; along small stream entering Salmon River from north, 4.3 km E of Etna-Somesbar Road/California Highway 96 intersection at Somesbar (sec. 1 or 2, T. 11 N, R. 6 E, Humboldt Base and Meridian; USGS Forks of Salmon quadrangle [7.5-minute series, Topographic]). B. Roth, E. J. Kools coll., 17 May 1984.

Paratypes: SBMNH 77923 (2), from same locality as holotype; SBMNH 78125 (3) from same locality as holotype, B. Roth, W. B. Miller coll., 10 April 1992. Additional paratypes. ANSP, BR and CAS.


Remarks: Vespericola sasquatch is distinguished from most other species in northwestern California by its large size, large number of whorls, and depressed-globose shape. The combination of large shell and small parietal tooth is unique to V. sasquatch, but in one of the adult specimens examined the parietal tooth is absent. Vespericola karokorum Talmadge, 1962, from streams draining into the Klamath River near Orleans, Humboldt County, differs in having fewer, more distantly spaced, and longer periostral setae, many of which have recurved tips. The embryonic whorls of V. karokorum are more coarsely papillose. The inner lip is reflected over the umbilicus to about the same degree in both species; but the base of V. sasquatch is somewhat more flattened, that of V. karokorum more inflated. Vespericola karokorum has an acicular verge, about 3.4 mm long; the verge of V. sasquatch is short and conical, 0.5–0.8 mm long.

The vegetation at the type locality is mixed woodland with Douglas fir (Pseudotsuga menziesii), canyon oak (Quercus chryssolepis), bigleaf maple (Acer macrophyllum), and madrone (Arbutus menziesii). Vespericola sasquatch was found under logs on the ground, particularly near the stream bed. Other mollusks found with V. sasquatch at the type locality included Propylasoon andersoni (Cooper, 1872), Monadenia fidelis salmonensis Talmadge, 1954, and Ancotrema sp., cf. A. voyanum (Newcomb, 1865).

Etymology: Sasquatch, from the Salish language: a hairy, anthropoid being said to inhabit northwestern
North America, including the Klamath Mountains. For purposes of the American Fisheries Society list of the common names of mollusks (Turgeon et al., 1998) and other administrative uses, we propose the name "sasquatch hesperian."

Vespericola embertonii Roth & Miller, sp. nov.

(Figures 6–10)

Diagnosis: A large Vespericola with depressed-globose, very narrowly umbilicate shell, 5.4–6.1 whorls, sparse periostracal setae, and sometimes a small parietal lamella. Penis elongate-conical, with anterior 60% of length enclosed in sheath; with short, conical, pointed verge 1.0 mm long; spermathecal duct massive, swelling to a diameter of 2.0 mm before tapering to a constriction at base of spermatheca.

Description: Shell (Figures 6–8) large for the genus, depressed-globose, very narrowly umbilicate, of 5.4–6.1 whorls; base inflated. Spire low-domed to broadly conical, its sides straight or weakly convex; whorls flattened, suture moderately impressed. Embryonic whorls 1.4–1.8; initial 0.1 whorl smooth; remainder of embryonic shell with crowded, irregular, papilllose, radiating rugae. Post-embryonic sculpture of low, retractive rugae and dense, sharp granulation with collabral trend. Periostracum bearing sparse, moderately long, aciculur setae in distant, steeply descending rows; 3–4 setae/mm² on shoulder of body whorl, erect or curving away from direction of coiling, occasionally forked at base, usually with finlike abapertural basalt extension. Periostracum between setae sharply granulose and finely wrinkled, with a few fine, raised spiral lines on shoulder of whorl. Periphery rounded, sometimes more sharply curved at shoulder. Base tu- mid, densely setose with setae shorter than on spire, papillose where setae worn off. Last whorl not markedly de-

scending, constricted behind lip. Aperture broadly auricular; peristome concave in profile, oblique, at angle of 35–45° to shell axis; lip expanded and reflected, lightly to moderately thickened submarginally. Inner part of bas-
al lip narrowed, weakly deflected forward, end dilated backward over narrow umbilicus. Parietal callus granu-
lose, free edge convex, with shallow re-entrant below up-

limb of peristome. Small, white, convex-forward parietal lamella present in about two-thirds of all adult spec-
ims examined. Shell tan; lip pinkish tan.

