CONFIRMATION OF THE STATUS OF
EURYURUS MISSISSIPPIENSIS (CAUSEY),
WITH CONGENERIC RECORDS FROM
THE GULF STATES
(DIPLOPODA: POLYDESMIDA: PLATYRHACIDAE)

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ABSTRACT

Anatomical studies and comparisons with *Euryurus maculatus* Koch confirm that *Euryurus mississippiensis* (Causey) is properly referred to that genus and that *Singularius* Causey is a synonym of *Euryurus* Koch. A full description and illustrations are presented for *mississippiensis*, along with new locality records of *maculatus*, *E. cingulatus* Hoffman, and *E. leachii fraternus* Hoffman from Alabama and Mississippi.

RESUMEN

Estudios anatómicos, y comparaciones con *Euryurus maculatus* Koch confirman que *E. mississippiensis* (Causey) se refiere propiamente a este género, y que *Singularius* Causey es un sinónimo de *Euryurus* Koch. Se presentan una descripción completa y ilustraciones para *E. mississippiensis*, con nuevas localidades registradas para *E. maculatus*, *E. cingulatus* Hoffman, y *E. leachii fraternus* Hoffman de Alabama y de Mississippi.

The taxonomic status of *Euryurus mississippiensis* (Causey) has never been satisfactorily determined. It is a modified euryrine species with a simple telopodite that lacks a subterminal process, and Causey (1955) erected the new genus *Singularius* to accommodate it. Chamberlin and Hoffman (1958) repeated her combination in their listing, but Jeekel (1963) noted the extremely close relationship between *Singularius* and *Euryurus* Koch, and expressed doubt about the significance of the generic difference. He suggested that *Singularius* be withdrawn, and 15 years later Hoffman (1978) did so, transferring *mississippiensis* to *Euryurus*. However, Hoffman qualified his action with the admission that he had not seen any specimens and was acting solely on Causey's description, which is inadequate by modern standards. The holotype of *mississippiensis* was absent from its published repository, the American Museum of Natural History (AMNH), and could not be examined, but Hoffman noted that *Singularius* might justifiably be retained if Causey's statement (1955) were true that the coxae were connected by a short, flexible suture. He showed that all other species of *Euryurus* possessed a distinct intercoxal sternum, and this supposed difference in *mississippiensis* might be worthy of generic distinction. Thus, doubt
Shelley: Euryurus mississippiensis

still exists as to the proper systematic position of mississippiensis, and the description by Causey (1955) has never been upgraded.

Following the death of Dr. Causey in 1979, her large myriapod collection was transferred to the Florida State Collection of Arthropods (FSCA). Through the courtesy of Howard V. Weems, Curator of the FSCA, I have sorted through this vast amount of material and found several samples of mississippiensis. I also discovered what must be the lost holotype, which had gone unrecognized because it was mislabeled. Thus, the status of mississippiensis can now be settled, and a thorough study of these specimens leaves no doubt that it is a valid species of Euryurus. Causey overlooked the intercoxal sternum, and the absence of a subterminal process on the telopodite is merely a specific difference. I agree with Jeekel (1963) and Hoffman (1978); Singulirus is a synonym of Euryurus. I publish herein a full description of mississippiensis to clarify its identity, and comparative illustrations of Euryurus maculatus Koch, to confirm the congeneric relationship. The Causey collection also contained several samples of E. maculatus, E. cingulatus Hoffman, and E. leachii fratermus Hoffman from unreported localities in Alabama and Mississippi, and I have obtained other new records in my field studies. These new records are also presented to update knowledge of the species of Euryurus in the Gulf states. Material from the North Carolina State Museum collection is indicated by the acronym NCSM and is accompanied by the invertebrate catalog number.

Euryurus mississippiensis (Causey)

Fig. 1, 3-6

Singulirus mississippiensis Causey, 1955: 23-4, Fig. 2. Chamberlin and Hoffman, 1958: 59.


