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ON TWO NEW SPECIES AND NEW DISTRIBUTION RECORDS OF PARAIULID
MILLIPEDES FROM THE EASTERN UNITED STATES

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Millipeds of family Paraiulidae are known from North America and Eastern Asia, with 26 genera and approximately 113 species occurring in the United States and Canada. In the United States the family is best known from east of the Mississippi River, but much remains to be learned about range of species, variation within a species, and the taxonomic characters of females. Several of the species described by H. C. Wood and Charles H. Bollman from this area have never been reported since their initial collection. There are undoubtedly others that are undescribed.

The distribution within a state is perhaps best known in Ohio, where Williams and Hefner (1928) collected 8 species. I have identified the following 7 species from Illinois: *Oriulus venustus* (Wood), *Hakiulus diversifrons* (Wood), *Aliulus rugosus* (Bollman), *Ptyoiulus ectenes* (Bollman), *Illiulus illinoensis* Causey, *Uroblaniulus sandersoni* Causey, and *Aniulus bollmani*, new name; another species of *Uroblaniulus* occurs in counties of Indiana bordering Illinois and may be found in Illinois.

Many of the specimens studied during the preparation of this paper are in the collection of the Illinois Natural History Survey and were made available to me through the kindness of Dr. Milton W. Sanderson. The holotypes of *Aniulus orientalis* and *Uroblaniulus stolidus* will be deposited in the American Museum of Natural History.

Genus *Aniulus*

Chamberlin 1940. Bull. U. Utah. 30(11):3.

Aniulus bollmani, nomen novum

Julus impressus Say [nomen nudum] 1821. Jour. Acad. Nat. Sci. Phila. 2(1):102.

Iulus venustus Wood [partim] 1864. *Ibid.* (1864):10; 1865, Myr. N. Amer., 196, fig. 29.

Parajulus impressus (Say). Bollman, 1887, Ann. N. Y. Acad. Sci. 4:24; 1893, Myr. N. Amer., 52, 144.

Parajulus venustus (Wood). Bollman, *ibid.* 183.

Parajulus venustus (Wood). Brolemann, 1922, Ann. Ent. Soc. Amer. 15:295, figs. 43-50

[non] *Parajulus impressus* (Say). Brolemann, 1922, *ibid.*, 294, figs. 35-42.

Parajulus impressus (Say). Williams & Hefner, 1928, Ohio Biol. Sur., Bull. 18, 127, fig. 21.

Parajulus impressus (Say). Hefner, 1929, J. Morph. & Phys. 48(1):153-163, 4 pls.

[?] *Aniulus impressus* (Say). Chamberlin, 1940, Bull. U. Utah. 30(11):3.

Aniulus venustus (Wood). Chamberlin, 1947, Proc. Acad. Nat. Sci. Phila. 99:36.

Aniulus impressus (Say). Causey, 1950, Proc. Ark. Acad. Sci. 3:46, figs. 7, 8.

Some of the 14 millipeds described by Thomas Say were collected in Florida, others in Pennsylvania or from states in between. Unfortunately, he gave no locality for *J. impressus*, the only species of family Paraiulidae described by him, but later authors (Wood, 1865; Bollman, 1887, 1893) somehow deduced that either Georgia or Florida was the type locality. Since the description contains no specific characters, it can be assumed that Say believed that all of the paraiulids which he encountered - and there are several in the area from which his collections were made - to be one species. For these reasons *J. impressus* Say must become a *nomen nudum* as of 1821. *Aliulus bollmani*, nomen novum, is hence proposed for a widely distributed and perhaps the best known Middle Western milliped, to which the trivial names *impressus* and *venustus* have been applied for almost three-quarters of a century.

H. C. Wood (1864, 1865) confused two species of Illinois paraiulids, as pointed out by Hefner (1929, p. 154). In his description of *venustus*, he showed

figures of the male gonopods of *venustus* (1865, p. 197, figs. 26-28) and the female genital apparatus (*ibid.*, fig. 29) of another and more common species. That Wood was aware of some of this confusion is indicated by the following statement:

"It is most probable that *I. venustus*, Wood, is the species intended to be indicated by Mr. Say under the name of *impressus*, although his description is so meagre that it could be applied to other species. The locality would seem to fix it, however." (*ibid.*, p. 197)

C. H. Bollman (1887, p. 34) adequately described the male of the species that Wood had drawn the female genital apparatus of and he designated it as *impressus* Say, but unfortunately he did not realize that two species were represented in Wood's description of *venustus*. He altered his position in a paper published (1893, p. 183) after his brief, brilliant career, in which he stated, but still erroneously, that "the true *impressus* is found in Indiana, Georgia, and Florida, while *venustus* is found in Colorado, Kansas, Minnesota, Michigan, Illinois, and Indiana."