Dimensions of holotype: Diameter (exclusive of expanded lip) 15.4 mm, height 9.5 mm, whorls 6.0.

Measurements and counts of material at hand: Range of adult shell diameter 13.2–16.6 mm (mean of 25 spec-
ims including holotype, 14.95 mm); height 8.0–10.0 mm ($\bar{x} = 9.14$ mm); height/diameter ratio 0.57–0.66 ($\bar{x} = 0.611$); number of whorls 5.4–6.1 ($\bar{x} = 5.85$).

Description of soft anatomy: The holotype and eight paratypes were dissected.

Color of living animal pinkish buff, darker and grayier on body-stalk. Mantle over lung clear buff, 20–40% mac-
ulated with black.

Atrium (Figure 9) of moderate length for the genus. Penis elongate-conical, with anterior, basal portion en-
closed in thin sheath adnate to base. Penial retractor mus-
cle inserted on epiphallus. Narrow retentor muscle ex-
tending from penial retractor muscle at attachment on epi-
phallus to summit of penial sheath, from which other thin retentor fibers form connections with parts of epiphallus and vas deferens. Sheathed part of penis in holotype about 5.5 mm long; protruding part about 3.6 mm. In mature paratypes, sheathed part varying from 5.0 to 6.2 mm, with a mean of 5.6 mm; protruding part varying from 3.0 to 4.8 mm, with a mean of 4.1 mm. Mean ratio of protruding length to sheathed length about 0.8. Slender
Vespericola embertoni Roth & Miller, sp. nov. Drawings made from projections of stained whole mounts. Structures seen in transparency are shown by dotted lines. Scale line = 1 mm. Figure 9. Anterior part of reproductive system of paratype, SBMNH 77888, CALIFORNIA: Mendocino County; tributary ravine to Reeves Canyon on W side of U.S. Highway 101 at milepost 54.60 (3.9 road mi N of Outlet Creek bridge), B. Roth, W. B. Miller coll., 19 November 1989. Figure 10. Penial complex of paratype, SBMNH 77888, with apical portion of penis opened to show verge and pilasters; same locality as the preceding, W. B. Miller coll., 7 April 1990.

peduncular section of about 1.4 mm present between base of sheath and junction with atrium. Apex of penis containing short, conical, pointed verge 1.0 mm long and 0.4 mm wide at base (Figure 10). Seminal duct opening into penial chamber at tip of verge.

Spermathecal duct massive, tightly appressed to free oviduct (which is smaller in diameter and branches from it), cylindrical-conic, about 5.5 mm long, about 1.4 mm in diameter at junction with oviduct, widening to a maximum diameter of 2.0 mm before tapering to a 0.5 mm constriction at base of spermatheca. Spermatheca oblong-ovate in fully mature specimens, often flattened on side apposed to prostate/uterus and narrowly cylindrical in less mature individuals, about 5.5 mm long, with rounded tip.

Type material: Holotype: SBMNH 143178 (shell and dissected anatomy), CALIFORNIA: Mendocino County; tributary ravine to Reeves Canyon, N of Willits, on W side of U.S. Highway 101 at milepost 54.60 (3.9 road mi N of Outlet Creek bridge), W. B. Miller coll., 7 April 1990.

Paratypes: SBMNH 77888 (8), from same locality as holotype. Additional paratypes, ANSP, BR, CAS.
Referred material: CALIFORNIA: Humboldt County: Richardson Grove State Park (BR 1816), Mendocino County: just south of Longvale (CAS 052365); Reeves Canyon S of Longvale along US Highway 101 at milepost 53.91, in redwood stump (BR 336); Reeves Canyon, in ravines off US Highway 101, 7.8 mi N of Willits, at mileposts 54.60 and 53.94 (SBMNH 77999); Reeves Canyon, on W side of US Highway 101, 7.8 mi N of Willits, at milepost 54.11, along tributary ravine, under logs and in old stumps (SBMNH 77866).

Remarks: A parietal lamella is variably present or absent. The single specimen from Richardson Grove, Humboldt County, lacks a lamella. It has 2–3 periostracal setae/mm², compared to 3–4 setae/mm² in the type lot. 

