

*SPHAEROLANA*, A NEW GENUS OF CIROLANID  
ISOPOD FROM NORTHERN MEXICO, WITH  
DESCRIPTION OF TWO NEW SPECIES

GERALD A. COLE AND W. L. MINCKLEY

*Department of Zoology, Arizona State University, Tempe*

ABSTRACT. *Sphaerolana*, new genus, the second known American cirolanid isopod capable of flexing its body into a ball, is described from the Cuatro Ciénegas basin, central Coahuila, northern México (type species, *S. interstitialis*). Two new species, *S. interstitialis* and *S. affinis*, both living in sediments of thermal springs, occur in partial sympatry in the area. Comparisons with the European genus *Faucheria*, and with the genus *Creaseriella* from Yucatán, México, indicate no close relationships. Most resemblances appear superficial, a result of parallel evolution. Ecology, associated crustacean species, and distribution of the two new forms are discussed.

The northern part of the Mexican Plateau is yet poorly known from the biological standpoint, and the aquatic and mesic habitats of that vast, arid region continue to yield unique faunal elements. The Cuatro Ciénegas basin, because of its extensive series of aquatic environments (Minckley, 1969), supports a remarkably large and diversified biota, including a number of troglobitic crustaceans. One of these is an asellid of the subfamily Stenasellinae, the only known occurrence of that Old-World group in the Western Hemisphere (Cole and Minckley, 1970). The other three forms are cirolanids, *Speocirolana thermydronis* Cole and Minckley (1966), and two well-marked species of the novel genus described below.

