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Cabraca unigon, n. gen., n. sp., a remarkable
new cleidogonid milliped from Mexico
(Chordeumatida: Cleidogonidae)

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ABSTRACT

The new genus and species *Cabraca unigon*, based on specimens from Tamaulipas, Mexico, is distinct from all known cleidogonids by the strongly reduced posterior gonopods which consist of a single, undifferentiated, podomere.

INTRODUCTION

When I revised the Family Cleidogonidae in 1972, I reduced the number of generic names in the family from nineteen to five. Most of the synonymized genera were monotypic and had been based on species that at the time seemed distinct, but later, in the context of our knowledge of a wider range of species, proved only to be somewhat peripheral to larger generic units. Nonetheless, the numbers of species in each genus remain quite unbalanced, with thirty-eight species in *Pseudotremia* and about fifty in *Cleidogona*, but only eight in *Tiganogona*, three in *Dybasia* and two species in *Solaenogona*. However unequal their content, these genera stand as well-defined and distinct (see the diagnoses in my 1972 paper). A character which proved exceptionally reliable in grouping species into genera was the form of the posterior gonopods. These appendages represent the ninth pair of legs of the males and evidently play no role in spermatophore transfer, simply being reduced in size in order that they might not interfere with the action of the anterior gonopods, elaborate and highly reduced eighth legs which actually transfer spermatophores. This is also true of the related families Trichopetalidae and Entomobielziidae, but in the Cleidogonidae, the posterior gonopods have developed a secondary function. The enlarged and lobed coxae of these

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appendages firmly lock the telopodite processes of the anterior gonopods in place, providing support and protection for these structures, a development paralleled in other milliped groups, but in quite different ways. This functional change provides an excellent synapomorphy serving to unite the members of the family. The form taken by the coxae of the posterior gonopods and the distal segments of the appendage differ in each genus, but provide distinctive suites of characters uniting the species having them. For instance, in *Cleidogona* the posterior gonopod coxa itself is enlarged but cylindrical, with a basal lobe which may in some species be drawn out as a long process, and the prefemur is enlarged and usually nearly deltoid in outline. The more distal segments are highly reduced. In *Tiganogona* the coxae are swollen, globose and complexly lobed, while the posterior gonopod sternum bears a strong knob; the locking function is most highly developed in this genus. The telopodite segments are all reduced in size. In the related genera *Pseudotremia* and *Solaenogona*, the coxae are enlarged and knobby, but the femora remains more or less cylindrical. The distinctions between these latter two genera are to be found in the structure of the anterior gonopods.

Recently James Reddell of the Texas Memorial Museum, Austin, Texas, and the Association for Mexican Cave Studies, sent me a large collection of Mexican millipeds, including both cave and surface species. In dissecting what appeared to be a routine new species of *Cleidogona*, I was utterly astonished to find posterior gonopods completely different from any described in the family. They consist of a **single, large segment, strongly modified, and have lost entirely the locking function** typical of the family. This development is so distinct, such a striking autapomorphy, that even pending the discovery of other related species it demands recognition with its own generic name. Fully aware of arguments against monotypic genera, I think in this case the procedure is justified.

In a pivotal paper, Eldredge and Gould (1972; see also Gould and Eldredge, 1977) have proposed a concept which is rapidly gaining recognition among evolutionary biologists. Succinctly stated, the principal of "punctuated equilibria" attempts to explain the long-term stability of taxa and their sudden appearance in the fossil record by showing that the origin of such groups is in small, peripheral populations which evolve rapidly due at least in part to the impact of sampling error and the increased likelihood of the rapid spread of new gene combinations and mutations. It seems to me that if instances are sought outside the fossil record, millipeds provide excellent ones. For example, the large Appalachian xystodesmid tribe Apheloriini has long been known to consist of one or a few highly speciose genera and several peripheral monotypic ones, or in a few cases genera with but a handful of species. Similarly, the situation described in the paragraphs above for the Cleidogonidae intimates the same explanation—small groups of distinctive related species that have originated as peripheral isolates of larger genera. And, in the Cleidogonidae, these small genera are biogeographically coherent and peripheral as well (see the spot maps in Shear, 1972). Under such conditions, it is to be expected that some of the satellite groups of larger genera will be monotypic. To deny them designation as genera when the anatomical gaps between them and their putative ancestral genus are of the same magnitude as such gaps elsewhere would be to conceal rather than to mirror evolution in our classification. Therefore I think it entirely justified under such circumstances to describe a monotypic genus, and reject the narrow philosophical argument put forward by Platnick (1976), an argument from which he has also retreated somewhat (Platnick, 1977).

Shear: *New Cleidogonid Milliped*

Cabraca, new genus

Type Species: *Cabraca unigon* Shear; genus monotypic.