Vespericola embertonii is distinguished anatomically from other species by its short, conical, pointed verge at the apex of a slender, elongate-conical penis sheathed basally for about half to two-thirds of its length, and by a massive spermatheca and spermathecal duct complex as large or larger than the penial complex.

The large, depressed shell, sparse setation, very narrow umbilicus, and granular surface texture distinguish V. embertonii from most other species in northern California.

The type lot was collected in a stream gully in second-growth redwood forest. The predominant tree species along the riparian corridor was tan oak (Lithocarpus densiflora), with Douglas fir (Pseudotsuga menziesii) and California bay (Umbellularia californica) also prominent. Other land mollusks found at the type locality included Haplotrema minimum (Ancey, 1888), Monadenia infumata (Gould, 1855), and Helminthoglypta arrosa pomonesis A. G. Smith, 1938.

Etymology: The species is named for Kenneth C. Emberton, in honor of his innovative research on the family Polygyridae. For purposes of the American Fisheries Society list of the common names of mollusks (Turgeon et al., 1998) and other administrative uses, we propose the name “Reeves Canyon hesperian.”

Vespericola rhodophila Roth & Miller, sp. nov. (Figures 11-16)

Diagnosis: A medium-sized Vespericola with depressed-globose, almost imperforate shell of 5.5–5.8 whorls; periostracal setae about 30–36/mm². Penis either completely enclosed by sheath or with upper 10–20% swollen and protruding; with 1.5 mm, cylindrical-conic verge with membranous, lateral flaps and tubular ventral groove forming outlet of seminal duct.

Description: Shell of medium size for the genus, depressed-globose, almost imperforate, of 5.5–5.8 whorls; base inflated, solid-looking. Spire broadly conic, its sides weakly convex; whorls somewhat flattened, suture shallowly impressed. Embryonic whorls 1.6, sculptured with crowded, radially elongate, blunt papillae that on the second whorl tend to align in radiating rows separated by shallow grooves. Early neanic whors with fine, slightly retractive growth ruge and rather sparse, erect or gently curving, acicular setae in protractive, descending rows. Setae not obviously forked at base; some setae with finely basall extension abaperturally. Periostracum between setae radially wrinkled and irregularly granulose. Setae closer together, shorter, and more regularly spaced on subsequent whors, 30–36/mm² on body whorl. Periphery rounded, broadest above middle of whorl, somewhat sloping toward base. Base densely and regularly setose. Last whorl not markedly descending, sharply constricted behind lip. Aperture broadly auriculate, peristome concave in profile, oblique, at angle of about 45° to vertical; lip expanded and reflected, most strongly at base, moderately thickened submarginally. Umbilical crevice extremely narrow, oblique. Basal lip straight; inner lip nar-
Vespericola rhodophila Roth & Miller, sp. nov. Drawings made from projection of stained whole mounts. Scale line = 1 mm.

Figure 14. Anterior portion of reproductive system of holotype, SBMNH 00000. CALIFORNIA: Sonoma County: China Gulch at crossing of Kruse Ranch Road, 1.1 road km from California Highway 1, Kruse Rhododendron State Reserv. W. B. Miller, rowed, weakly curved forward, and dilated so that it encroaches on, and nearly covers, umbilicus from left side. Parietal callus granulose, free edge strongly convex, swinging well to left of umbilicus, with shallow sinus below upper limb of peristome. Moderate-sized, white, straight parietal lamella usually present near middle of parietal callus. Shell light reddish brown; peristome pinkish tan, with whitish callus thickening.

Dimensions of holotype: Diameter (exclusive of expanded lip) 13.2 mm, height 9.0 mm, whorls 5.5.

Soft anatomy: The color of living animals is pinkish buff, darker and grayer on the body-stalk. The mantle over the lung is clear buff, 20–40% maculated with black.

The holotype and 13 paratypes were dissected; an additional five specimens from Salt Point State Park were also dissected.

The atrium (Figure 14) is of moderate length for the genus.