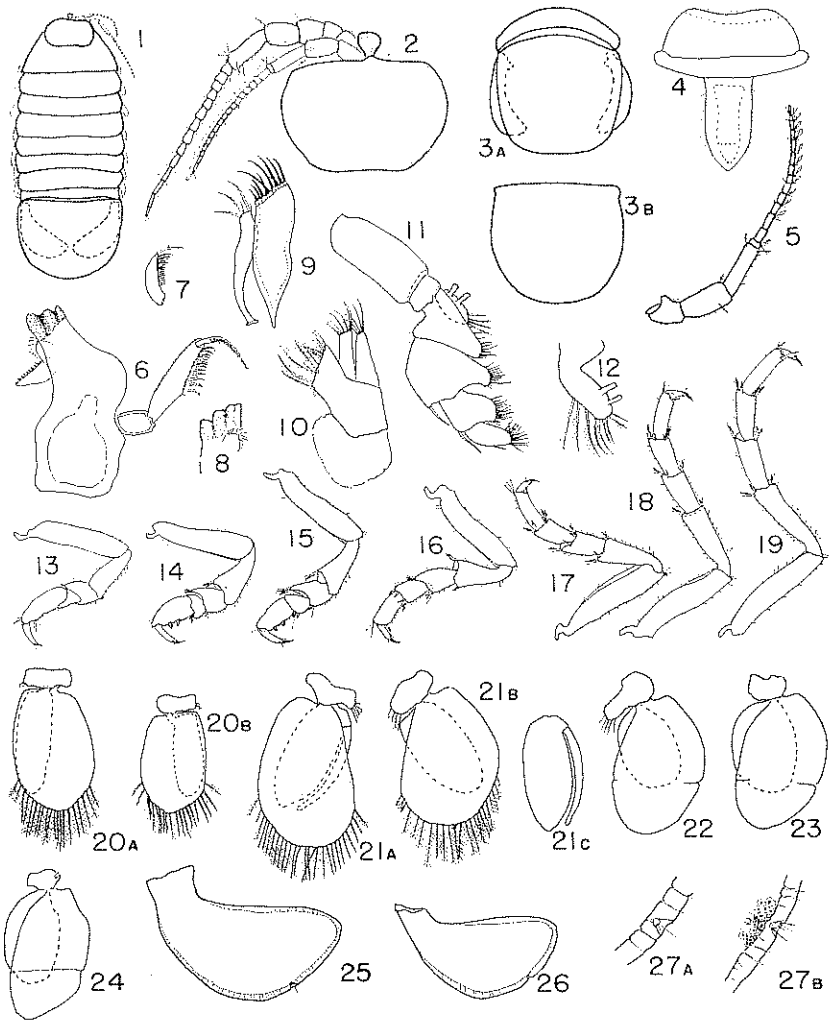
***Sphaerolana***, new genus

Unpigmented, eyeless. Capable of rolling into a ball. Pleonites 1-2 present, visible dorsally; no evidence of pleonites 3-5. Uropod sympodites broad, sub-triangular, narrow proximally; exopod and endopod greatly reduced, inserted in a notch on posterior margin of sympodite. Pereopods 1-3 prehensile, but pereopod 1 less so than the stouter 2-3. Exopods of pleopods 1-2, with plumose setae, all other rami unarmed; exopods of pleopods 4-5 partially divided by a suture.

The generic name is transliterated from the Greek "*Sphaira*," meaning ball, plus (*Ciro*)*lana*, and refers to the habit of rolling tightly when disturbed. The type species is *Sphaerolana interstitialis*.

*Sphaerolana interstitialis*, new species  
(Figs. 1-27)

DESCRIPTION. This isopod ranges to a maximum of 17.1 mm long. There is no obvious sexual dimorphism excepting in details of pleopod 2 of the male. Cephalon trapezoidal, posterior margin nearly straight,



broader than long, with a short rostrum (Fig. 2). Pereon segments 2-7, with conspicuous, unfused epimera (Fig. 1); pereonite 1 with epimera fused except at posterior corners. Pleon, pleonite 1 with produced postero-lateral corners; pleonite 2 shorter, with lateral margins concealed by pleonite 1; pleonites 3-5 lacking. Telson broad and bluntly rounded posteriorly, length about 0.9X width (Fig. 3a-b). Frontal lamina stout and bluntly pointed (Fig. 2). Clypeus more than 5X wider than long, anterior margin straight, lateral margins curved posteriorly (Fig. 4). Labrum width 3X length, with broad buccal concavity (Fig. 4).

Antenna 1 with four peduncular segments, ultimate segment tiny; flagellum with 10-17 articles, each usually bearing a distal, paddle-shaped sense organ (sometimes lacking on proximal article; Figs. 2, 5). Antenna 2 with five well-developed peduncular segments, combined length of segments 1-3 greater than length of segment 4; flagellum with up to 15 articles, reaching to pereonite 3 when reflected; peduncle scarcely longer than that of antenna 1, but flagellum of 2 almost 2X length of flagellum of 1 (Fig. 2).

Left mandible with incisive process ventrally overlapping right incisive process; incisor tri-lobed; lacinia rounded, with 9-16 recurved, transparent teeth; molar process blade-like, sub-triangular with 10-14 short teeth (Figs. 6-8). Mandibular palp with ultimate segment armed with 12-18 teeth and 1-2 distal, long, stout, plumose setae on its slightly concave margin (Fig. 7); penultimate segment longest of

Figs. 1-27. *Sphaerolana interstitialis* from the Cuatro Ciénegas basin, Coahuila, México (all paratypes).