TYPE SPECIMEN: As stated by Hoffman (1978), the male holotype is not at the AMNH, as reported by Causey (1955) and Chamberlin and Hoffman (1958), nor did I discover a specimen labeled as such in the Causey collection. However, the collection does contain a male labeled, "Euthatus simplex Causey, Holotype," whose locality and date of collection—MS, Jackson Co., Vancleve, 1 January 1964, N. B. Causey—match what Causey (1955) reported for the holotype of S. mississippiensis. I also discovered an entry in Dr. Causey's notes stating that she could not find the type of S. mississippiensis and that it must be lost. Three years before she described mississippiensis, Causey (1952) described Euthatus aculeatus from Illinois and reported Euthatus erythropygus from North Carolina, so at this time in her career Causey thought that Euthatus was the correct name for this genus. However, Hoffman (1954) synonymized Euthatus with Euryurus. Euthatus simplex was never published, and Causey apparently either forgot that she had chosen this binomial or changed her mind and opted to erect the new genus and to call the species mississippiensis. Later she must have forgotten her original decision and hence could not find the specimen in her own collection, since it was labeled Euthatus simplex instead of S. mississippiensis. Thus, since Euthatus simplex never was published, I consider this male the holotype of Singulirus mississippiensis Causey, and deposit it in the AMNH collection in accordance with her wishes (1955), where a male and a female toptype also are housed.
**Shelley: Euryurus mississippiensis**

**Diagnosis:** Acropodite simple and falcate, tapering smoothly to acuminate tip, without subterminal process; femoral lamella absent; prefemoral knob vestigial, laminate.

**Holotype:** Length 27.1 mm, maximum width 3.9 mm, W/L ratio 14.4%, depth/width ratio 64.1%. Body parallel sided for most of length, tapering at both ends.

Color in life (Causey 1955): metaterga olive-black with middorsal row of red-orange spots; paranota with conceolored red-orange spots.

Head capsule smooth, polished, width across genal apices 2.3 mm, interantennal isthmus 0.8 mm. Epicranial suture sharp, distinct, terminating in interantennal region, not bifid. Antennae moderately long and slender, reaching back to caudal edge of 3rd paranota, becoming progressively more hirsute distally, articles 2-6 clavate and similar in length, 7 short and truncate, with four terminal sensory cones. Genae not margined laterally, with distinct medial impression, ends broadly rounded and projecting slightly beyond adjacent cranial margins. Facial setae as follows: epicranial and interantennal absent, frontal 1-1, genal 2-2, clypeal about 8-8, labral about 14-14.

Terga smooth, polished, without detectable wrinkling. Collum moderately broad, ends projecting slightly beyond those of following tergite, edges set off by faint marginal ridge. Paranota relatively large and transversely quadrate, flat and projecting subparallel to substrate, interrupting slope of dorsum and imparting distinct "flat backed" appearance to animal; scapulocoronal margin; anterolateral corners with distinct acute dentation, reduced on anteriormost segments; caudolateral corners rounded through segment 3, blunt on segments 4-7, becoming progressively more acute posteriorly. Peritremata thick and conspicuous on segments 5-18, sharply set off from paranotal surface; oxopores located in slight swelling near middle of paranota, opening laterad. Epiproct large, broadly spatulate, widest apically, corners rounded.

Sides of metazonites smooth, without noticeable grooves or indentations. Structures sharp, distinct. Pregonopodal sternum essentially unmodified; that of segment V with 2 small paramedial knobs between 4th legs and slight depression between 5th legs. Postgonopodal sternum generally flat and unmodified, with indentations between leg pairs leading to distinct transverse grooves. Legs generally without modifications, first 2 pairs smaller and more erussate than others; gonopores arising from coxae of 2nd legs, relatively long, apically expanded; tarsal claws slightly curved, not bisinuate. Hypoproc broadly ovoid, paraprocts with margins slightly thickened.

