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A new species of *Sonorella* (Pulmonata: Helminthoglyptidae) from western Texas

Lance H. Gilbertson[1] **and Artie L. Metcalf**[2]

[1] Natural History Museum of Los Angeles County, Malacology Section, 900 Exposition Boulevard, Los Angeles, California 90007, U. S. A., quail2@sbcglobal.net

[2] Department of Biological Sciences, University of Texas at El Paso, El Paso, Texas 79968-0519, U.S.A.

Abstract: A new species of the genus *Sonorella* is described from the Hueco Mountains, Texas. It is one of the smallest species of *Sonorella* and its locality extends the northeastern known boundary of the genus.

Key Words: land snail, Helminthoglyptidae, Hueco Mountains

The Hueco Mountains are located in extreme western Texas along the border of El Paso and Hudspeth counties and continue a few kilometers northward into Otero County, New Mexico. In Texas, they extend approximately 32 km southward from the New Mexico border and have a maximum width of about 7 km. The mountains are bordered to the west by the Hueco Bolson, an intermontane basin of approximately 1,230 m in elevation, and to the east by the somewhat higher Diablo Plateau. In the northwestern part of the range, block-faulting has produced a prominent escarpment capped at about 1,645 m by a massive limestone formation called the "Rimrock" (USGS Hueco Tanks 7.5 min. quad. 1955). The Rimrock is formally named Hueco Canyon Limestone and is of early Permian age. It is approximately 150 m thick, thus forming a salient feature visible from far to the west in the Hueco Bolson (Fig. 1). The limestone disintegrates to produce, in some places, streams of talus down the west-facing mountainside below. Such talus is scattered along the Rimrock escarpment, extending from New Mexico for approximately 8 km south and southeast to north of Hueco Tanks State Historical Park. Because these talus spills face the west or southwest, they are exposed to the heat of the afternoon sun most days of the year. It is only in these talus accumulations that the new species of *Sonorella* Pilsbry, 1900, described herein, has been found. *Gastrocopta pellucida* (Pfeiffer, 1841) and *Metastoma roemeri* (Pfeiffer, 1848) also occur here (A. Metcalf, pers. obs.).

The land snail genus *Sonorella* contains over 100 described taxa that inhabit mountain ranges in the southwestern US states of Arizona, New Mexico, and Texas, as well as the northern Mexican states of Sonora and Chihuahua. Species of *Sonorella* are relatively large snails with shell diameters of approximately 13 to 30 mm. They constitute a major component of the molluscan fauna of this region. Only two species, *Sonorella orientis* Pilsbry, 1936, and *Sonorella metcalfi* Miller, 1976, have been described from Texas, the eastern edge of the range of the genus.

MATERIALS AND METHODS

Snails were collected in the field by the junior author (along with T. J. Dillon on one occasion). Three living specimens were drowned and their bodies were removed from their shells. Their reproductive systems were dissected free of the other organs, stained with Delafield Hematoxylin and Eosin B, and mounted on slides by LHG in the manner originally described by Gregg (1959) and later revised by Naranjo-García (1989).

Abbreviations of institutions cited in this paper are as follows: ANSP, Academy of Natural Sciences of Philadelphia; LACM, Natural History Museum of Los Angeles County; SBMNH, Santa Barbara Museum of Natural History; USNM, National Museum of Natural History - Smithsonian Institution; UTEP, University of Texas at El Paso.

SYSTEMATICS

Family HELMINTHOGLYPTIDAE Pilsbry, 1939
Clade Sonorellamorpha Roth, 1996
Clade Sonorellales Roth, 1996
Genus *Sonorella* Pilsbry, 1900

Figure 1. A view of the west-facing Rimrock escarpment of the northern Hueco Mountains, Texas, from the Hueco Bolson. Photograph by ALM.

