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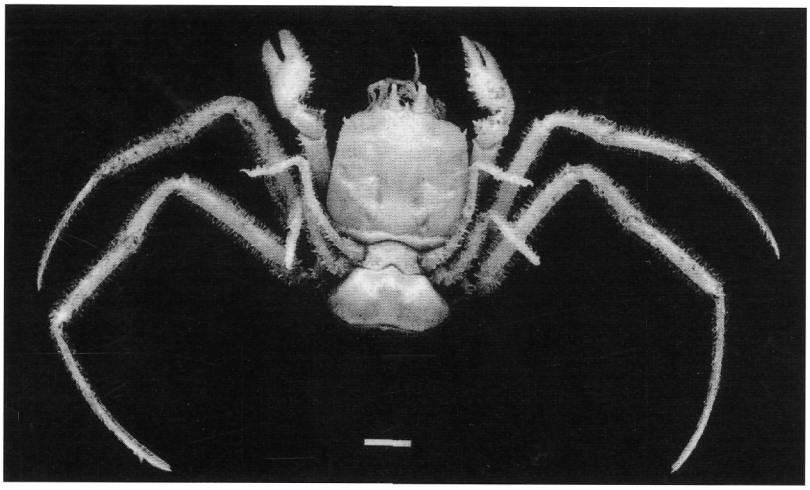

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Thermosphaeroma mendozai, a new species from hot springs in northern Chihuahua, Mexico (Crustacea: Isopoda: Sphaeromatidae)

Marilyn Schotte

Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560-0163, U.S.A.

Abstract.—A new species of *Thermosphaeroma* (*T. mendozai*) is described from a collection of specimens found in hot springs in Chihuahua State, Mexico. Apomorphic characters are seen in the frontal lamina, pleotelson, and uropods. A new record is given for *T. subequalum* and the morphology of the female brood pouch is described for *T. smithi*. Bowman's (1981) key to species of *Thermosphaeroma* is amended to include all known congeners.

Of the 95 genera of sphaeromatid isopods, only members of the genus *Thermosphaeroma* are known to occur exclusively in hot springs, whereas other genera in the family have successfully colonized different aquatic habitats around the world. This genus has been found to date only in the southwestern United States and central Mexico between the eastern and western ranges of the Sierra Madre mountains and their northern extensions. The new species is the eighth known congener, described herein. Its discovery represents a westward expansion of the range of the genus.

Material of three *Thermosphaeroma* species was collected in central Mexico over several years by Jerry J. Landye of the U.S. Fish and Wildlife Service and others while searching for freshwater snails in thermal springs in Chihuahua state. Because thermal springs tend to be isolated, there is a high degree of endemism. However in this study, material from Julimes, Chihuahua has been identified as *Thermosphaeroma subequalum* Cole & Bate, 1978 whose type locality is Boquillas del Carmen, Texas, about 150 miles to the east. A third species, *T. smithi* was retrieved from a spring at its type locality and included ovigerous females, hitherto unknown. All material is deposited at the National Museum of Natural History (NMNH).

Family Sphaeromatidae White, 1847
Genus *Thermosphaeroma* Cole & Bane, 1978

Cole & Bane, 1978:225; Bowman, 1981: 105–106.

Thermosphaeroma mendozai, new species
Figs. 1 A–N, 2 A–H, 3 A–G, 4

Material.—Holotype, USNM 291484, non-ovigerous female TL 5.0 mm, Paratypes, USNM 291485, subadult male TL 3.9 mm, 13 juvs., Mexico, Chihuahua State, Ojo de Agua de Casas Grandes, Chihuahua State, 30°24′N, 107°59′E, under gravel and in recreational canal running from multiple spring heads ca. 6 km NNW of main square in Casa Grandes, temperature 29 to 30°C, coll. J. J. Landye and Phil Hines, 16 and 17 Sep 1990.

Diagnosis.—Frontal lamina anteriorly truncate. Pleotelson triangular with straight sides meeting at angled apex. Uropodal exopod lanceolate, held at right angle to broad, parallel-sided, apically square endopod; both rami extending beyond apex of pleotelson.

