

***Branneria bonoculus*, n. sp., a second species in the North American milliped family Branneriidae (Diplopoda: Chordeumatida: Brannerioidea)**

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Abstract

Branneria bonoculus, n. sp., is described from southwestern Arkansas (USA) as the second species in its genus and family. Some misinterpretations of branneriid gonopods are corrected, and the composition of the superfamily Brannerioidea is briefly discussed. New figures of the gonopods of *Branneria carinata* (Bollman) are presented.

Key words: Milliped, Diplopoda, Chordeumatida, Branneriidae, *Branneria bonoculus*, *Branneria carinata*, taxonomy, United States, Arkansas

Introduction

The diplopod order Chordeumatida is replete with monotypic taxa, so it is a pleasure to add a species to a genus and family that since 1893 has included a solitary member. Recently, I also discovered a second species (Shear, in press) in the previously monotypic genus *Apterourus*, the only genus in the family Apterouridae (Loomis, 1966). The broader significance of both of these discoveries is that even casual collecting of the litter fauna in what might be thought of as well-collected regions can turn up new taxa of fundamental interest. For chordeumatidans, the importance of collecting at the right time of year is also becoming obvious. Many chordeumatidans are active only in the cooler, wetter winter months, when few collectors are abroad. The new *Apterourus* was taken in a pitfall trap left out from November to February in California, and the species described below was collected in Arkansas in February. More evidence for the desirability of winter collecting has come in the form of a virtual bonanza of new chordeumatidan taxa from the state of Washington, USA, which will be described in a forthcoming series of papers.

The minute, soil-and-litter-dwelling milliped *Craspedosoma carinata* was first described by C. H. Bollman in 1888, from material taken in Jefferson Co., Tennessee. By 1893, Bollman had realized the distinctiveness of his species and placed it in a new genus, *Branneria*. Only a few years later, Cook (1896) raised the taxon another level by establishing the Family Branneriidae; the year before, Cook and Collins (1895) provided a new illustration and descriptive notes. No further notice of the species was taken in print for 75 years, when it was redescribed by me (Shear, 1972) in the context of a review of the North American chordeumatidan fauna. The gonopods were studied and illustrated for the first time, and new records established the distribution of the species in the southeastern states from Tennessee in the north to the Florida panhandle in the south, and from southern Mississippi in the west to central Georgia in the east.

Examining a collection of millipeds at the University of Arkansas Arthropod Museum in Fayetteville, my colleague Rowland Shelley noted a very small chordeumatidan milliped that appeared to represent a new taxon at some level. He asked the curator of the collection, Jeffrey K. Barnes, to send it to me. Close examination revealed that the specimen was a mature male *Branneria*, but clearly not *B. carinata*, a species in which the males have only 26 trunk segments--the Arkansas specimen has 28, as well as different pigmentation and more numerous, 'better' ocelli. A detailed comparison of the gonopods of the suspect new taxon with those of *B. carinata* confirmed that it was a new, and second, species in the genus, as well as representing a significant range extension.

The gonopod complex of branneriids involves legpairs 8, 9, and 10. The gonopods proper are formed from legpair 8, while pairs 9 and 10 have modified coxae and substantially reduced telopodites. My discussion of the gonopods in 1972 was based on what has subsequently proven to be an erroneous assumption: that telopodite elements participate in the formation of chordeumatidan gonopods (vestigial telopodites are found in some chordeumatidans). What I called the telopodite in 1972 should now properly be referred to as the *colpocoxite*, homologous to the extruded and sclerotized coxal gland. The remainder of the gonopod is *angiocoxal*, representing modifications of the body of the coxa itself and the margin of the pore of the coxal gland. Viewed in this light, the following amended description of branneriid gonopods is presented.

The gonopod sternum (*s*, Figs. 1, 4) is a simple, arcuate plate to which the gonopods are attached by a flexible membrane; no coxosternum is developed. The coxae (*c*, Figs. 1, 4) are at least partially fused along the median line, the fusion being more obvious distally, and bear flat, plate-like angiocoxal processes (*a*, Figs. 1, 4). The pattern of coxal setation seems quite regular in both known species, with lateral groups of 5 setae each, mesal groups of 3, and a single seta subterminal on each of the angiocoxal processes. The colpocoxite is two-branched, with an anterior, digitiform branch (*ac*, Figs. 1, 4) and a long, posterior flagelliform branch that is sinuously curved (*pc*, Figs. 2, 5).