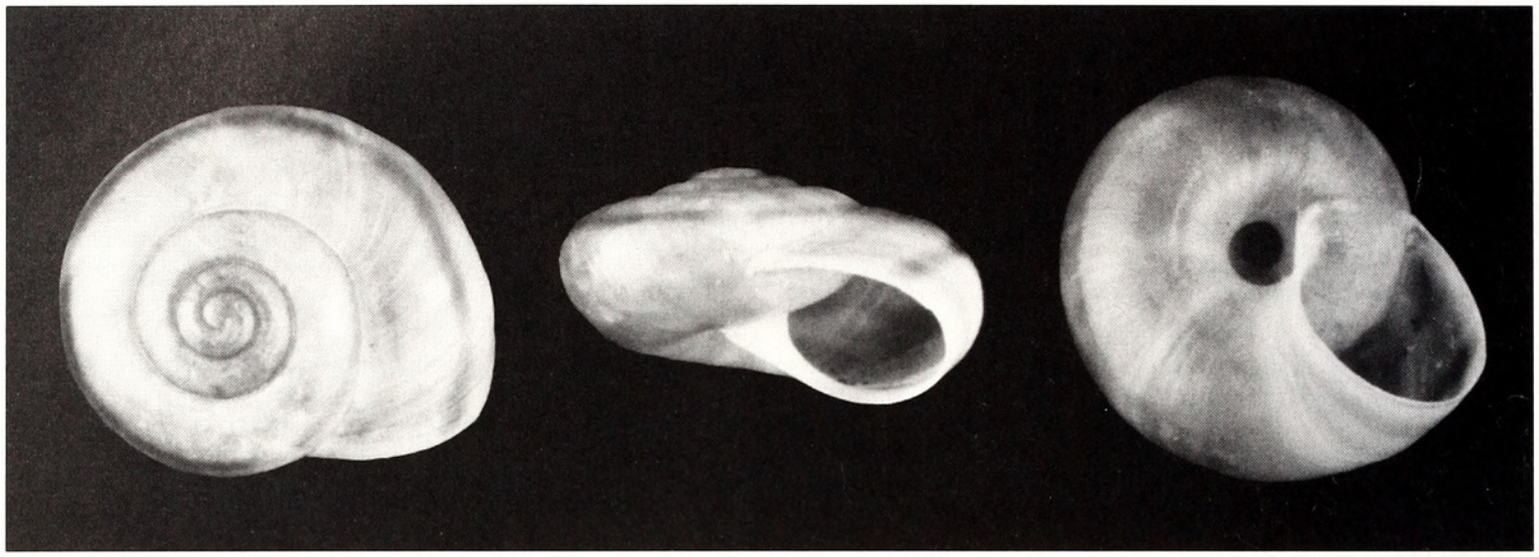

Figure 2. *Sonorella huecoensis* Gilbertson and Metcalf, sp. nov., holotype: apical view (left), apertural view (middle), umbilical view (right). LACM 2965 (exUTEP 12313). Shell 14.0 × 7.5 mm.

Sonorella huecoensis Gilbertson and Metcalf, sp. nov.
(Figs. 2-4)

Diagnosis

A very small *Sonorella* with a glossy, depressed shell; embryonic whorls exhibit very fine, radial, incised grooves. Male genitalia have a slender, smooth, cylindric to subclavate, bluntly-rounded verge and a penial retractor muscle inserting on epiphallus above apex of penis.

Description of holotype (LACM 2965, ex UTEP 12313)

Shell very small for genus (diameter 14.0, height 7.5 mm), umbilicate, depressed, heliciform, glossy, light tan, moderately thin, with a light brown spiral band on upper part of rounded shoulder of body whorl and 0.3 of penultimate whorl (Fig. 2). Umbilicus about one-seventh of diameter of shell (2.0 mm), slightly covered by reflected columellar lip. Whorls 4.4, moderately convex. Embryonic shell of 1.7 whorls very glossy and translucent with numerous, very fine, incised, somewhat anastomosing and interrupted radial grooves (producing a ripple effect) after smooth apex; threads and granules lacking. Post-embryonic whorls exhibit light growth wrinkles. Aperture oblique, rounded, slightly wider than high, margins converging. Peristome simple except for reflection of columellar lip.

Paratypes

Twenty-two representative paratypes from three collection lots (UTEP 4730, 11956, 12313) ranged from 12.8 to 15.2 mm in diameter ($\bar{x}$ = 13.9) and from 6.6 to 8.0 mm in height ($\bar{x}$ = 7.3) (Table 1). Several paratypes have a slightly thickened ventral margin of peristome. Many shells, including numerous unmeasured specimens, show effects of weathering and hence are not as glossy as holotype. Some shells exhibit weak, spirally descending threads and scattered, minute granules in addition to radial ripples on the embryonic whorls (Fig. 3).