Description.—Body length 1.4 times greatest width, surface smooth. Sides of pereon subparallel. Pigmentation of preserved specimens various, from even cover to dense, solid black-brown color. Cephalon

with interocular suture. Pereonite 1 longest, pereonites 2–7 and single visible pleonite subequal in length. Sutures at coxal plates very faint. Pleotelson almost twice as wide as long; smoothly domed in lateral view; lateral margins straight, coming together at approximately right angle at apex.

Antennular peduncle, article 1 equal in length to articles 2 and 3 combined, latter article with 4 plumose setae; flagellum with 5 articles, ring-like first article bearing 2 feather-like setae; articles 4 and 5 provided with 1 and 2 aesthetases respectively. Antennal peduncle reaching midlength of cephalon and bearing several plumose setae on terminal article; flagellum consisting of 8 articles.

Frontal lamina, anterior margin straight, one-half of total width; corners angular, arms truncate posteriorly. Clypeus moderately long, anterior margin emarginate.

Mandible, left and right incisors 3 to 4-cuspate; left lacinia 3-cuspate; left spine row with 5 stout, tufted setae; right spine row with 6 setae, 2 of which tufted. Mandibular palp, penultimate article with 6–7 fringed setae, terminal article with 8–11. Maxilla 1 typical of genus. Maxilla 2, endopod bearing 14 fringed setae apically; exopod, both rami with 9 very long dentate setae. Maxilliped articles 2–4 with lobes on inner margins less produced than in other species; epipod lacking.

Pereopods 1–7 provided with numerous patches of short setae, especially on anterior margins of propodus, carpus, merus and ischium. Pereopod 1 with 2 dentate setae at distal margin of propodus. Pereopods 6 and 7 bearing 4 and 6 stout, dentate setae respectively, on distal margin of carpus. Basis of pereopods 2–7 with patches of scale setules on outer surface.

Pleopods 1–3 evenly covered with pigment. Pleopod 1, with 3 coupling hooks on peduncle, 15 and 22 plumose marginal setae on endopod and exopod respectively. Pleopod 2, 3 coupling hooks, 23 and 31 plumose marginal setae on endopod and exopod respectively. Pleopod 3, 3 coupling hooks, 10 plumose marginal setae on distal margin of endopod; exopod bearing 41 plumose marginal setae. Pleopod 4, lacking marginal setae; branchial folds very poorly developed, somewhat stronger in endopod; both rami strongly pigmented. Pleopod 5 endopod with many branchial folds; exopod similar to that of *T. smithi*, with deep incision on lateral margin proximal to reniform scale patch.

Uropodal endopod, length almost 4 times greatest width, widening very slightly posteriorly; apically blunt, almost square, with fringe of extremely small setules on distal margin. Exopod lanceolate, shorter than endopod, with tiny setules apically. Both rami somewhat longer than pleotelsonic apex.

Adult male.—unknown.

Etymology.—The species name is a patronym for the New World Mendoza family: Mario, my husband David, Art, and Brandon.

Remarks.—Thermosphaeroma mendozai is distinguished from its congeners by the truncate frontal lamina, straight-sided triangular pleotelson and unusual uropods (wide, parallel-sided and truncate at apex), which are found in no other members of the genus. The angled apex of the pleotelson runs counter to the Cole & Bane's original diagnosis (1978), which describes it as "somewhat rounded terminally." The uropodal exopods, as in *T. smithi*, are held at right angles to the endopod. Since the adult male of *T. mendozai* is unknown, the degree of setation on the pereopods may differ from that found in the holotype female described herein. Examination of other *Thermosphaeroma* species in the USNM collection revealed the absence of a maxillipedal epipod, as is the case with many sphaeromatid genera.

Thermosphaeroma smithi Bowman, 1981

Thermosphaeroma smithi Bowman, 1981: 110–113, figs. 4–6, 8e, 9e.

