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DISTRIBUTION OF THE MILLIPE TYLOBOLUS UTAHENSIS CHAMBERLIN, WITH REMARKS ON T. FREDERICKSONI (CAUSEY) (SPIROBOLIDA: SPIROBOLIDAE)

Rowland M. Shelley and Selena B. Bauer

Abstract.—Tylobolus utahensis Chamberlin, the only representative of the genus occurring in the southwestern deserts, ranges from central Inyo County, California, to the western periphery of Kane County, Utah. This distribution roughly corresponds to the northern limit of the Mojave Desert ecosystem and is also shown by the millipede Piedolus utus Chamberlin (Spirobolida: Atopetholidae) and the centipede Theatops posticus (Say) (Scolopendromorpha: Cryptopidae). Tylobolus fredericksoni Causey, ostensibly from Douglas County, Kansas, is designated a "nomen dubium" and disregarded pending collection of fresh material; Narcus gordonus (Chamberlin) is deleted from South Carolina and Tennessee. Tylobolus uncigerus (Wood) occurs north of the Columbia River in Klickitat County, Washington, and Hiltonius thebanus Chamberlin is referable to Onychelus Cook in the family Atopetholidae.

Key words: Tylobolus; T. utahensis; T. fredericksoni; Narcus americanus; Washington County, Utah; Inyo County, California; Hiltonius.

The subfamily Tylobolinae of the diplopod family Spirobolidae comprises 2 genera, Tylobolus Cook and Hiltonius Chamberlin. Keeton (1960) revised both taxa, recognizing 3 species of Hiltonius in southwestern California and adjacent Baja California Norte, and 2 species in mainland Mexico that range northward into Santa Cruz County, Arizona (Keeton 1960, Shelley 1995, plus unreported samples examined by the 1st author). The 8th species, H. thebanus Chamberlin, occurring at Theba, Maricopa County, Arizona, is referable to Onychelus Cook in the family Atopetholidae, as the 1st author has learned from examining the female holotype at NMNH (see acronyms below). In a supplemental paper on the California representatives of Tylobolus, Keeton (1966) cited 6 species west of the crest of the Sierra Nevada, 1 of which, T. uncigerus (Wood), ranged northward to the Columbia River at Portland, Oregon; we extend its distribution into the adjacent periphery of Washington based on a female from Klickitat, Klickitat County, at FSCA. Tylobolus extends southward into the adjacent fringe of Baja California Norte (Bollman 1888, Keeton 1960, Loomis 1968) and, like Hiltonius, occupies the western interior, as T. utahensis Chamberlin inhabits Zion National Park, Washington County, Utah. There are also questionable reports of an additional species, T. fredericksoni (Causey), in Douglas County, Kansas, on the eastern periphery of the Central Plains. We report 37 additional samples of T. utahensis that expand its range some 300 mi (480 km) westward to central Inyo County, California, east of the Sierras, and provide data on segment numbers, lengths, and widths. We also designate T. fredericksoni as a "nomen dubium" because there is no recent, indisputable evidence that a representative of this genus occurs east of the area occupied by T. utahensis. The distribution of the Tylobolinae in the United States and the adjacent periphery of Mexico is shown in Figure 1. Acronyms of sources of preserved study material are as follows:

BYU—Monte L. Bean Life Science Museum, Brigham Young University, Provo, UT
CAS—California Academy of Sciences, San Francisco
CDFA—California Department of Food and Agriculture, Sacramento
DC—Life Sciences Division, Dixie College, St. George, UT
FSCA—Florida State Collection of Arthropods, Gainesville
LACMNH—Los Angeles County Museum of Natural History, Los Angeles, CA

1North Carolina State Museum of Natural Sciences, Box 26882, Raleigh, NC 27610-0882.
Fig. 1. Distribution of the Tylobolinae in the United States and adjacent periphery of Mexico. Solid lines (A), *Tylobolus*; dashed lines (B), *Hiltonius*.

MCZ—Museum of Comparative Zoology, Harvard University, Cambridge, MA
NCSM—North Carolina State Museum of Natural Sciences, Raleigh
NMNH—National Museum of Natural History, Smithsonian Institution, Washington, DC
SEM—Snow Entomological Museum, University of Kansas, Lawrence
UCD—Bohart Entomological Museum, University of California at Davis
UGA—University of Georgia Museum of Natural History, Athens.

*Tylobolus utahensis* Chamberlin
(Figs. 2-5)

*Tylobolus utahensis* Chamberlin, 1925:60-61.