Description of reproductive anatomy (Fig. 4, Table 2; LACM 2966): Description based on a mature, stained, slide-mounted paratype. Albumen gland and uterus typical in appearance; vagina approximately same length as penis. Spermathecal duct relatively long, unbranched; spermatheca small, round. Penis small, slender (about 0.4 mm diameter), internal wall of apical region with numerous, finely serrated rings (presumably glandular). Verge nearly one-half length of penis, elongate, slender, smooth, sub clavate, and surrounded by rather capacious lumen of penis. Penial sheath enveloping most of lower penis (following a slight medial constriction). Epiphallus about same length as penis; proximal region following vas deferens somewhat enlarged and attached to penial sheath by band of connective tissue. Penial retractor muscle long, thin, inserting on slender distal region of epiphallus above apex of penis. Epiphallic cecum (flagellum) very short, moderately thick, detached.

Variation of additional paratypes (Table 2, LACM 2966). Two additional slide-mounted specimens are very similar in appearance. However, both are somewhat smaller over-all and exhibit shorter verges (approximately one-third length of penis) that are cylindrical (not subclavate) in shape. One specimen clearly shows seminal duct opening centrally on bluntly rounded tip of verge.

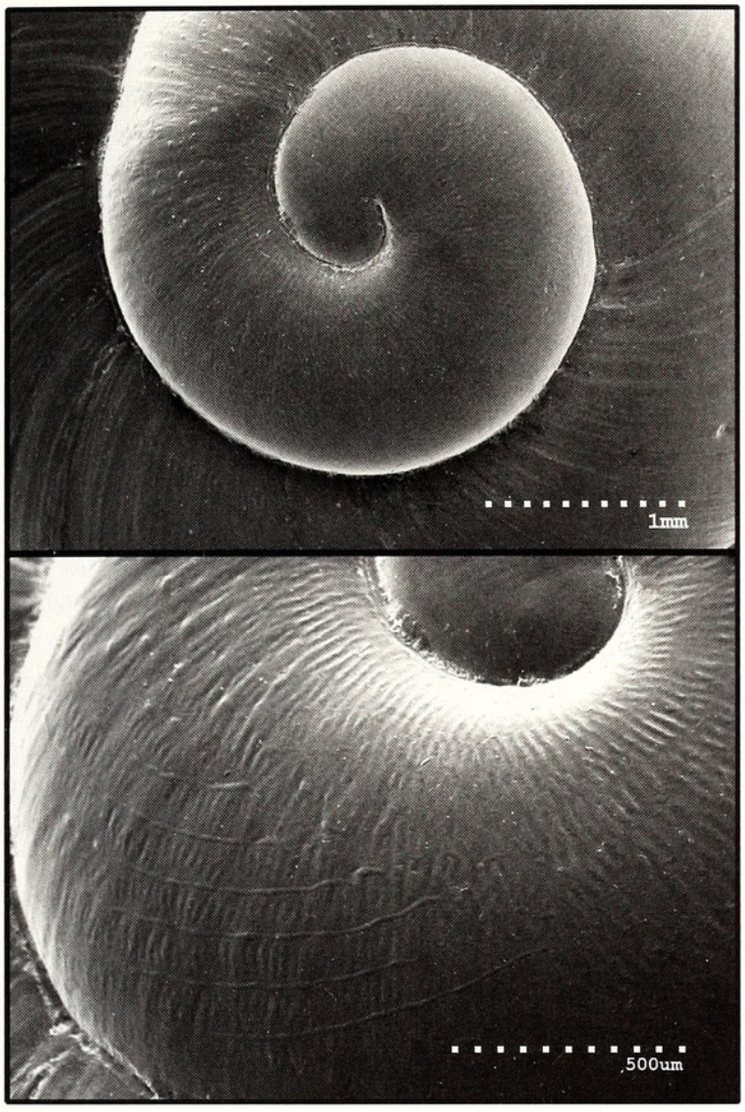

Figure 3. Scanning electron micrographs of the apical whorls of *Sonorella huecoensis* Gilbertson and Metcalf, sp. nov., paratype. Upper photo: apical view. Lower photo: oblique view.