Material.—1 ♂, 3 ovig. ♀, 4 ♀ with brood pouches, 13 juvs. Mexico, Chihua-

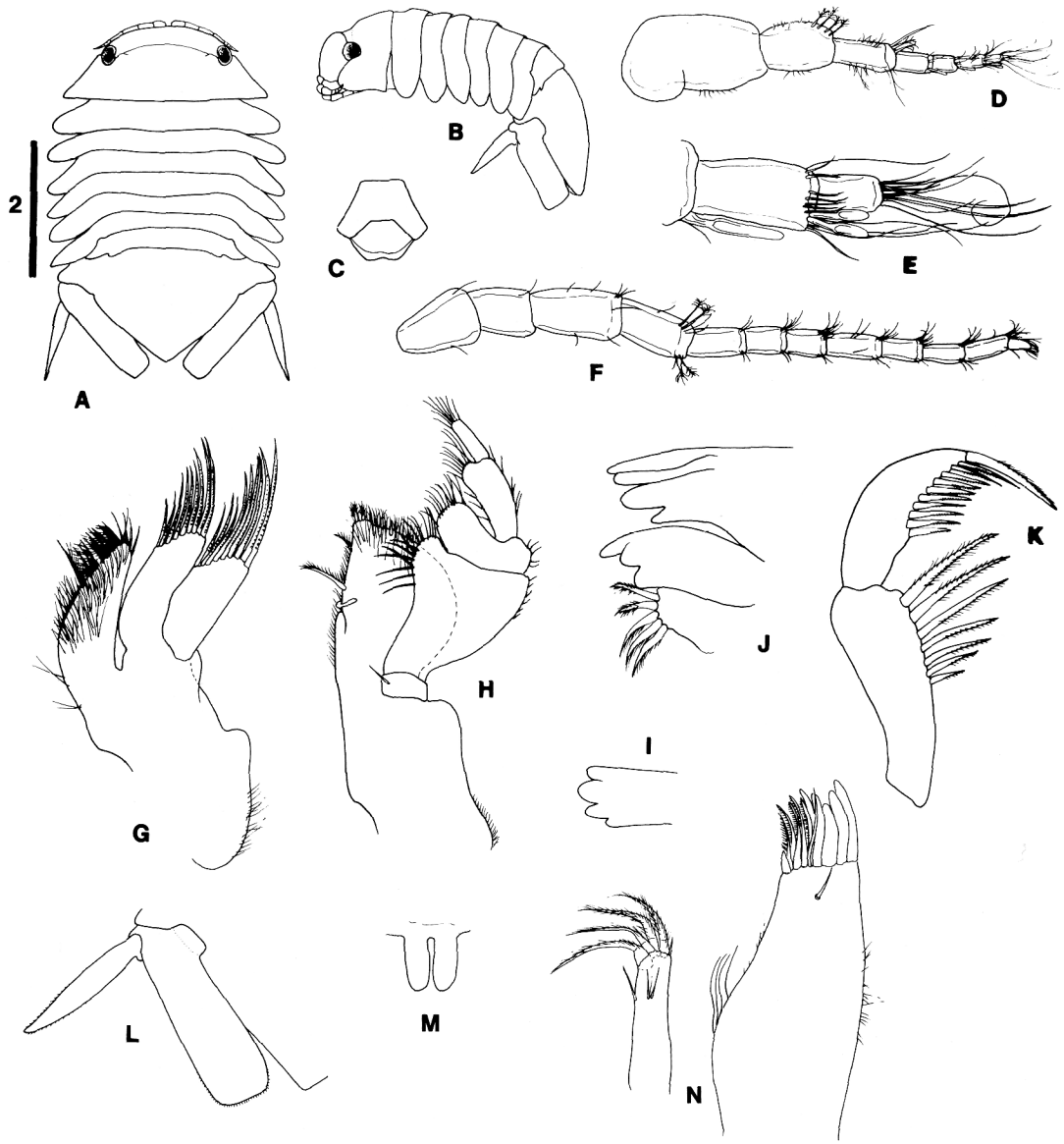

Fig. 1. *Thermosphaeroma mendozai*, n. sp. A, Female holotype; B, Lateral view; C, Frontal lamina; D, Antennule; E, Terminal articles of antennule; F, Antenna; G, Maxilla 2; H, Maxilliped; I, Right incisor; J. Left mandible; K, Mandibular palp (terminal articles); L, Uropods; M, Penes of subadult male; N, Maxilla 1.