Legpair 9, sometimes (but erroneously in this case--these appendages have no role in sperm transfer) called the posterior gonopods, consists of two coxosterna (*cxs*, Figs. 2, 5)

separated in the midline; from each of these a coxal lobe arises (*cl*, Figs. 2, 5) which bears a coxal gland (*cg*, Figs. 2, 5). The telopodite is reduced to two articles, the basal of which is presumably the prefemur; the tiny distal article may be the coalesced remains of the rest of the telopodite. Legpair 10 is also strongly reduced, but the sternum (*s*, Figs. 3, 6) is separate from the coxae (*c*, Figs. 4, 7). The coxae are large, contiguous, or even fused, and carry a coxal gland (*cg*, Figs. 3, 6). The telopodite articles are roughened, with distinct triangular tubercles. If the present illustrations and description are compared with those I published in 1972, it will be seen that in that earlier paper I switched the two legpairs. This was probably because I assumed that there could not be coxal glands on the “posterior gonopods (legpair 9)” and in fact missed the glands present on the real legpair 10—they are not entirely obvious. Legpair 11 in both species has slightly enlarged coxae, but I was able to detect a gland only in *B. bonoculus*. In both species, the eleventh, but not subsequent, coxae have sharp tubercles like those on the telopodite articles of legpair 10.

In situ, the gonopods are inclined posteriorly, lying between the telopodites of the ninth legpair, with their tips in contact with the coxa of legpair 10. The small gonopods and the extreme reduction of the two legpairs following create an obvious gap in the leg series and make it easy to spot males of *Branneria*.

As I illustrated in 1972, the outermost of the 3 segmental setae on each side of the metazonite is on the posterior side of a large tubercle, giving the effect of a paranotum, and the segmental setae themselves are blade-like. The sculpture of the metazonites is not exactly represented in that drawing; instead of irregular rugae, it really consists of short, sharp-edged, parallel ridges very much like those found in species of *Tingupa* (Tingupidae).

For illustration purposes, parts of specimens were mounted in glycerine on microscope slides. All drawings were made at 400X magnification, using a camera lucida attachment on an Olympus BX50 microscope with Nomarski differential interference contrast.