- |   |  |
|---|--|
| 1. Whole body, dorsum, ♂                              | 15. Pereopod 3, ♂                                    |
| 2. Head, ♂  | 16. Pereopod 4, ♂                                    |
| 3a-b. Pleonites and pleotelson (a) and pleotelson, ♂♂ | 17. Pereopod 5, ♂                                    |
| 4. Labrum and clypeus, ♂                              | 18. Pereopod 6, ♂                                    |
| 5. Antenna 1, ♂                                       | 19. Pereopod 7, ♂                                    |
| 6. Mandible, ♂  | 20a-b. Pleopod 1, ♂ (a) and ♀ (b)                    |
| 7. Ultimate mandibular palp segment, ♂                | 21a-b. Pleopod 2, ♂ (a) and ♀ (b)                    |
| 8. Mandibular lacinia and incisive process, ♂         | 21c. Pleopod 2, endopod and appendix masculina, ♂    |
| 9. Maxilla 1, ♂                                       | 22. Pleopod 3, ♂                                     |
| 10. Maxilla 2, ♂                                      | 23. Pleopod 4, ♂                                     |
| 11. Maxilliped, ♂                                     | 24. Pleopod 5, ♂                                     |
| 12. Maxilliped, inner plate, ♂                        | 25. Uropod, ♂  |
| 13. Pereopod 1, ♂                                     | 26. Uropod, ♂  |
| 14. Pereopod 2, ♂                                     | 27a-b. Exopod and endopod of uropod, ♂ (a) and ♀ (b) |

three, bearing up to 18 recurved teeth, pectinate on two margins.

Maxilla 1 with inner plate bearing three faintly plumose, stout setae, and two shorter, smooth setae (Fig. 9); outer plate with 10–12 strong teeth. Maxilla 2 with inner plate armed with 15–18 setae of differing types, the longest plumose and the 4–7 shortest smooth (Fig. 10).

Maxilliped with two fleshy coupling processes and 7–10 plumose setae decreasing in length distally on the inner plate (the shortest seta sometimes smooth; Figs. 11–12). Palp five-segmented, inner margins of segments 3 and 4 produced, outer margins with a single stout seta at distal corners; outer margin of palp segment 5 with one stout seta inserted about midway; inner margins of palp segments 2–5 with many setae.

Pereopods 1–3 subchelate, prehensile, with longer dactyli than pereopods 4–7 (Figs. 13–19); pereopods 2–3 with two, stout, toothed spines on palmar margins of propodi; pereopod 1 somewhat less prehensile, propodus longer, less stout, usually unarmed or rarely with one spine on palmar margin. Pereopods 4–7 similar, ambulatory, pereopod 7 longest. Distal corners of ischium, merus, and carpus with toothed spines in all but pereopod 1; pereopods 4–7 with a distal toothed spine on propodus.

Pleopods with exopods 1–2 ovoid, armed with terminal and sub-terminal plumose setae, more on pleopod 2 (Figs. 20–24); exopods 3–5 unarmed, with faint, transverse sutures; endopods 1–2 transparent; endopods 3–5 translucent, fleshy; all endopods naked. Protopod 1 with 2–6 coupling hooks, rarely with a plumose seta in addition; protopod 2 with 2–4 coupling hooks and 1–5 distal plumose setae; protopod 3 with up to five plumose setae; protopods 4–5 lack setae and coupling spines. Appendix masculina of male pleopod 2 lanceolate, usually not reaching tip of endopod (Fig. 21a, c).

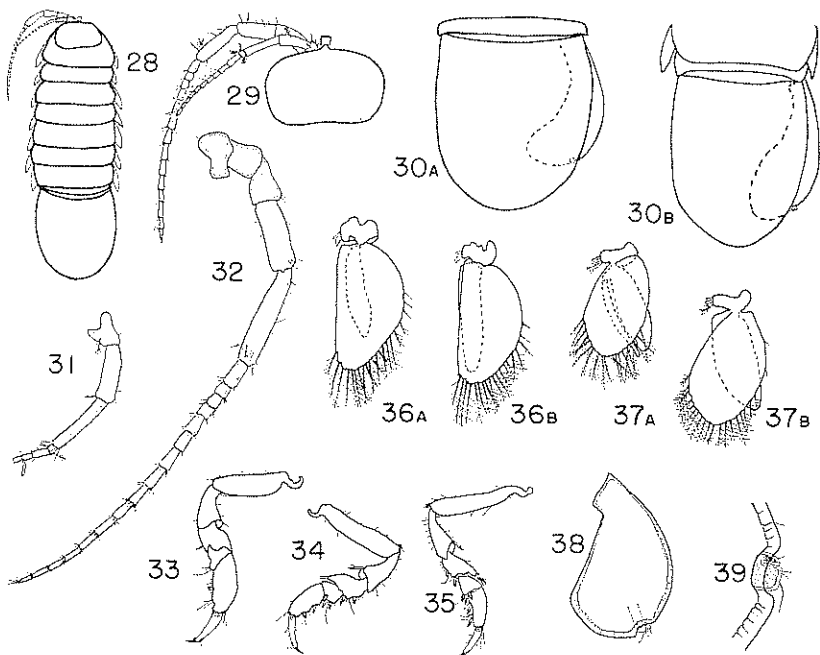
Symphodite of uropod sub-triangular, flat, narrow at base (Figs. 25–26); uropodites represented by minute, marginal mound, within a shallow notch on posterior edge of symphodite (Fig. 27a-b).