hua, Balneario de San Diego (about 37 km E of Cuidad Chihuahua), 28°35.5′N, 105°32.5′ W, isolated hot spring on hill E of Rio Chusvicar with lateral springs coming out on N, S and W sides, temperatures 44.7 to 25°C in isolated pool, coll. J. J. Landye et al., 29 Aug 1971.

Remarks.—The type material deposited at USNM contains no ovigerous females and so the sexual characters for the species were not described. In the present material several females with brood pouches were found. Females resemble males except for secondary sexual characters; the mouthparts are unmetamorphosed; the brooch pouch consists of two opposing pockets opening

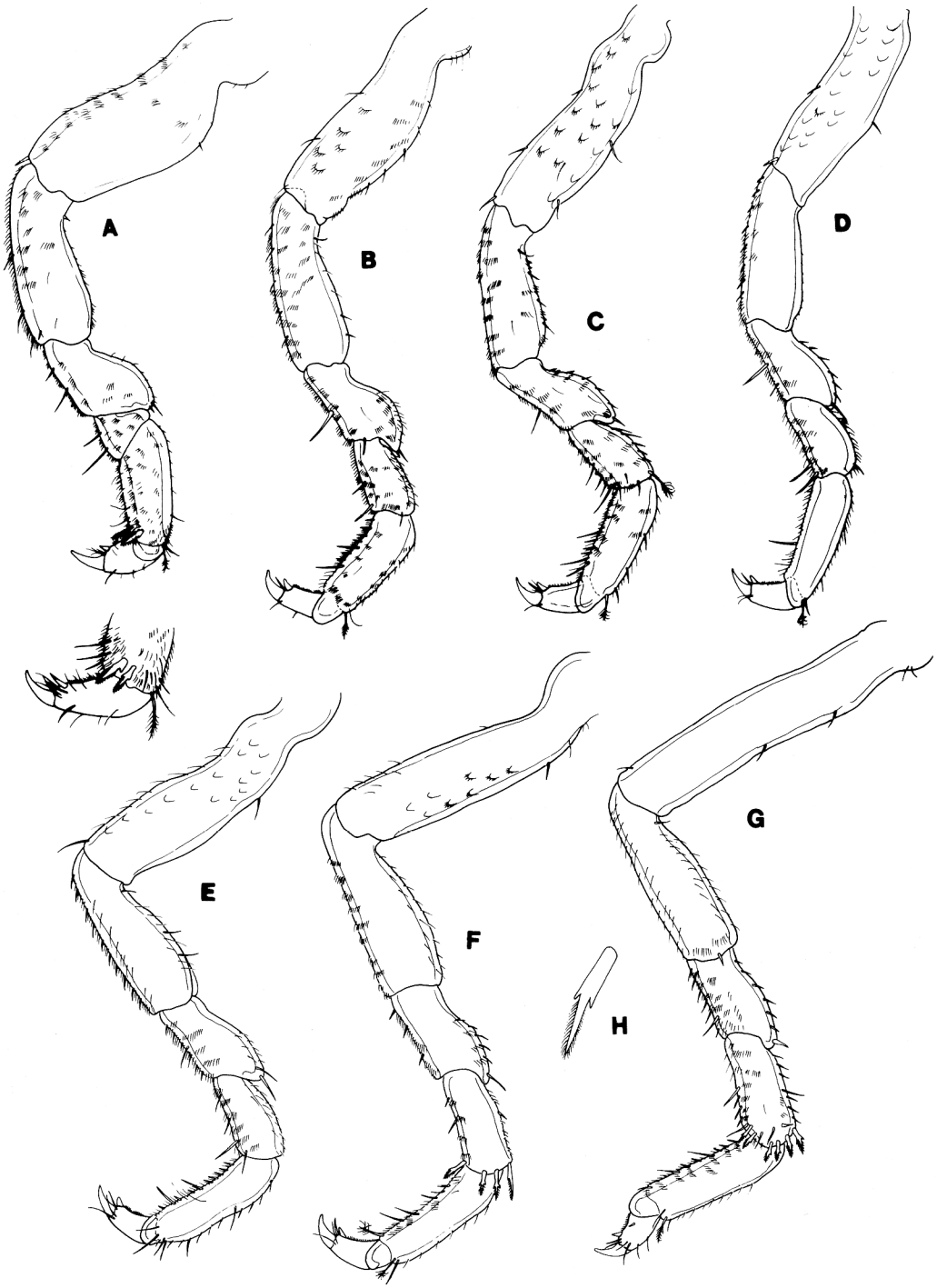

Fig. 2. *Thermosphaeroma mendozai*, n. sp. A, Pereopod 1; B, Pereopod 2; C, Pereopod 3; D, Pereopod 4; E, Pereopod 5; F, Pereopod 6; G, Pereopod 7; H, Dentate seta on carpus.