Gonopodal aperture relatively large, extending nearly to anterior margin of prozonum, 1.4 mm wide and 1.1 mm long at midpoint, indented slightly anterolaterally, sides strongly elevated above metazonal surface. Gonopods in situ (Fig. 1, not this specimen), with telopodites projecting ventrad from aperture, curving medially and crossing each other in midline, extending anteriad beyond anterior margin of aperture. Gonopod structure as follows (Fig. 3-5): coxae large, subglobous, completely filling aperture, connected.

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**Fig. 1-2.** 1) *Euryurus mississippiensis*, gonopods in situ, ventral view of male from Gulf Hills, Jackson Co., MS. 2) *E. maculatus*, gonopods in situ, ventral view of male from Jefferson Co., FL. Scale lines = 1.00 mm for each.
medially by elongate, narrow sternal remnant. Telopodite elongate and slender, subglobose basally, widening slightly at midlength into vestigial, laminate prefemoral knob, knob located on caudal margin, without femoral lamella on anterior margin, narrowing smoothly and continuously distal to knob to acuminate tip; perfemur about 2/3 of telopodite length, acropodite about 1/3. Acropodite falcate, curving and tapering smoothly to acuminate tip, without subapical process. Prostatic groove arising in pit in perfemur running along medial side of perfemur and continuing to apical opening on acropodite.

**Female Topotype:** Length 28.2 mm, maximum width 4.1 mm, W/L ratio 14.5%, depth/width ratio 73.2%. Agreeing closely with holotype in somatic features.

Cyphopodal aperture broadly ovoid, curving caudad to 2nd legs, with indentation between legs. Cyphopods in situ located caudolaterally to 2nd legs, with valves and tip of receptacle visible in aperture. Receptacle (Fig. 6) triangular, located on medial side of valves. Valves quadrate, subequal. Operculum small, located under free (lateral) end of valves.

**Variation:** The gonopods of a few males have a blunt corner proximal to the tip, indicated by the arrow in Fig. 3-4, and the distal prefemoral knob is more distinct in some individuals.

**Ecology:** Causey (1955) stated that the holotype was taken from a rotting log in mixed woods; the sample from Hancock-Harrison counties (NCSM A3763) was also collected in rotting logs in a mixed hardwood-conifer forest.

**Distribution:** Known only from southern Mississippi. The species is most common in counties bordering the Gulf of Mexico, but it ranges inland for at least 90 miles to Wayne County. It should also occur in southwestern Alabama (Washington and Mobile counties). Specimens were examined as follows:

**Mississippi:** Wayne Co., 3 of Waynesboro, along MS Hwy 63 at Chickasawhay R., δ, 22 June 1960, collector unknown (FSCA); unspecified locality, δ, 2♀, 4 June 1960, N. B. Causey (FSCA); and Buckatunna, δ, 15 June 1959, N. B. Causey (FSCA). George Co., ca. 11 mi. W. Lucedale, along MS Hwy 24 at Pascagoula R., 2♀, 11 April 1966, L. D. Wilson (FSCA). Jackson Co., Vanleave, δ, 1 January 1954, N. B. Causey (AMNH) and δ, 2♀, 28 June 1959, N. B. Causey (FSCA) Type Locality; Ocean Springs, Gulf Hills, 2δ, 2♀, 1 October 1958, collector unknown (FSCA), δ, 24 June 1959, collector unknown (FSCA), and several δ♀ and Φ♂, 1 June 1961, N. B. Causey (FSCA). Hancock-Harrison Cos., along MS Hwy 53 at county line, 2δ, several Φ♀ and juvs., 1 February 1960, A. K. Johnson (NCSM A3763).

**Remarks:** In addition to the above records, Dr. H. Enghoff has informed me that the Zoologisk Museum Copenhagen has a sample of 2♀, 3♀, from Biloxi, Harrison Co., collected by H. Kroeyer in 1853-1854.