Diagnosis: Distinct from all other cleidogonid genera in the form of the posterior gonopods (fig. 3), which consist of a single segment on each side, showing little or no indication of their derivation from reduced legs.

Description: With the characteristics of the family (see above, also Shear, 1972). Segments dorsally smooth, evenly cylindrical, but base of outer segmental seta slightly protruding in males. Segmental setae small, acute. Sides of segments without prominent striations. Pregonopodal legs of males: legs 1 and 2 slender, 6-segmented; legs 3 through 7 increasingly crassate, prefemora and femora especially enlarged and curved mesally, prefemur with strongly produced mesoapical corner, this most prominent on leg 7 (fig. 6), coxa of leg 7 largely unmodified. Anterior gonopods (figs. 1, 2) highly derived; sternum and coxal bases fused, sternum mesally produced between gonopod coxae, lateral sternal sclerites very distinct. Coxae relatively small, densely setose, widely separated. Colpocoxites mesally fused, thick at base but rapidly attenuated to transparent lamellae bearing posterior densely fimbriate ridge; spermatophore held between this ridge and outer rim of colpocoxite. Telopodites small, basally fused, evidently not movable. Posterior gonopods (fig. 3) with sternum well-developed, produced mesally between gonopods, with strong lateral flanges. Gonopods consisting of a single segment with apical groups of strong, ensiform setae. Tenth and eleventh legs with elongated coxae bearing glands; twelfth sternum with median projection extending anteriorly between tenth and eleventh coxae. Female cyphopods (fig. 5) with postgenital plate absent, mesal valves with posterior serrate lamella.

Distribution: Tamaulipas, Mexico.

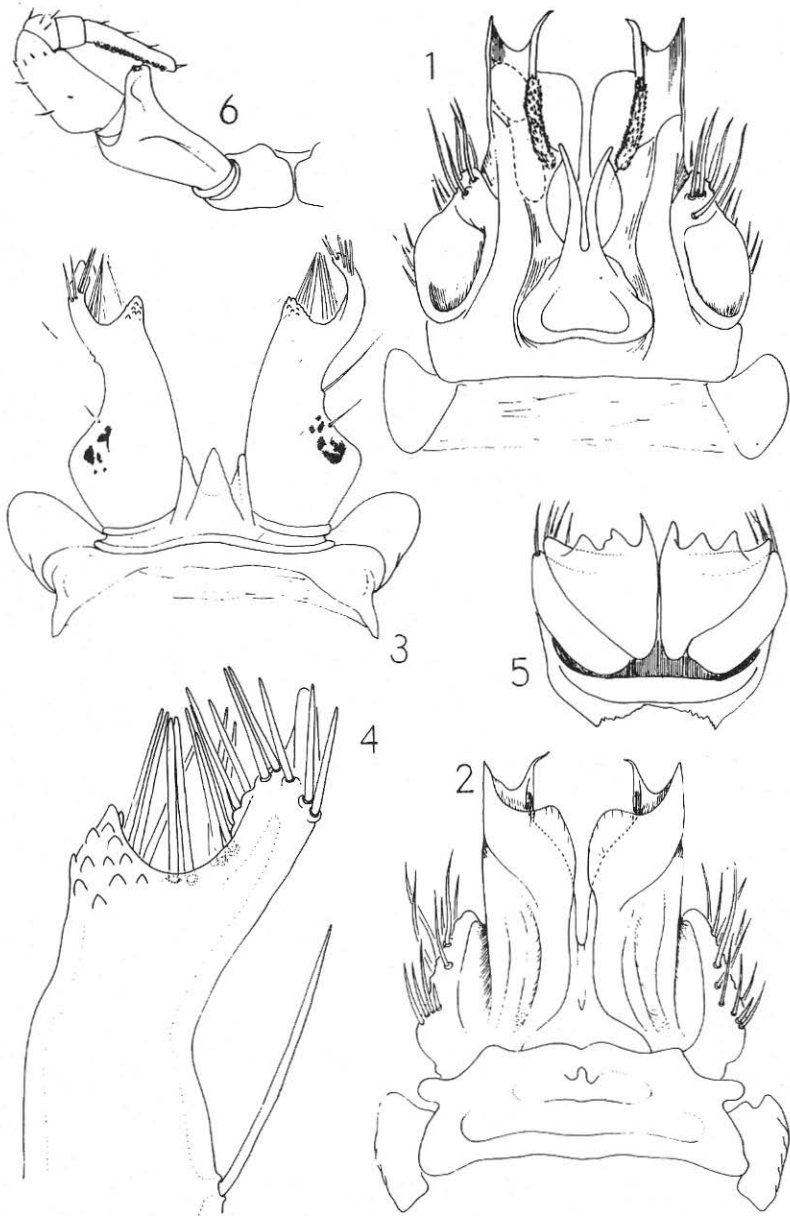
Cabraca unigon, new species. (Figs. 1-6).