The name “*interstitialis*” is derived from *interstitium* (space between) from the Latin, in allusion to the typical habitat of the form in spaces of travertine or within other bottom deposits.

**MATERIAL.** The male holotype of *S. interstitialis* (U. S. National Museum [USNM] No. 123817), and 12 male and female paratopotypes (USNM 123818–20), were obtained from a small, unnamed pit (“*pozo*”) ca. 8.2 km south and 4.7 km west of Cuatro Ciénegas de

Carranza, Coahuila, México, on 11 August 1967. Our original discovery of *Sphaerolana* was in the stomach contents of the locally-endemic, aquatic box turtle, *Terrapene coahuila* Schmidt and Owens, caught in this same pozo by William S. Brown in 1966. Additional paratypes from this pozo, and from small springs within a km west (total of four localities, collected in 1968), are deposited in the National Museum of Canada, the Colección de México, and at Arizona State University. The distribution of *S. interstitialis* in the Cuatro Ciénegas basin is given in Figure 40.

*Sphaerolana affinis*, new species  
(Figs. 28–39)



Figs. 28–39. *Sphaerolana affinis* from the Cuatro Ciénegas basin, Coahuila, México (all paratypes unless otherwise designated).

- |   |                                     |
|---|-------------------------------------|
| 28. Whole body, dorsum, ♂   | 33. Pereopod 1, ♂                   |
| 29. Head, ♂   | 34. Pereopod 2, ♂                   |
| 30a-b. Pleonites and pleotelson, ♂ (a) and ♀ specimen from population sympatric with <i>S. interstitialis</i> . | 35. Pereopod 3, ♂                   |
| 31. Antenna 1, peduncle and 1st 3 segments of flagellum, ♂  | 36a-b. Pleopod 1, ♂ (a) and ♀ (b)   |
| 32. Antenna 2, ♂  | 37a-b. Pleopod 2, ♂ (a) and ♀ (b)   |
|   | 38. Uropod, ♂                       |
|   | 39. Exopod and endopod of uropod, ♂ |

DESCRIPTION. This species differs from *S. interstitialis* in several details, the most conspicuous of which are in the pleopod 1 and in the uropod. In populations of *S. affinis* allopatric to *S. interstitialis* the largest individuals were 9.2 mm long; specimens from an area of sympatry ranged from 14.7 to 22.1 mm.

Exopod of pleopod 1 with straight median margin in both sexes (Fig. 36a-b); setae present on distal half of curved outer margin, inner margin, with subterminal setae only; 2-3 proximal setae on outer margin are smooth, all others plumose. Endopod narrow, strap-like.

Uropodites represented by a bi-lobed structure in a conspicuous notch (Figs. 38-39); uropodites continuous with postero-lateral margin of sympodite, and may protrude slightly beyond it; exopod and endopod possibly represented by outer (small) lobe and inner (large) lobe, respectively (Fig. 39).