**Type specimens.**—Male holotype, female allotype, and 2 male and 1 female paratypes (MCZ) collected by R.V. Chamberlin in May 1924 at an unknown location in Zion National Park, Washington County, Utah.

**Diagnosis.**—Metazonal striae terminating ventrolaterad, well below level of ozopores; anterior gonopod telopodite apically blunt and rounded, not uncinate; posterior gonopod tibiotarsus forming right angle with distal projection (Figs. 2-4).

**Variation.**—New material agrees closely with the holotype. The posterior gonopod tibiotarsus is slightly broader and blunter, and the denticles, which Causey (1955) and Keeton (1960) termed “prickles,” cover larger areas on both the anterior and posterior gonopods. In juveniles the distal projection of the posterior gonopod is less angular, extending submediad rather than downward or dorsal. We reexamined the holotype and found the denticles to be stronger than shown by Keeton (1960, figs. 262-264); there is also a pronounced line or ridge of these along the ventral surface of the posterior gonopod telopodite that he did not show (Fig. 5).

In his supplemental work on California species, Keeton (1966) tabulated meristic and morphometric data; we present such data for *T. utahensis* (Table 1) to provide parallel accounts for all species of *Tylobolus*. On the average, females are slightly longer and broader than males; adults are equivalent in length throughout the range, but those on the east are narrower. The adult segment number varies from 51 to 57, as all individuals with ≥ 52 segments have no legless segments except the epiproct. Three females and 2 males have 51 segments, none legless, while 3 males and 1 female with this count have 1 or 3 legless segments; all individuals with ≤ 50 segments have at least 1 without appendages.

**Distribution.**—Occurring from the Inyo Mountains on the eastern side of Owens Valley, Inyo County, California, to the eastern edge of Zion National Park in western Kane County, Utah, a distance of approximately 300 mi (480 km; Figs. 1, 6). The millipede should also be expected along the Virgin River in the northwestern corner of Mohave County, Arizona; along this river and in other parts of northern Clark County, Nevada; and throughout most of Lincoln County, Nevada, particularly in canyons and gorges east of Caliente, Panaca, and Pioche. Specimens in Inyo County were taken in pitfall traps at elevations
of 2296–6560 ft. In addition to the types, specimens were examined as follows:

**California:** Inyo Co., Inyo Mts, Lead Canyon (Cyn), F, 9 March–13 August 1981, D. Giuliani (CAS); Inyo Mts, Hunter Cyn, M, F, 9 June 1980–26 May 1981, D. Giuliani (CAS); Inyo Mts, Willow Cr, F, 16 September 1976, collector unknown (LACMNH); Saline Valley, 11 different stations but exact locations unknown, 10M, 17F, juv, 5 April 1959–14 June 1960, B. Banta (CAS); Saline Valley, 10 stations along Grapevine Cyn Rd but exact locations unknown, 16M, 6F, 15 August 1959–7 May 1960, B. Banta (CAS); 21 and 25 mi (33.6 and 40 km) S Saline Valley, 2M, 29 April 1975, A.R. Hardy (CDFA); and Death Valley Nat Pk, Panamint Mts, Johnson Cyn, F, 2 June 1961, R. Waner (NMMH).

**Nevada:** Nye Co., Nuclear Test Site, Ranier Mesa, 2M, juv, date unknown, D.B. Thomas (LACMNH, NCSM).

**Utah:** Washington Co., 12 mi (19.2 km) NW St. George, nr Baker Dam, 3M, 2F, 16 April 1971, B.K. Carrell (DC); Pine Valley, F, 26 May 1971, Prothero (DC); Snow Cyn St Pk, M, 16 April 1982, R.W. Baumann (BYU); Pintura, F, 8 March 1941, J. & W. Ivie (NMNH); Motaqua, M, 17 April 1933, M. Zuie (NMNH); Oak Grove

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**Figs. 2–5. Tylobolus utahensis:** 2, anterior gonopods of a male from Saline Valley, Inyo County, California, anterior view; 3, left posterior gonopod of the same, anterior view; 4, the same, caudal view; 5, right posterior gonopod of holotype, anterior view. Scale line = 1.00 mm for all figures.
TABLE 1. Meristic and morphometric data on *Tylobolus utahensis*. Individuals are listed in descending order according to segment counts, which include the epiproct; the number of legless segments in addition to the epiproct, if any, is shown in parentheses. Measurements are in mm. Averages are for specimens with no additional legless segments.

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blechrostriatus Shelley and Bauer (Julida: Pa­
eromopodidae), occurring in Saline Valley and along the eastern slope of the Sierra Nevada (Shelley and Bauer 1997), and Idrionaria dineh Shelley, known only from Washington County (Shelley 1996).