For his study of female paraiulids, Henry W. Brolemann (1922) used specimens obtained through R. V. Chamberlin. His figures 35-42, labelled *venustus* (Wood), are really the *impressus* of Bollman 1887, and figures 35-42, labelled *impressus* (Say), are a species of *Oriulus*.

Williams and Hefner (1928), Hefner (1929), and Causey (1950) applied the trivial name of *impressus* to the species, and Chamberlin (1947) has usually used *venustus*.

Aniulus bollmani is thus to be applied to the milliped which has most often been determined as *Aniulus impressus* (Say), after Bollman, 1887, who described the male, and Wood, 1864, 1865, the female. It is distinct from *Oriulus venustus* (Wood), as clearly indicated by Wood's figures of the anterior gonopods of *venustus*. It can be identified by the coxal lobes of the male gonopods, which are in the form of irregular, chitinous plates, each rolled medially in the vertical plane to form a partially closed tube; also of specific value is the serrated inner curvature of the seminal blade of the posterior gonopods; normally the seminal blades are contiguous medially, but they do not cross each other. The species has been identified by the writer from the following states: Ohio, Indiana, Illinois, Michigan, Minnesota, Wisconsin, and North Dakota; it probably occurs also in Pennsylvania. Its frequent occurrence in fields of corn in dry weather has led to the common name of corn milliped.

Aniulus orientalis, n. sp.

Figures 1-4

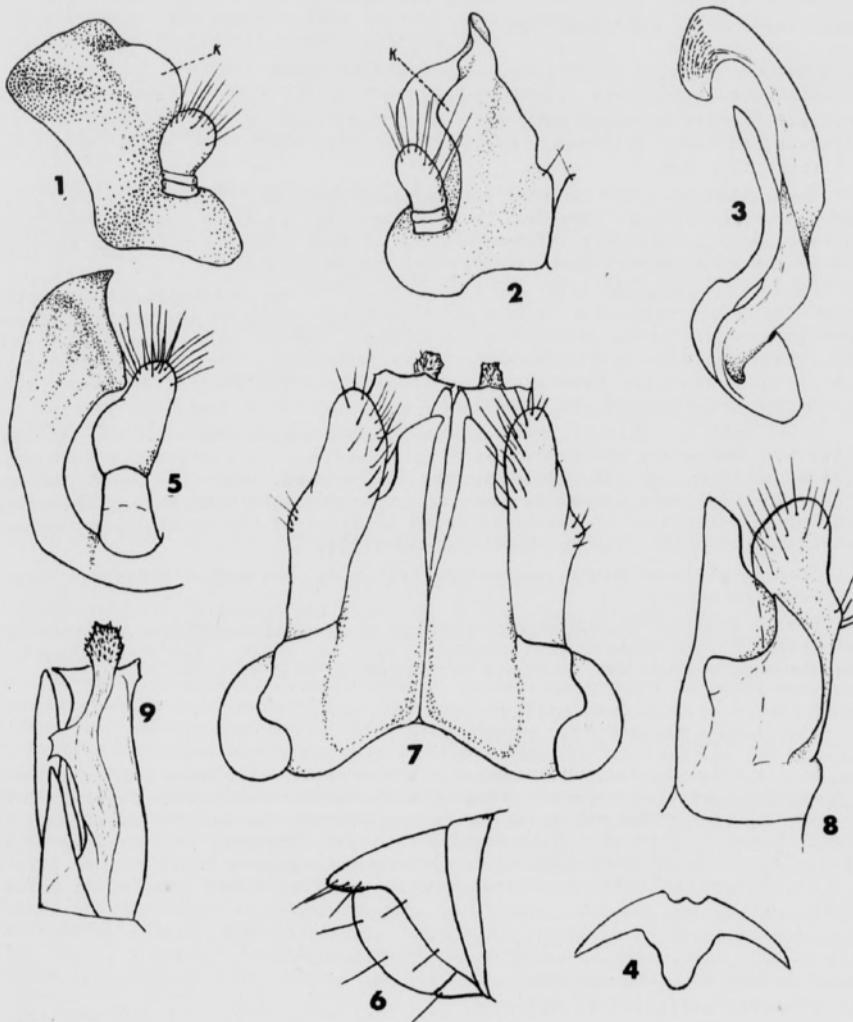
One of the smaller members of the genus, with the male gonopods nearest those of *An. bollmani*; distinguished from *bollmani* by the absence of serrations along the inner curvature of the seminal blades and by the coxal lobes, which together form a single cuplike-like structure, much as in *A. adelphus* Chamberlin 1940, rather than two open tubes.