The pleotelson in *S. affinis* is longer than wide, or with a length equal to its width (Fig. 30a-b); in *S. interstitialis* the pleotelson is slightly wider than long. Most specimens of *S. affinis* have the distal ends of antenna 2 sweeping back to the fourth pereonite (Fig. 28), and the peduncular segments of both antennae are relatively long (Figs. 29, 31-32). In *S. interstitialis* the antennae usually reach pereonite 3 and the peduncular segments are stouter (Figs. 2, 5).

The name "*affinis*" (related to), from the Latin, refers to the apparent close relationship of this species and *S. interstitialis*.

MATERIAL. The male holotype of *S. affinis* (USNM 123815) and three paratopotypes (USNM 123816) were sieved from bottom materials in a small pozo ca. 20.3 km south and 5.5 km east of Cuatro Ciénegas de Carranza, Coahuila, México, on 20 August 1967. Additional paratopotypes from 1967 and/or 1968 are in the National Museum of Canada, the Colección de México, and at Arizona State University. Additional localities for *S. affinis* are given in Figure 40 (material not designated as paratypes).

COMPARISONS OF *SPHAEROLANA* WITH OTHER CIROLANID GENERA. Morphological similarities between *Sphaerolana* and *Speocirolana* are only familial; relationships between these genera must be quite distant. Species of two other cirolanid genera are known to roll into a ball when disturbed. These are *Creaseriella anops* (Creaser), from the Yucatán, México, and *Faucheria faucheria* Dollfus and Viré, from the Département of Gard, France. Each of these has been re-described in an excellent manner, by Rioja (1953) for the former, and Racovitza (1912) for the latter. Both genera further resemble *Sphaero-*

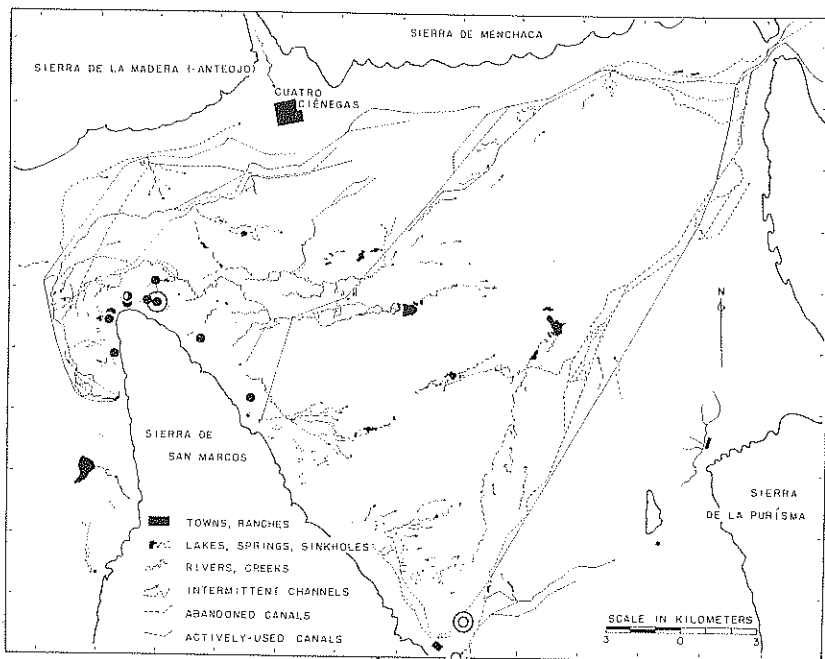


Fig. 40. Distribution of isopods of the genus *Sphaerolana* in the Cuatro Ciénegas basin, Coahuila, México. Dots are for *S. interstitialis* occurring alone, circles are for *S. affinis* occurring alone, and the half-darkened symbol at the tip of Sierra de San Marcos denotes their sympatric occurrence; type localities for the species are marked by the larger circles.