The penis is swollen, banana-shaped, with a bulbous apex, its anterior, basal portion enclosed in a thin sheath adnate to the base, and the apical protruding part of wider diameter than the sheathed part. The penial retractor muscle is inserted on the epiphallus. A narrow retentor muscle extends from the penial retractor muscle at its attachment on the epiphallus to the summit of the penial sheath, from which other thin retentor fibers form connections with parts of the epiphallus and vas deferens.

The sheathed part of the penis in the holotype is about 6.0 mm long; the protruding part is about 2.5 mm. In the mature paratypes, the sheathed part varies from 4.4 to 6.5 mm, with a mean of 5.8 mm; the protruding part varies from 2.0 to 5.0 mm, with a mean of 3.3 mm. The mean ratio of protruding length to sheathed length is about 0.6.

There is a slender peduncular section of about 1.5 mm between the base of the sheath and the junction with the atrium.

The apex of the penis contains a short, tongue-shaped, verge 1.0 mm long and 0.2 mm wide at its base, equipped for the apical two-thirds of its length with a narrow, ventral, longitudinal groove flanked by a thin membranous flap on each side, ending at the apex with an open groove about 0.4 mm long, which forms the outlet of the seminal duct (Figure 15). The inner wall of the penis consists of a reticular pattern of closely appressed papillae (Figure 16).

The spermathecal duct is massive and short, appressed

Figures 14–16

B. Roth coll., 17 November 1989. Figure 15. Lateral, ventral, and dorsal views of verge of paratype SBMNH 77951. Figure 16. Anterior portion of reproductive system of paratype, SBMNH 77951, with apical portion of penis opened to show verge and internal papillae; same locality as the preceding. W. B. Miller, B. Roth coll., 6 October 1990.
to the free oviduct (which is smaller in diameter and branches from it); it is cylindrical-conic, about 3.0 mm long, with a diameter of about 1.5 mm at its junction with the oviduct, tapering gradually to a 0.5 mm constriction at the base of the spermatheca.

The spermatheca is oblong-ovate in fully mature specimens and narrowly cylindrical in less mature individuals, about 3.3 mm long, with a rounded tip.

**Type material:** Holotype: SBMNH 00000 (shell and stained whole mount of reproductive system), CALIFORNIA: Sonoma County: China Gulch at crossing of Kruse Ranch Road, 1.1 road km from California Highway 1, Kruse Rhododendron State Reserve. W. B. Miller, B. Roth coll., 17 November 1989.

**Paratypes:** SBMNH 77860 (4), from same locality as holotype. SBMNH 77951 (10), along China Gulch creek at crossing of Plantation Road, 0.9 km from California Highway 1, Kruse Rhododendron State Reserve. W. B. Miller, B. Roth coll., 6 October 1990. Additional paratypes, ANSP, BR, CAS.

**Referred material:** CALIFORNIA: Sonoma County: Kruse Rhododendron State Reserve, below parking lot (SBMNH 75030); Miller Creek, at crossing of California Hwy. 1 (first deep hairpin turn N of Gerstle Cove Campground), Salt Point State Park (BR 1672, BR 1712, WBM 7861).

**Remarks:** In the material at hand, adult shell diameter ranges from 11.9 to 13.7 mm (mean of 25 specimens including holotype, 13.02 mm); height, 8.2 to 9.9 mm (\( \bar{x} = 8.96 \) mm); height/diameter ratio, 0.64 to 0.76 (\( \bar{x} = 0.688 \)); number of whorls, 5.2 to 5.8 (\( \bar{x} = 5.54 \)).

In some specimens, the body whorl is pale straw-colored rather than reddish brown.

*Vespericola rhodophila* is distinguished anatomically from other species by its banana-shaped penis with a bulbous apical part usually protruding from the basal, sheathed part. The short, grooved verge with membranous lateral flaps somewhat recalls the spoon-shaped verge of *V. megasoma* but is not as stout.

The species is found under logs in riparian woodland.

**Etymology:** Gr., *rhodos*, rose, + *philos*, lover, with reference to the Western Azalea (*Rhododendron occidentale*) which is a prominent component of the understory within its range. For purposes of the American Fisheries Society list of the common names of mollusks (Turgeon et al., 1998) and other administrative uses, we propose the name "azalea hesperian."

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**LITERATURE CITED**