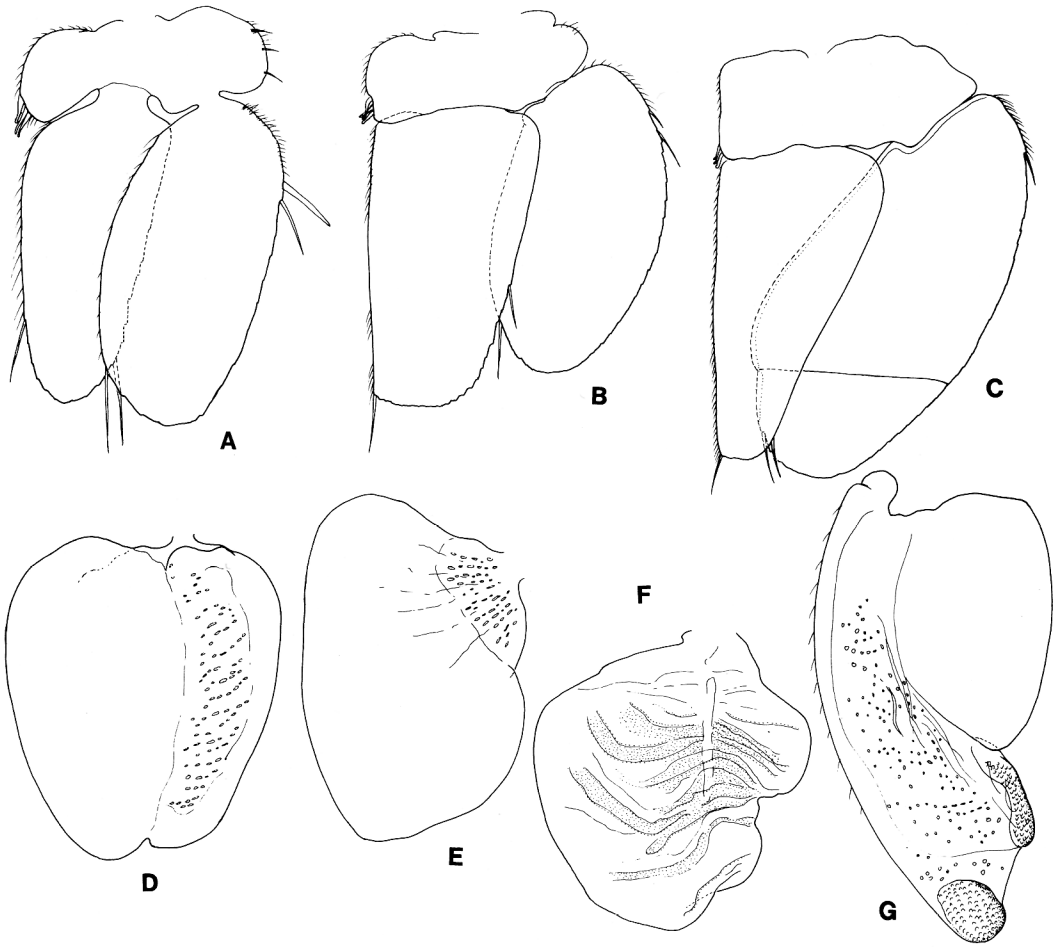

Fig. 3. *Thermosphaeroma mendozai*, n. sp. A, Pleopod 1; B, Pleopod 2; C, Pleopod 3; D, Pleopod 4, endopod; E, Pleopod 4, exopod; F, Pleopod 5, endopod; G, Pleopod 5, exopod.

near fourth pereopods and oostegites are absent. Examination of other type species of the genus in holdings at NMNH yielded no ovigerous females but this character state for *T. smithi* is undoubtedly consistent for the genus.

Thermosphaeroma subequalum Cole & Bane, 1978

Thermosphaeroma subequalum Cole & Bane, 1978:223–228, figs. 1–3.—Bowman, 1981:116–117, figs. 8c, 9c, 10c.

Material.—4 ♂, 9 ♀ with brood pouches, 15 juv. Mexico, Chihuahua, Ojo de Julimes, 28°25′N, 105°25′W, hot springs with multiple sources and common main pool, 44 to 45°C, coll. J. J. Landye and D. Wong, 05 Apr 1991.

Remarks.—The specimens are indistinguishable from type material from Texas, held at USNM. The morphology of the brood pouch in ovigerous females is the same as in *T. smithi*. The uropodal endopod is somewhat longer than the exopod instead of subequal to it (particularly in the case of the juveniles), but otherwise the characters fit those of the type diagnosis exactly. The conspecificity is at first glance puzzling due to the distance between the populations (150 miles) in a genus known for endemism. However, Ojo de Julimes lies in the