*lana* by being almost devoid of pigment, and eyeless. In other features, however, *Sphaerolana* is distinctive (Table 1). Degeneration of pleonites, common to *Faucheria* and *Sphaerolana*, differs in the manner in which segments have disappeared. The reduction of uropodites, also shared by the two genera, has proceeded further in *Sphaerolana*. Details of the antennae, mouth parts, and pleopods all negate the possibility of close relationship between *Sphaerolana* and either of the others, and the new genus cannot be placed within the subfamily Faucheriinae as presently constituted to embrace *Faucheria* and *Creaseriella*. Probably the ability to roll has been developed independently, and the category Faucheriinae is of little phylogenetic significance.

**HABITAT AND ECOLOGY.** The species of *Sphaerolana* have been taken only from thermal springs and their outflows at temperatures ranging between 29.5° and 34.0° C. The water is slightly alkaline in pH, ranging between 7.2 and 7.5 (usually 7.2), and total alkalinity as

TABLE 1

*Comparisons of some characters of three genera of cirolanid isopoda,  
Creaseriella, Faucheria, and Sphaerolana*

Characters	<i>Creaseriella</i>	<sup>Taxa</sup> <i>Faucheria</i>	<i>Sphaerolana</i>
Size	17-18 mm.	3.5 mm.	Up to 22 mm.
Head	Rectangular, 2x wider than long.	Trapezoidal, posterior margin concave.	Trapezoidal, posterior nearly straight.
Pleon	Five well-developed segments.	Four rudimentary segments.	Only first two segments present.
Telson	Posterior margin truncate, nearly straight.	Posterior margin rounded.	Posterior margin broadly rounded.
Uropods	Well developed uropodites; triangular sympodite.	Uropodites reduced, inserted sub-terminally on sympodite; later irregular, triangular prism-shaped.	Uropodites greatly reduced, inserted in notch on sympodite; latter flat, blade-like, base narrow.
Antenna 1	Peduncle of 2 segments, first as long as second. Flagellum with 24-28 articles, 1-3 sense organs per segment.	Peduncle of 3 segments subequal in length. Flagellum with 5 articles, only 0.5x length of peduncle; basal 4 segments with very long sense organs.	Peduncle of 4 segments, ultimate much shorter than others. Flagellum of 10-17 segments, 1.0-1.2x peduncle length; each article with 1 relatively short sense organ.
Antenna 2	Peduncle of 5 segments. Flagellum with 40-45 articles.	Peduncle of 5 segments, basal segment rudimentary. Flagellum with 7-8 cylindrical articles.	Peduncle of 5 segments. Flagellum of 12-16 articles.



Maxilla 1	Inner plate apex with 3 stout, plumose setae.	Inner plate apex with 3 stout setae, the outer much the longest.	Inner plate with 3 subequal, stout, plumose setae, and 2 short, smooth setae.
Maxilla 2	Inner lobe slightly broader than either outer two.	Inner lobe as broad as outer two combined.	Inner lobe broader than outer two combined.
Maxilliped	Inner plate with 4-5 coupling spines. Palp segments, outer and inner margins with many setae; penultimate segments produced inward.	Inner plate with 1 coupling spine. Palp segments, outer margins with short setules, inner margins with many setae.	Inner plate with 2 coupling spines. Palp segments 3-5 with single seta on outer margin; antepenultimate and penultimate segments produced inward.
Pereopods	All ambulatory, but pereopod 1 strongest.	1-3 prehensile, pereopod 1 strongest.	1-3 prehensile, pereopod 1 weakest.
Pleopods	Exopods and endopods of pleopods 1-2 with terminal setae. Appendix masculina extending past exopod of pleopod 2.	Exopods 1-5 and endopods 1-2 of pleopods setose. Appendix masculina inserted terminally on endopod of pleopod 2, extends past exopod.	Exopods of pleopods 1-2 setose, all other rami naked. Appendix masculina no longer than endopod.