Type locality. U.S.A., Texas, El Paso County, Hueco Mountains, 31°58′24″N; 106°02′54″W, limestone talus on west-facing escarpment below the Rimrock. Elevation 1,493 m. The holotype and 12 paratypes were collected by ALM on 2 November 1987 (UTEP 12313). Ninety-two paratypes were previously collected by ALM at this site on 17 January 1976 (UTEP 4730). Additional paratypes were collected at a similar, nearby site, 31°59′13″N; 106°02′47″W, 12 August 1989 by Timothy J. Dillon and ALM (UTEP 11956). This locality extends a section of the northeastern known boundary of the genus *Sonorella* and of the family Helminthoglyptidae, by approximately 50 km.

Freehling (1976) summarized climatic conditions for the southern Hueco Mountains, noting that average annual precipitation was 20.23 cm. Average midday relative humidity ranged from 21% in April to 39% in July (the peak month of the monsoonal rainy season) and 42% in January. The mean monthly temperature was 17.4°C with an average daily minimum in January of -1.0°C and an average daily maximum in July of 34.8°C.

Disposition of Types. Holotype: LACM 2965 - exUTEP 12313. Paratypes: ANSP 410946 - exUTEP 12313 (3); LACM 2967 - exUTEP 4730 (21), 2968 - exUTEP 11956 (8), three slides of reproductive anatomies 2966 - exUTEP 12313; SBMNH 348127 - exUTEP 12313 (3); USNM 1013148 - exUTEP 12313 (4); UTEP 4730 (76), 11956 (26).

Etymology. This species is named for the Hueco Mountains where it lives. For purposes where a common name is useful, the term "Hueco Mountains talus snail" is proposed.

DISCUSSION

Sonorella huecoensis is one of the smallest known species of *Sonorella*. Its small size may be an adaptation to the sea-

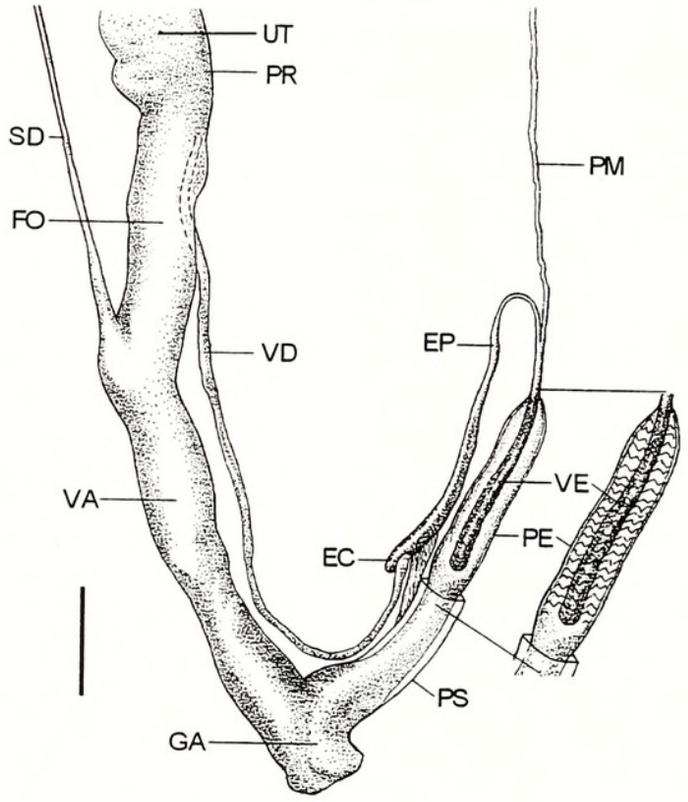

Figure 4. Diagram of the basal organs of a slide-mounted reproductive system of *Sonorella huecoensis* Gilbertson and Metcalf, sp. nov., paratype. Enlargement of proximal region of penis illustrates internal folds. The band of connective tissue between the penial sheath and the epiphallus has been artistically reconstructed. Abbreviations: EC, epiphallic cecum; EP, epiphallus; FO, free oviduct; GA, genital atrium; SD, spermathecal duct; PE, penis; PM, penial retractor muscle; PR, prostate gland; PS, penial sheath; UT, uterus; VA, vagina; VD, vas deferens; VE, verge. LACM 2966 (exUTEP 12313). Scale bar = 1 mm.