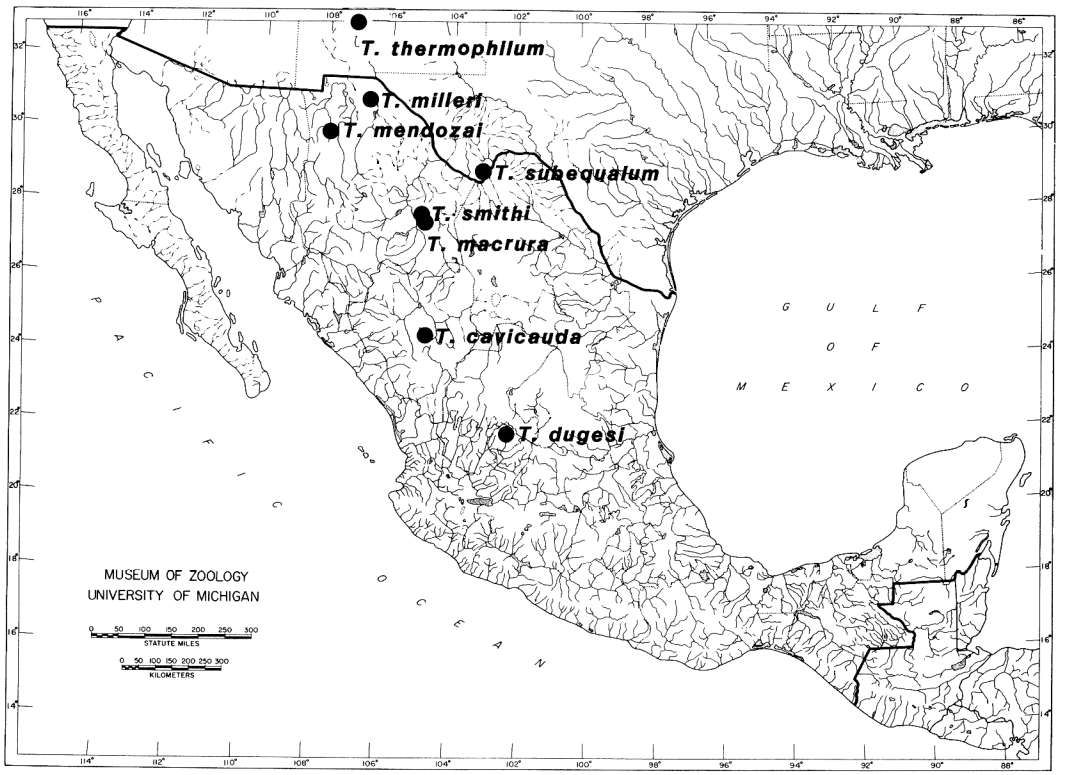

Fig. 4. Distribution of known species of *Thermosphaeroma*. *T. subequalum* has also been found near Julimes, Chihuahua state, near the type locality of *T. macrura*.

watershed of Rio Conchos, which flows into the Rio Grande and ultimately past Boquillas del Carmen, Texas, the type locality. As the two regions are connected by rivers, it is possible that they are also hydrologically connected underground or were so in the recent past.

Bowman (1981) discusses the difficulty of deducing relationships between *Thermosphaeroma* and other isopod groups, and suggests a possible origin of the genus, i.e., a marine sphaeromatid in the Dynameninae family. Such "subfamily" designations, based on branchial folds in the pleopods, are now considered of little use (Bruce 1994). *Thermosphaeroma* differs from other so-called "Dynameninae" in the absence of lateral sutures on the free pleonite, the lack of branchial folds in the fourth pleopodal exopod and the incompletely divided exopod of the fifth pleopod. These character states are also present in the estuarine species *Cassidinidea*, representing another so-called "subfamily" Cassidininae. Until a cladistic analysis of all sphaeromatid genera is performed, discussion of the generic affinities of *Thermosphaeroma* and a possible ancestor would be only conjecture.

Key to known species of *Thermosphaeroma*

1a. Apex of pleotelson incised . . . . . *T. cavicauda* Bowman, 1985 (La Laguna, Durango State, Mexico)

1b. Apex of pleotelson not incised 2