_Euryergus mississippiensis_ is unique in having a strongly falcate acropodite and in lacking a subterminal process. It also lacks the femoral lamella and has a vestigial prefemoral knob, but these structures are also reduced or absent in other species. The prefemoral knob is more laminate than knob-like, as it also is in the specimens of _maculatus_ I have examined. Causey (1955) was wrong in stating that the coxal were connected by a short, flex-
**Shelley: Euryurus mississippiensis**

ible suture. In fact they are firmly attached by the sclerotized sternal remnant, and it is therefore difficult to dissect one gonopod without the other. Consequently, *Singularius* cannot be justified by the absence of this feature. In other respects, the in situ configuration of the gonopods of *mississippiensis* and the configurations of the telopodite in medial and ventral views conform to the general patterns of *maculatus*, the type species (compare Fig. 2 and 3, 3-4 and 7-8). The hooked acrospodite and the absence of the subterminal process are only of specific value and serve to distinguish *mississippiensis* from its congenerics. The curve of the acrospodite is the sharpest in the genus, but there is also a slight bend in *maculatus*. The blunt corner proximal to the tip is suggestive of a subterminal process, but there is not even a vestige of such a projection. The valves in the female cyphopods are distinctly quadrates, which may allow for reasonably accurate determinations of females, especially when combined with geographical information. Anatomically, *mississippiensis* is most closely related to *maculatus*, the only other species in the Gulf Coastal Plain, and it probably represents an isolated population of an ancestral stock that was once continuous along the Gulf Coast.

**Euryurus cingulatus** Hoffman

At the time of its description, *cingulatus* was known only from the male holotype, collected in Jasper, Walker County, Alabama. The range can now be expanded to 8 other counties in western Alabama, and I agree with Hoffman (1978) that it will eventually be found in Mississippi (Itawamba and Monroe counties). The females of *maculatus* that Hoffman reported from Tuscaloosa County are probably referable to *cingulatus*, since it has now been collected both north and south of this county. I show this record as *cingulatus* in Fig. 9. Specimens were examined from the following new localities:


**Euryurus maculatus** Koch

Fig. 2, 7-8

Hoffman (1978) reported *maculatus* from Jackson and Liberty counties, Florida, and Lee and Tuscaloosa counties, Alabama. As mentioned above, however, the Tuscaloosa record is probably referable to *cingulatus*. He also showed a site in north-central Alabama in the distribution map but did not include a corresponding record in the list of localities. I have not seen any material of *maculatus* from north-central Alabama and believe that *leachii fraternus* is the only form of Euryurus in this part of the state. The only authentic Alabama records of *maculatus* are from the easternmost counties south of the Talladega Division of the Talladega National Forest. In Florida,
Fig. 3-8. 3-6, *Euryurus mississippiensis*. 3) left gonopod of holotype, medial view. 4) the same, ventral view. 5) sternal remnant between coxae, ventral view, specimen from Gulf Hills, Jackson Co., MS. 6) right cyphopod of female from same locality, caudal view. 7-8) *E. maculatus*. 7) left gonopod of male from Jefferson Co., FL, medial view. 8) the same, ventral view. Scale line = 1.00 mm for figs. 5-6, 1.25 mm for Fig. 3-4 and 7-8.

The species has been collected repeatedly in and near Florida Caverns State Park, outside of Marianna, Jackson County, and in Torreya State Park, Liberty County. The popularity of these 2 Florida parks seems to have diverted the attention of naturalists away from other areas of the panhandle. For example, in Florida west of the Chattahoochee River, *maculatus* has not been collected anywhere other than near Marianna, and I have never
Shelley: Euryurus mississipiensis

even seen a diplopod sample from Calhoun or Gulf counties, south of Jackson County. The situation improves a little east of the Chattahoochee River, as several localities in Leon, Jefferson, and Wakulla counties have been investigated. For all practical purposes, however, the Florida panhandle has been largely ignored by diplopod collectors, except for Florida Caverns and Torreya State Parks, and the Tall Timbers Research Station near Tallahassee. More attention should be given to other areas of the panhandle in order to produce more complete knowledge of the distribution of *maculatus* and other millipeds in this part of Florida. Specimens were examined from the following new localities:


*Euryurus leachii fraternus* Hoffman

Hoffman (1978) reported both subspecies of *leachii* from Alabama, but did not see any material from Mississippi. Thus, the following 2 records of *l. fraternus* from Mississippi constitute new state records. The Alabama listing of *l. leachii* was from Jackson County in the northeastern corner of the state, which is isolated by over 200 miles from other records of this race, from central Kentucky northward. I have not seen this particular sample, containing a single male and female, but Hoffman explained why he included it under the nominate subspecies instead of *l. fraternus*. For the purposes of this paper, however, I show it as *l. fraternus* in Fig. 9. Thus, *l. fraternus* occurs in the northernmost counties of Alabama and Mississippi, which are the southern range limit for the species. Specimens were examined from the following new localities:


**Summary**

In a brief discussion of biogeography, Hoffman (1978) noted the importance of the southern Appalachians in the evolutionary history of *Euryurus*, and stated that 5 species occur within a 150 mile radius of Asheville, North Carolina. The Gulf states also contain a diversity of species, and assuming the occurrence of *mississipiensis* in the southwestern corner near Mobile, 4 of the 7 species of *Euryurus* occur in Alabama. The 3 that are absent are *oretesis* Hoffman, in the Blue Ridge Province, and *amyicus* Hoffman and *carolinensis* (deSaussure), both endemic to North Carolina. Thus, all of the species of *Euryurus* that are potential inhabitants of Alabama probably do occur there. This known diversity in one millipede genus raises the question of what it might be in others. Unfortunately, Alabama has received
Fig. 9. Distribution of species of Euryurus in Alabama, Mississippi, and the adjacent Florida panhandle. Dots, mississippiensis; triangles, maculatus; squares, cingulatus; stars, leachii fraternalis.

little attention from field collectors, and the fauna of the state is poorly known. Most of the available material is the result of random collecting by non-myriapodologists; there have been no systematic surveys by anyone versed in the preferred habitats of diplopods. In addition to cingulatus, another species known only from Alabama is Chocletula hubrichti Hoffman, described in 1965 from Roebuck Plaza near Birmingham, Jefferson County. In 1980 I found large numbers of C. hubrichti in Oak Mountain State Park, Shelby County, suggesting that the species is endemic to the Birmingham area. Thus, the little that is known about Alabama reveals an interesting, unique millipede fauna, and suggests that more discoveries await the persistent collector. Now that the southern Blue Ridge Province, one of the prime global centers of millipede evolution, has been thoroughly sampled (Shelley 1981), Alabama looks like a good place for productive field research in the southeastern United States.

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sippiensis in the AMNH collection were loaned by Norman Platnick, and Henrik Knghoff advised me of the sample in the Zoologisk Museum Copenhagen. Specimens of maculatus and C. hubrichti from Cheaha and Oak Mountain State Parks, respectively, were taken with permission of the State Parks Division, Alabama Department of Conservation and Natural Resources. Renaldo G. Kuhler, NCSM scientific illustrator, prepared Fig. 1-2. This research was supported in part by NSF Grant No. DEB 7702396.

LITERATURE CITED


BIOLGY OF DIAPREPES ABBREVIATUS
(COLEOPTERA: CURCULIONIDAE)
REARED ON AN ARTIFICIAL DIET

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ABSTRACT

A method is described for rearing the so-called sugarcane rootstalk borer weevil, Diaprepes abbreviatus (L.), on an artificial diet, and its biology on this diet is reported. Females and males emerged after a mean of 381 ± 4.7 days and 282 ± 6.4 days, respectively. The mean number of eggs per mass was 69.2 ± 7.8; the mean number of eggs deposited per female was 6517 ± 331.1. Females lived a mean of 147 ± 17.1 days, and males 135 ± 21.5 days. Virgin females produced a mean of 1910 ± 349.3 eggs. Most larval hatch occurred 7-8 days after oviposition, with the longest incubation period being 15 days. Hatchling larvae were able to survive for 53 days with adequate moisture.