Table 1. Measurements of selected representative paratypes of *Sonorella huecoensis* Gilbertson and Metcalf, sp. nov., from three collection lots (diameter × height) in mm. See section on type locality for collection data.

*exUTEP 4730	**exUTEP 11956	#exUTEP 12313
14.1 × 7.0	14.6 × 7.9	15.2 × 7.6
14.0 × 7.5	14.3 × 7.5	14.6 × 8.0
14.0 × 7.3	14.1 × 7.5	14.2 × 7.2
14.0 × 7.3	14.0 × 7.4	14.0 × 7.2
14.0 × 7.1	14.0 × 7.5	13.8 × 7.2
13.1 × 7.2	13.9 × 7.4	13.7 × 7.0
$\bar{x}$ = 13.8 × 7.2	$\bar{x}$ 14.2 × 7.5	13.6 × 7.0
		13.4 × 6.7
		13.1 × 6.8
		12.8 × 6.6
		$\bar{x}$ = 13.8 × 7.1

* LACM 2967

** LACM 2968

ANSP 410946 (3); SBMNH 348127 (3); USNM 1013148 (4, including shells with largest and smallest diameters)

sonally hot, arid conditions of its west-facing rocky habitat. A similar tendency toward reduced size in helminthoglyptids that survive in highly stressful climatic conditions may be noted in *Sonorella micra* Pilsbry and Ferriss, 1910; *Maricopella allynsmithi* (Gregg and Miller, 1969); most species of *Eremarionta* Pilsbry, 1913; and others.

Species of *Sonorella* are usually found on volcanic rock, rarely on limestone (Pilsbry 1939: 268); therefore this new species is atypical for the genus. Another calcicolous *Sonorella* is *S. hachitana hachitana* (Dall, 1896) from neighboring southwestern New Mexico.

Other geographically proximate congenerics of *Sonorella huecoensis* are assigned to the *Sonorella hachitana* (Dall, 1896) "Group" or "Complex" (see Bequaert and Miller 1973:111; Metcalf and Smartt 1997:61-62; Miller 1968:14; Pilsbry 1939:273; Roth 1996:25,32). Unlike the new species, they are large snails with shell diameters in the 18-30 mm range. Their male genitalia are noticeably larger and typically exhibit an elongate, slender, pointed (*i.e.* acicular) verge that is variously sculptured (annulated, corrugated, or serrated). However, *S. huecoensis* shares several shell and genital features with *Sonorella metcalfi*.

Sonorella metcalfi is described from the Franklin and southern Organ Mountains, located over 50 km westerly across the Hueco Bolson, in Texas and New Mexico, respectively. This species is somewhat atypical of the *Sonorella hachitana* Group by having a smooth, bluntly rounded verge that is slightly less than half the length of its penis. Its verge, the shape of its epiphallus, and the insertion point of the penial retractor muscle on the epiphallus, resemble those of *S. huecoensis*. Its shell, while much larger (holotype diameter 19.8 mm; Miller 1976), resembles that of the new species in shape, color, and apical sculpture. Nevertheless, *S. metcalfi* and *S. huecoensis* are reproductively isolated from each other by a significant disparity in the sizes of their genitalia (*metcalfi* organs are over three times larger that the organs of *huecoensis;* Table 2). In addition, these two species are ecologically separated by the Hueco Bolson, which lacks suitable habitat for the survival of intergrading populations.

Table 2. Genital measurements (length in mm) of *Sonorella huecoensis* Gilbertson and Metcalf, sp. nov. (three slide-mounted paratypes; LACM 2966) and *S. metcalfi* (holotype; Miller 1976).

Species	Penis	Verge	Penial sheath	Epiphallus	Vagina	Spermatheca/duct
S. huecoensis						
1. (Fig. 4)	3.7	1.7	1.1	4.0	3.8	17.8
2.	3.9	1.3	1.1	3.2	2.1	12.1
3.	3.5	1.4	1.2	3.6	2.9	—
$\bar{x}$	3.7	1.5	1.1	3.6	2.9	15.0
S. metcalfi	13.0	6.0	6.5	14.0	10.0	—

(—) not available

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