CaCO<sub>3</sub> is generally near 200 mg/liter. Dissolved oxygen ranges from a little less than 2.0 mg/liter to slightly higher than 3.5 mg/liter in the springs. Oxygen conditions in the sediments of interstices of travertine are doubtless quite different from those in the open water, but no data are available on micro-conditions near the animals themselves. Sediments in which *Sphaerolana* lives range from solidified travertines to finely-divided organic deposits, but it seems most abundant in semi-solid to consolidated muds in association with plant roots. The isopod is very secretive during the day, but must move actively at night since "pit traps" placed in the spring outflows caught numerous specimens (on some nights, but none on others). *Sphaerolana* is restricted to walking on, or burrowing in the substrate, unlike its relative *Speocirolana thermydronis*, which can swim actively. The troglobitic crustaceans of the Cuatro Ciénegas area are often closely associated. *Sphaerolana* more often than not occurs with *Speocirolana*, and with *Hyalella azteca* (Saussure) and an undetermined species of white, eyeless, gammarid amphipod. *Hyalella* also ranges into most other habitats in the basin, but is quite common in the extreme origins of springs.

Additional information on features of waters of the Cuatro Ciénegas area is available in Taylor (1966) and Minckley and Cole (1968); Minckley (1969) has summarized information on aquatic habitats and general biota of the area.

Differences in body size among populations of *S. affinis*, with larger animals occurring in sympatry with *S. interstitialis* and smaller maximum sizes present in allopatric populations, plus other qualitative features, suggest the possibility of character displacement (as used by Brown and Wilson, 1956) in the sympatric population. The largest individuals of *S. affinis* collected from single-species populations were 9.2 mm long. In the area of sympatric occurrence we caught no *S. affinis* smaller than 14.7 mm, and the largest was 22.1 mm. When it occurred alone, *S. affinis* was very similar to the naked eye in morphology and behavior to *S. interstitialis*, but in the mixed population the former moved differently, seemed more elongate, and appeared unable to roll tightly when disturbed. The two species were immediately separable when they occurred together in the field. However, when animals from allopatric populations were mixed, they were almost indistinguishable without microscopic examination.

Work in the Cuatro Ciénegas basin has been supported by N. S. F. Grants GB-2461 and GB-6477X since 1964. Permits from the Mexican government, and the assistance of many persons in the field and in the laboratory, are gratefully acknowledged.

## LITERATURE CITED

- BROWN, W. L., JR. and E. O. WILSON. 1956. Character displacement. *Systematic Zool.* 5: 49-64.
- COLE, G. A. and W. L. MINCKLEY. 1966. *Speocirolana thermydronis*, a new species of cirolanid isopod crustacean from central Coahuila, México. *Tulane Stud. Zool.* 13: 17-22.
- and —————. 1970. Occurrence of the asellid subfamily Stenasellinae (Crustacea, Isopoda) in the Western Hemisphere, with description of a new genus and species. *Internat. J. Speleol.* *in press*.
- MINCKLEY, W. L. 1969. Environments of the Bolsón of Cuatro Ciénegas, Coahuila, México, with special reference to the aquatic biota. *Univ. Texas El Paso Stud., Sci. Ser.* 2: 1-65.
- and G. A. COLE. 1968. Preliminary limnologic information from the Cuatro Ciénegas area, Coahuila, México. *Southwest. Nat.* 13: 421-431.
- RACOVITZA, E. G. 1912. Biospeologica. XXVII. Cirolanides. *Arch. Zool. Exper. Gen.*, 5th Series 10: 203-329, 13 pls.
- RIOJA, E. 1953. Estudios carcinológicos. XXX. Observaciones sobre los cirolanidos cavernícolas de Mexico (Crustaceos, Isopodos). *An. Inst. Biol. Mexicana* 24: 147-169.
- TAYLOR, D. W. 1966. A remarkable snail fauna from Coahuila, Mexico. *Veliger* 9: 152-228. 11 pls.