2a. Frontal lamina truncate, level across anterior margin, corners angular; apex of pleotelson angled . . . . . *T. mendozai* n. sp. (Casas Grandes, Chihuahua State, Mexico)

2b. Frontal lamina not truncate anteriorly; apex of pleotelson rounded 3

3a. Exopod and endopod of uropod subequal in length ..... *T. subequalum* Cole & Bane, 1978 (Boquillas Canyon, Big Bend National Park, Texas; Ojo de Julimes, Chihuahua State, Mexico)

3b. Exopod and endopod not subequal in length 4

4a. Exopod of uropod distinctly longer than endopod .... *T. smithi* Bowman, 1981 (Balneario San Diego, Chihuahua State, Mexico)

4b. Exopod of uropod distinctly shorter than endopod; lacinia of left mandible 3-cuspate 5

5a. Apex of endopod of uropod angular .. 7

5b. Apex of endopod of uropod rounded .. 6

6a. Pleotelson evenly and broadly rounded; exopod of uropod about 0.6 length of endopod; appendix masculina of male pleopod 2 curving laterad, longer than endopod ..... *T. thermophilum* (Richardson 1897) (Socorro, New Mexico)

6b. Pleotelson with slightly concave margins just anterior to narrowly rounded apex; exopod of uropod more than 0.7 length of endopod; appendix masculina of male pleopod 2 straight, about as long as endopod .... *T. milleri* Bowman, 1981 (Bolson de lós Muertes, Chihuahua State, Mexico)

7a. Frontal lamina nearly triangular, anterior margin narrowly rounded .... *T. milleri* Bowman, 1985 (Julimes, Chihuahua State, Mexico)

7b. Frontal lamina very broadly rounded anteriorly, anterior margin almost level ..... *T. dugesi* (Dollfus 1893) (Ojo Calientes, Aguascalientes State, Mexico)

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