Taxonomy

Family Branneriidae Cook 1896

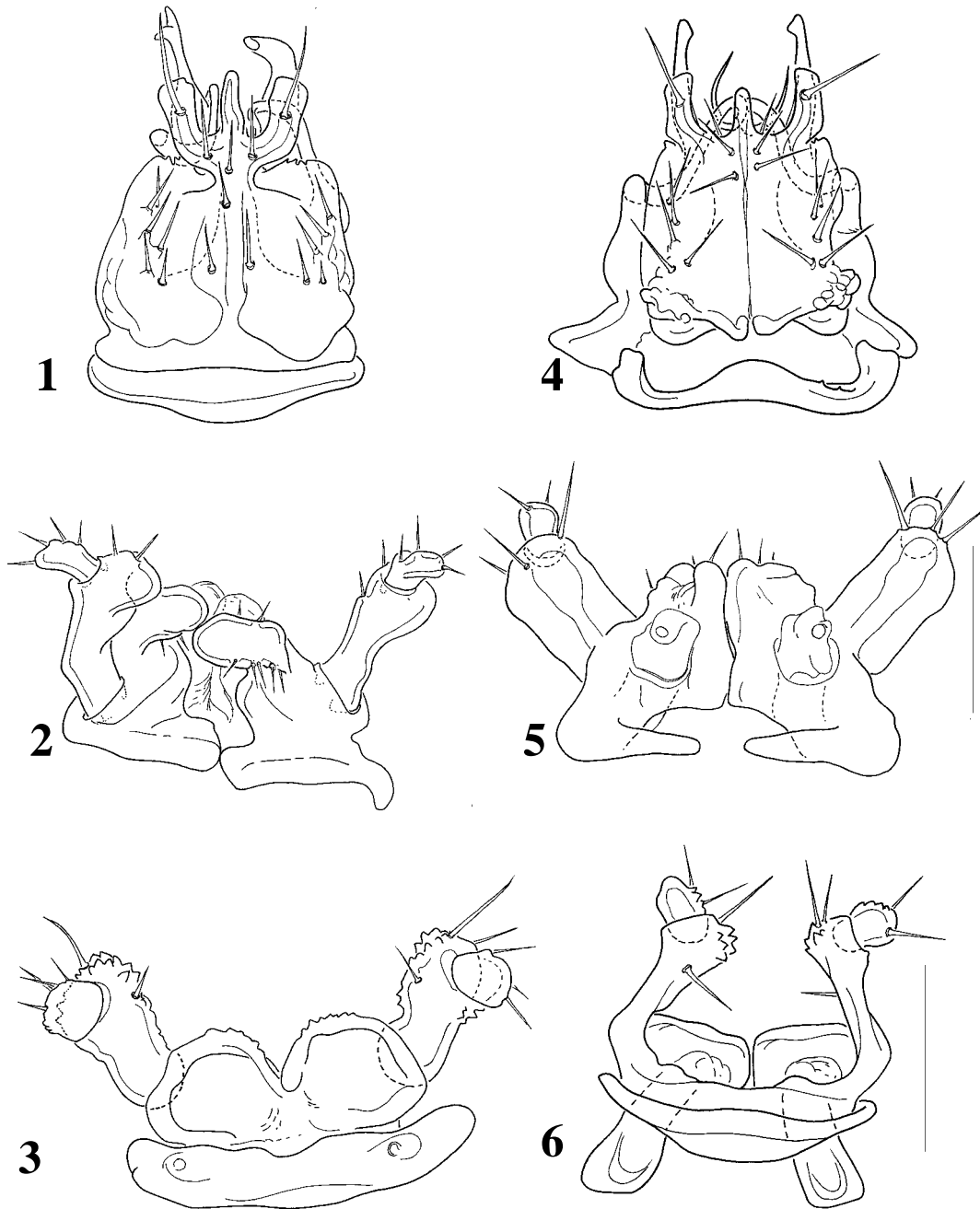
Branneria Bollman 1893

Branneria bonoculus n. sp.

Figs. 1-3

Diagnosis: Distinct from *B. carinata*, its only congener, in having 28 trunk segments in the male, rather than 26; and in differences in the gonopods and ninth and tenth legs, discussed below.

Holotype: Male from Nevada Co., Arkansas, without further details, collected 25 February, 1977, collector unknown. Deposited in the collection of the Field Museum of Natural History, Chicago, Illinois, USA.



FIGURES 1-6. *Branneria bonoculus*, n. sp., 1-3. 1, gonopods, anterior view. 2, ninth legpair, anterior view. 3, tenth legpair, anterior view. *Branneria carinata* (Bollman), 4-6. 4, gonopods, anterior view. 5, ninth legpair, anterior view. 6, tenth legpair, anterior view. Scale lines = 0.1 mm (100 μ).

Etymology: The species name, a noun in apposition, is a Latin neologism, 'good eye' and refers to the better developed ocelli, compared to *B. carinata*.

Description: Male of head and 28 segments, about 4.0 mm long (specimen broken), 0.4 mm wide. Head subglobose, with eleven round, well-developed, pigmented ocelli in rows in triangular eyepatch. Antennae short, reaching only midpoint of trunk segment 2 when extended, clavate, article 4 nearly twice as wide as article 3. Trunk segments with well-developed paranota, outer segmental seta inserted on posterior angle of paranotum, middle seta on distinct tubercle just above and posterior to paranotum. Metatergal sculpture of short, sharp-edged ridges, irregularly, sparsely distributed, but in a distinct row at posterior margin of segment. Color dark brown, metaterga with symmetrical darker brown patches. Legpairs 3-7 slightly shorter, stouter, than legpairs posterior to legpair 12.