**Tylobolus fredericksoni** (Causey)


*Tylobolus fredericksoni*: Keeton, 1960:132–133.

For over a century records have existed of a mysterious tyloboline on the eastern periphery of the Central Plains. The confusion began with Cragin (1885), who reported *Spirobolus “uncigerus Wood (?)”* from Topeka, Shawnee County, Kansas, stating that there were “important differences” with *uncigerus*, but the specimen was closer to this species than to any other. Kenyon (1895) repeated Cragin’s citation, including the parenthetical question mark, for an individual from Weeping Water, Cass County, Nebraska. He also reported the abundant east-Nearctic spirobolid, *Narceus americanus* (Beau­vois) [cited as *Spirobolus marginatus* (Say)], from adjacent Sarpy County. Thus, Kenyon’s record of *uncigerus* is plausibly a misidentifi­cation of this common species. Gunthorp (1913, 1921) questioned Cragin’s record as being geo­graphically improbable and deleted *uncigerus* from the Kansas fauna; he suggested that mutilated specimens of *N. americanus* from Topeka [cited as *Arctobolus marginatus* (Say)] may have been misinterpreted. Thirty-four years later Causey (1955) proposed *Californibolus fredericksoni* for 2 males ostensibly collected in 1949 in Douglas County, Kansas, and an immature female taken in 1950 from Monroe County, Iowa. Her illustrations of the antero­ventral corner of the mandible and both pairs of gonopods resemble the conditions in *uncigerus*, and all other Kansas spirobolids that she examined were *N. americanus* (cited as *N. oklahomae* Chamberlin). Keeton (1960) exam­ined the holotype, transferred *C. fredericksoni* into *Tylobolus*, and noted that the vial con­tained fragments of 2 specimens, the anterior end of a small male and the caudal end of a
larger individual. As the gonopods appeared to be from an immature specimen, Keeton withheld commentary on the status of T. fredericksoni pending discovery of an adult male. In our reexamination of the holotype, we found what appeared to be 1 highly fragmented specimen with no legless segments at the caudal end. Its gonopods are accurately figured by Causey and Keeton and are open to different interpretations. Keeton (1960) thought they were incompletely developed but gave no explanation for this opinion. They seem mature to us, and while similar to those of T. uncigerus and plausibly representing a variant, they also show enough differences to be reasonably interpreted as representing a distinct species.

Today, 47 yr after its description, T. fredericksoni is still questionable, and no potential tylobolines have been collected from Kansas, Nebraska, or Iowa during this time. Its ostensible occurrence in the Central Plains continues to generate confusion, as Enghoff (1995, family-clade no. 13) recorded Tylobolus from the east- and west-Nearctic based on this species. To our knowledge, the only definite spiroboloid records from Kansas are of N. americanus (cited as N. oklahomae Chamberlin) from Douglas County (Causey 1955) and N. annularis Rafinesque from Osage County (Keeton 1960). We have seen 1 authentic Kansas spiroboloid, a juvenile from Lawrence, Douglas County (UGA), that is clearly referable to Naceus. Aside from south Texas, which is occupied by Anelus richardsoni (Pocock) (Allopo- cockiidae) and 1 or more representatives of the Atopeothalidae (Hoffman and Orcutt 1960, Shelley and Hoffman 1995), only 4 spiroboloids definitely occur in the United States east of the Rocky Mountains: N. americanus, which is widespread east of the Central Plains and extends northward into Quebec (Shelley 1988); N. gordonus (Chamberlin), in peninsular Florida; Chicobolus spinigerus (Wood) (Spirobolidae), ranging from southern South Carolina to the south Florida Keys (Keeton 1960); and Floridobolus penneri Causey (Floridobolidae), endemic to the Lake Wales Ridge, Highlands and Polk counties, Florida (Causey 1957, Keeton 1959, 1960, Deyrup and Franz 1994). There is no recent, credible evidence that another form exists in the eastern two-thirds of the continent, and the locality of T. fredericksoni may represent a labeling error. The distribution pattern of species along the Pacific Coast and in the western interior, and another some 1000 mi (1600 km) to the east in the eastern Central Plains, is not demonstrated by another diplopod genus and thus seems implausible for Tylobolus. We therefore designate T. fredericksoni as a "nomen dubium" and recommend disregarding the species until its presence in the Plains is confirmed by a freshly collected male with unimpeachable locality data, or until the millipede is discovered in the principal generic area, probably in California, and an accurate locality can be reported.

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