Male holotype.--Lateral margins of collum wide and straight, each with one entire sulcus and a partial one. Vertical segmental sutures about the diameter of the pores from the pores and weakly curved. Anal spine straight, extending slightly beyond anal valves. Sternal plate of eighth segment triangular, extending almost to the posterior margin of the anterior gonopods (Fig. 4).

Femur of anterior gonopods of the usual shape and size; coxal lobe relatively larger than in *bollmani*, laminate, roughly rectangular, with a keel on the antero-lateral surface (Figs. 1, 2, k), the mesial surface smooth and concave. Each posterior gonopod (Fig. 3) consists of a flattened seminal blade, sigmoidally curved, and of a shorter accessory blade. *In situ* the coxal lobes are almost vertical, the two forming a single large cup, open ventrad and caudad, around the posterior gonopods; the seminal blades are subvertical, contiguous, or approximately so near their apices, and the accessory blades probably cross at the middle as in *adelphus*.

Diameter 1.5 mm.

Locality probably Durham, North Carolina; 2 males collected Dec. 9, 1939; N. Causey.



Explanation of Figures

Aniulus orientalis, male paratype.

- Fig. 1. Left anterior gonopod, lateral view; k, keel on coxal lobe.
 Fig. 2. Same, cephalic view.
 Fig. 3. Right posterior gonopod, mesial view.
 Fig. 4. Sternal process of eighth segment.

Aliulus rugosus (Bollman), male.

- Fig. 5. Left anterior gonopod, lateral view.

Uroblaniulus stolidus, male holotype.

- Fig. 6. Posterior segments.
 Fig. 7. Gonopods, ventral view.
 Fig. 8. Left anterior gonopod, dorsal view.
 Fig. 9. Left posterior gonopod, dorsal view.

Genus *Aliulus*

Causey 1950. Proc. Ark. Acad. Sci. 3:1.

Aliulus rugosus (Bollman)

Figure 5

Parajulus rugosus Bollman, 1887, Ent. Amer. 3:81 (Myr. N. A., 70, 105).

P. rugosus Bollman. Williams & Hefner, 1928, Ohio Biol. Sur. Bull. 18, p. 127, figs. 19C, 20A.

The following notes on this rare species were made from a male of 56 segments, diameter 2.6 mm, from Owen Co., Indiana, and from two females from Putnam and Calhoun Cos., Illinois. Determination of both sexes is made with some reservation until specimens from Pennsylvania can be studied.

Posterior gonopods very similar to those of the genotype, *Al. carrollus* Causey 1950, but instead of a minute subterminal tooth on the seminal blades, there is a minute notch in the ventral margin. Seminal blades contiguous medially, where they are flattened vertically; just behind the coxal lobes the end of each turns abruptly laterad and horizontally. The shorter accessory blade follows the curvature of the seminal blade.

Coxal lobe of anterior gonopods simple, subtriangular in outline, thickened at the tip and along the posterior margin, and with a distinctive horizontal ridge ectad (Fig. 5). The broad surface of the coxal lobe is outward, and both it and the femur are almost perpendicular to the main body axis. This is in contrast to *carrollus*, in which the broad surfaces of the coxal lobes are horizontal and the cleft ends are contiguous medially.

Sternal piece of eighth segment of male wide, the medial extension tongue-like as in *carrollus*.

Female genital apparatus very similar to that of *carrollus*, with the ventral margin of the synoperculum unusually wide and rough. The sternites of the third segment are cut off obliquely and higher up than in other paraiulids.

Genus *Illius*, emend.

Causey 1950, Proc. Ark. Acad. Sci. 3:47.

In the original description of this genus is the statement that "the posterior gonopods have no separate accessory blade, that structure probably being represented by a ridge which arises at the base of the lateral surface of the seminal blade." This should be emended to read: Proximal half or more of accessory blade fused with seminal blade, appearing as a ridge on the lateral surface; the distal region of accessory blade simple and free as in related genera.