Types: Male holotype and female paratype from Ejido ("public land") Yerbabuena, Tamaulipas, Mexico, collected 22-24 March 1979 by T. Treacy and D. Pate. Specimens deposited in the American Museum of Natural History, New York.

Etymology: *Cabraca* is a figure from the great Mexican epic, *Popul Vuh*. The second son of the evil Vucub-Caquix, *Cabraca* was tricked and killed by the twins Hunapu and Ixbalanque. As a generic name, *Cabraca* is masculine. The specific epithet *unigon*, a noun in apposition, refers to the uniaarticulate condition of the posterior gonopods.

Description: Male holotype 13.2 mm long, 1.61 mm wide. Ocelli 27-29, well-formed, pigmented, in triangular eyepatch. Antennae normal for family, but penultimate segments slightly swollen when compared to female. Coloration as usual for epigeal cleidogonines, pale tan to creamy white infused and marked brownish violet, darker in head region. Segments as described for genus. Anterior

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Figs. 1-6. Anatomy of *Cabraca unigon*. Fig. 1. Anterior gonopods, anterior view. Fig. 2. Anterior gonopods, posterior view. Fig. 3. Posterior gonopods, posterior view. Fig. 4. Tip of right posterior gonopod, posterior view. Fig. 5. Cyphopods, posterior view. Fig. 6. right leg 7 of male, view slightly ventral of posterior.

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gonopods (figs. 1, 2) not deflexed, relatively short and small, sternum strongly produced in midline. Anterior faces of colpocoxites with shallow but well-marked groove, mesally with broad, transparent subapical flange, two short apical processes which are actually blade-like developments seen on edge. Coxae rugose, densely set with setae, deeply excavate on posterior face. Colpocoxites deeply grooved on posterior face, groove or cup formed by incurving apical lamellae (blade-like processes referred to above), the more mesal of these thicker and densely set with cuticular fimbriae. Telopodites small, basally fused. Posterior gonopods (figs. 3, 4) with strong sternum broadly separating gonopods. Coxotelopodite of one segment, basally broad, tapering to shelf-like apex set with four distinct groups of strong, ensiform setae. Coxae 10 and 11 and sternal process 12 as described for genus.

Female paratype 19.5 mm long, 2.03 mm wide. Ocelli 25 in triangular patch, well-formed and pigmented. Pigmentation and segment structure as in male. Cyphopods (fig. 5) with posterior margin of mesal valve bearing prominent crenulations, lacking setae; lateral valve setose. Postgenital structures much reduced. Coxae 2 posteriorly excavate, with large posterior knobs above excavations.

Notes: Aside from the major differences in the posterior gonopods, *Cabraca unigon* departs from *Cleidogona* species in the modifications of the pregonopodal legs and in the slight dimorphism observed in the penultimate antennal segment, though a similar form of dimorphism was noted by Loomis (1959) for *Cleidogona bacillipus* (Chamberlin and Mulaik) of southern Texas and northern Mexico. Also worthy of note is the considerable difference in size between the male and female. Male cleidogonines are usually smaller than females, but this case seems to be the extreme.

As infrequently happens in collections of chordeumatid millipeds, the male of *Cabraca unigon* was captured and preserved just as he prepared to mate, perhaps with the paratype. Thus the coxal glands of legpairs 10 and 11 have produced the characteristic secretion probably used by these millipeds to form up spermatophores. This is, however, the first case I have seen in which a spermatophore is actually being carried by the anterior gonopod; it is shown in dashed outline in fig. 2. The spermatophore consists of two portions, an ovoid mass and short peduncle.

The posterior gonopods of *C. unigon* are so unique as to make it difficult to relate to any other species in the family; they are by far the most strongly modified and retain no trace of segmentation. In the families Cleidogonidae, Trichopetalidae and Entomobielziidae, the posterior gonopods consist of at least two segments, are more or less leglike, and rather obviously have nothing to do with spermatophore transfer.¹ The peculiar form and large size of the posterior gonopods of *C. unigon* suggests that they might be entirely different functionally from those of any other known species in these families. On the other hand, the anterior gonopods are not terribly unusual, though they resemble most closely those of the aberrant *Cleidogona ceibana* of Honduras (Shear, 1972) and an

¹This statement is based on my observations on all known American genera, and on species of *Tianella* from Nepal. Hoffman (1979) has correctly shown that the family name of this latter group should be Entomobielziidae Verhoeff, not Pseudocleididae Attems, the name I used in 1979, while describing new *Tianella* species.

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undescribed trogliphilic species of *Cleidogona* related to *ceibana* from caves near Huehuetenango, Guatemala. I think it unlikely that these latter two species are related to *C. unigon*, since several distinct species groups of *Cleidogona* occupy intervening territory, and, as I stated in 1972, the development of the family has proceeded along independent lines to the north and south in Mexico and Central America.

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