Gonopods (Fig. 1) typical of genus. Sternum (*s*) bandlike, lacking spiracles. Coxae (*c*) rounded, somewhat rugose laterally, with two groups of 5 lateral setae, basalmost median setae proximal to coxal midpoint. Angiocoxal process (*a*) set off by deep constriction, median part about as long as lateral branches; lateral branches flattened, slightly diverging, squared at tips, with subapical setae. Lateral lobes of coxae lamellate, thin, with a few irregular teeth. Colpocoxite with two branches, anteriormost robust, curved, with subdistal tooth, posterior branch flagelliform, looping first anteriorly, then posteriorly between anterior branches.

Legpair 9 (Fig. 2) with separate coxosterna (*cxs*) bearing coxal lobes from which eversible glands proceed. Prefemora with smooth cuticle, distal median lobe; distal article about 1/5 size of prefemur, bearing 3-5 setae. Legpair 10 (Fig. 3) more robust than legpair 9, sternum (*s*) separate from coxae (*c*), coxae evidently fused, anteriorly excavate or depressed, but gland not detected. Prefemora distally with acute tubercles; small distal article with few similar tubercles. Legpair 11 with slightly enlarged coxae bearing small eversible glands and acute tubercles; telopodites of normal size. Subsequent legpairs unmodified.

Discussion: I compared the single available specimen of *Branneria bonoculus* side-by-side with males from a large sample of *B. carinata* taken at Torreya State Park, Liberty Co., Florida, USA, and with other specimens from throughout the range of the latter species. Aside from the immediately obvious difference in segment number, *bonoculus* was distinctly darker in pigmentation than any *carinata* specimens--the Florida collection was almost unpigmented. Nearly all *carinata* have 9 ocelli on each side of the head, usually rather poorly formed, poorly pigmented and slightly separated from one another, while *bonoculus* has 11 large, round, well-formed, darkly pigmented and contiguous ocelli. No additional nonsexual differences were evident.

The gonopods, while fundamentally similar, show significant differences (compare Figs. 1 and 4). The coxal setae have a different arrangement, with the basalmost median seta in *carinata* well distal to coxal midlength, while in *bonoculus*, it is proximal. Both species have 6 setae in the median group, but in *bonoculus*, the middle pair is displaced;

this might be an anomaly of the single specimen. The deep constriction at the base of the angiocoxal process, the stronger fusion of the coxae, and the broader, toothed angiocoxal lobe are all significant characters of *bonoculus* as opposed to *carinata*, where the constriction is far less pronounced, the coxae have a suture along the midline, and the angiocoxal lobe is small. The anterior colpocoxal processes are significantly more robust in *bonoculus*, but the flagelliform posterior branch seems about the same in both species.

Legpair 9 (compare Figs. 2 and 5) prefemora are stout, only about 3 times as long as wide in *carinata*, and about 4-4.5 times as long as wide in *bonoculus*. The relationship is reversed in the tenth legpair (compare Figs. 3 and 6), where *bonoculus* has stouter prefemora with much more obvious tubercles; the coxae of these legs are more heavily sclerotized in *bonoculus* and seem fused (or partly so) in the midline; the coxae have obvious glands in *carinata*, but I could not detect them in *bonoculus*. Coxae 11 of *bonoculus* have readily visible glands, but these are perhaps absent in *carinata*.

Trunk segment numbers are fixed within species in the milliped order Chordeumatida, but range between 26 and 32 through the order. Thirty-two segmented species are found only in the suborder Heterochordeumatidea; the most common number in the order as a whole is 30. Is it not unusual for males to have two fewer segments than females, the most frequent pattern being 28-segmented males and 30-segmented females. Twenty-six segments is uncommon and found only in a relatively few, very small, species. Two cases are known in which the fixed number is not an even number; in both there are 29 trunk segments. Reduction of segment number seems to be adaptive, since lower segment numbers are generally correlated with small size, and, as in the present case, it sometimes happens that species obviously closely related (with similar male gonopods) have different numbers. In the large genus *Diplomaragna* (Diplomaragnidae), species are found with 32, 30, 28 and even 26 segments (Shear, 1990; pers. obs.)

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