Illius illinoensis

Causey 1950, *ibid.*, figs. 13-17.

In males collected in Jefferson and Yell Cos., Ark., the free portion of the accessory blade has a diameter of about one-third that of the seminal blade at the point where they diverge; the accessory blade continues ventrad vertically, the apex reaching slightly below the lowest level of the outer curvature of the seminal blade. These specimens differ slightly from the holotype in that the coxal lobes are a little longer and are without the slight undulations in the lateral margins.

Genus *Uroblaniulus*

Uroblaniulus Attems. Chamberlin and Hoffman, 1950, Nat. Hist. Misc., No. 71, 6.

Uroblaniulus stolidus, n. sp.

Figures 6-9

This species is near *dux* (Chamberlin 1914). It differs from *dux* in that the femora of the anterior gonopods are not broad, the femora and coxal pieces are almost of the same length, and the coxal pieces do not "enlarge again a little," nor are they "distally subtruncate;" unlike *dux*, the posterior gonopods do extend beyond the anterior. Anal spine shorter than in any other species of the genus and not curved.

Male holotype. - Lateral margin of collum with three entire sulci on one side and two on the other. Eyes subtriangular, ocelli in 6 rows, 9 or 10 to 3 ocelli in each row. Anal spine stout and short (Fig. 6).

Femora of anterior gonopods weakly clavate, setae arranged in two areas (Fig. 7). Coxal pieces slightly excavated medially, abruptly narrowed distad, the apices obliquely truncate and almost as long as femora. Dorsally the coxal pieces have the usual lateral and medial folds (Fig. 8), the shape distinctive for the species.

Each posterior gonopod consists of four longitudinal pieces (Fig. 9): ventrad are the medial, narrow piece and the lateral main piece with its distal margin almost straight; dorsad are the medial, short piece and the long column, which is longitudinally striate, finely pubescent distally, and the longest piece of the four. In ventral view the posterior gonopods are visible between and beyond the anterior.

Diameter 1.6 mm., 46 segments, last 3 legless.

Type locality. - Peninsula State Park, Door Co., Wisc.; one male Sept. 29, 1951; Dr. and Mrs. H. W. Levi.

Several specimens of *U. immaculatus* (Wood) were collected by the Levis the same day from the same general locality.

Genus *Ptyoiulus*, emend.

Chamberlin 1940, Bull. U. Utah 30 (11):15.

In all known species the posterior gonopod has a basal accessory branch.

Ptyoiulus ectenes (Bollman)

Parajulus ectenes Bollman, 1887, Proc. U. S. Nat. Mus. 10:617 (Myr. N. A., 34).
Ptyoiulus coveanus Chamberlin, 1943, Bull. U. Utah 34(6):10, figs. 24-25.

When Bollman wrote that the male genitalia of *ectenes* are entirely different from those of *pennsylvanicus* (Brandt), he obviously meant to imply only that the two species are separable on the basis of the genitalia. Specimens of *ectenes* from Raleigh and Durham, N. C., correspond with Bollman's description of the types except that the anal spine passes beyond the anal valves, as in other species of the genus. The gonopods are distinguished from those of *pennsylvanicus* and *georgiensis* Chamb. 1943 collected at Hockaway, N. J., and Blount Co., Ala., respectively, principally by the type of setae on the femora, the shape of the corolla, and the shape of the posterior gonopods. The setae on the ventral surface of the distal region of the femora are, in *pennsylvanicus* and *georgiensis*, of two types: medially there is an area of evenly short, fur-like setae; laterad the setae are of uneven length, but longer; between the two areas is a short, longitudinal, glabrous ridge. In *ectenes* there is no fur-like area, the setae are of irregular length, and there is no longitudinal ridge. The corolla differs from that in other species in that it is smaller, flares less, it is not striated, the margin is not serrated, and it is cut away to the base dorsally; inside the corolla, the apex is blunt rather than sharp and hooked. The main piece of the posterior gonopods differs from that in other species in that the distal enlargement is smaller; the crook shown by Chamberlin (1943, fig. 25) appears when the piece dries. In *ectenes* the lateral margin of the distal half of the penial plate are concave; in other species they are convex.

Specimens of *ectenes* in the collection of the Illinois Natural History Survey are from Goodlettsville, Tenn., and from Pope, Hardin, and Gallatin Cos., Ill. Diameter of adult specimens is from 1.5 to 1.7 mm.

