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Autor: Hoffman, Richard L.

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The female of *Cyphocallipus excavatus* VERHOEFF, 1909 (Callipodida: Cypho- callipodidae)

Richard L. Hoffman

ABSTRACT

Contrib. Nat. Hist. 12: 643–649.

The previously unknown female structure of *Cyphocallipus excavatus* (VERHOEFF, 1909) is described and illustrated; this species is remarkable for modification of the 2nd pleurotergum into an acute lobe projecting caudad over the ventrolateral surface of the 3rd, unique in the order if not the class. The 2nd pair of legs is reduced to a vestigial transverse sternum, coxae, and bi-segmented telopodites. Both of these transformations occur during a post-maturational moult in which body size and number of segments are not increased.

Introduction

Southern Spain is known to be inhabited by a variety of faunal elements disjunct structurally or geographically (or both) from their respective taxa. Often the organisms themselves are rarely collected, and may have been originally described in a way that effectively concealed their characteristics; amongst the Diplopoda the genera *Macellolophus*, *Tonodesmus*, *Cyphocallipus*, and *Dorycallipus* come at once to mind; both factors have impacted on the genera just mentioned. Although named in 1909, both *Cyphocallipus excavatus* and *Dorycallipus arcuus* remained essentially unknown for decades, lacking any published representation of genitalic structure of either sex. The true status of *Macellolophus* was not clarified until 1968 (Hoffman & Lohmander 1968) and the gonopods of *Cyphocallipus* were not illustrated until even more recently (Mauriès 1978). Since the characters of the male sex have been so well clarified by Mauriès, I may confine my attention now to the previously unknown female. However, my specimens from Adra will enable a later investigation of the musculature of the complicated gonopods, necessary for a satisfactory taxonomic placement of this genus.

That our fragmentary knowledge of *Cyphocallipus* can now be expanded to include important characters of the female sex is another consequence of the innate generosity of Konrad Thaler. After collecting a series of *C. excavatus* in Almería in 1983, he remembered a casual remark (that I was interested in the classification of callipodids) made by me several years earlier, and promptly presented the material to me. How regrettable, that an investigation was so delayed that he could not see the results of that act of kindness, which are here offered as a small tribute to the memory of a respected colleague and esteemed friend. At least, his good deed will not go unnoticed.

Family Dorypetalidae VERHOEFF

Subfamily Cyphocallipodinae VERHOEFF

Verhoeff's original disposition of these various taxa was impartially maintained in my 1980 classification, but with the advantage of personal experience with both *Dorypetalum* and *Cyphocallipus*, I now believe that inclusion of the three genera *Cyphocallipus*, *Dorycallipus*, and *Lusitanipus* in the same family with the Aegaeon *Dorypetalum* cannot be justified. Until comparative studies of the gonopod musculature have been completed, however, I defer elevation of Cyphocallipodinae to family rank.

Genus *Cyphocallipus* VERHOEFF

1909. *Cyphocallipus* Verhoeff, Sitzungberichte der Gesellschaft naturforschender Freunde zu Berlin for 1909, p. 211. Proposed with a new species. Type species, *C. excavatus* VERHOEFF, 1909, by monotypy.
1910. *Cyphocallipus* Verhoeff, Nova acta Leopoldina: Abhandlungen der Kaiserlich Leopoldinisch-Carolinisch Deutschen Akademie der Naturforscher 92: 396.
1978. *Cyphocallipus* Mauriès, Annalen des Naturhistorischen Museums in Wien 81: 582.

Body with 59–60 segments. Epicranium of males with two small paramedian knobs; facial region concave. Coxal vesicles on 3rd–22nd pair of legs. Gonopods with two apparent (?) sternal elements, coxae elongated, with two parallel coxal processes, telopodites long and arcuate, attached at inner posterior end of coxa and with flagelliform accessory process. Posterior lateral edge of

2nd metazonum of female produced caudal as a large subtriangular lobe over lower side of 3rd. 2nd legs of female greatly reduced.

The genus is presently monobasic, with one species confined to a narrow coastal strip in southernmost Spain, extending some 500 kilometers from Gibraltar to Alicante.

***Cyphocallipus excavatus* VERHOEFF** (Figs. 1–4)

1909. *Cyphocallipus excavatus* Verhoeff, Sitzungberichte aus der Gesellschaft naturforschender Freunde zu Berlin für 1909, p. 211. Type material (present location uncertain) from Algesiras, Prov. Cadiz, Spain.

1978. *Cyphocallipus excavatus* Mauriès, Annalen des Naturhistorischen Museums in Wien, 81: 582, figs. 19–24.

Material: Two males, three females, two immatures, from Spain: Prov. Almería, Adra (36.45 N, 3.01 W), 17 August 1983, K. Thaler leg. (VMNH).

Description: Adult female: length ca 37 mm, maximum diameter ca 2.2 mm, body essentially cylindrical in cross-section, with 59+1 segments, one apodous. Colour in life unknown, at present largely depigmented, metazona dilute testaceous, prozona white. Segmental surface appearing smooth and polished, front of head finely setose.

On collum, all setae except **b** located near anterior margin; all are at mid-length of metaterga on segments 2–4; setae **a** and **c** located at midlength position, **b**, **d**, and **e** on posterior margin on segment 5; all setae posterior on segment 6 and all following.

Collum and 2nd metatergum smooth middorsally, carinae present only on sides; carination complete transversely on segments 3–59, confined to metazona, stricture distinct. 3+3 primary dorsal crests and 2+2 interspaced secondary crests between the ozopores. Superficially, crests appear small and inconspicuous; with magnification, lowest and least defined near stricture, becoming thin and elevated posteriad, primary and secondary crests similar in size and shape, but terminal setae present only on primaries. Ozopores unusually small and inconspicuous, most readily seen on dried specimen, located just dorsad to anterior end of 3rd primary crest, in the shallow groove between it and the 2nd secondary crest. About five primary (setiferous) crests between ozopores and ventral edge of metazona on midbody segments.

2nd segment (Fig. 1) unique in presence of prominent projection of caudal margin into subtriangular lobe that extends nearly to caudal edge of 3rd segment.

Paraprocts divided by indistinct oblique suture line near dorsal third. Hypoproct (Fig. 2) distinctly tripartite, setae on outer division set on small submarginal tubercles.

Everted coxal sacs visible on 3rd to 22nd pairs of legs.

Intersegmental membrane between 1st and 2nd legs with an apparent intercalary sclerite present just anteriad to the greatly reduced 2nd pair (Fig. 3, IS); latter with a rudimentary transverse ?sternal sclerite. Appendages composed of a transverse coxa and two-jointed telopodite (Figs. 3, 4). Cyphopods represented by several small irregular sclerites on each side posterior to 2nd legs, cyphopodal invaginations only poorly developed as tubes of thin membrane. Oviducts without visible oocytes or ova.

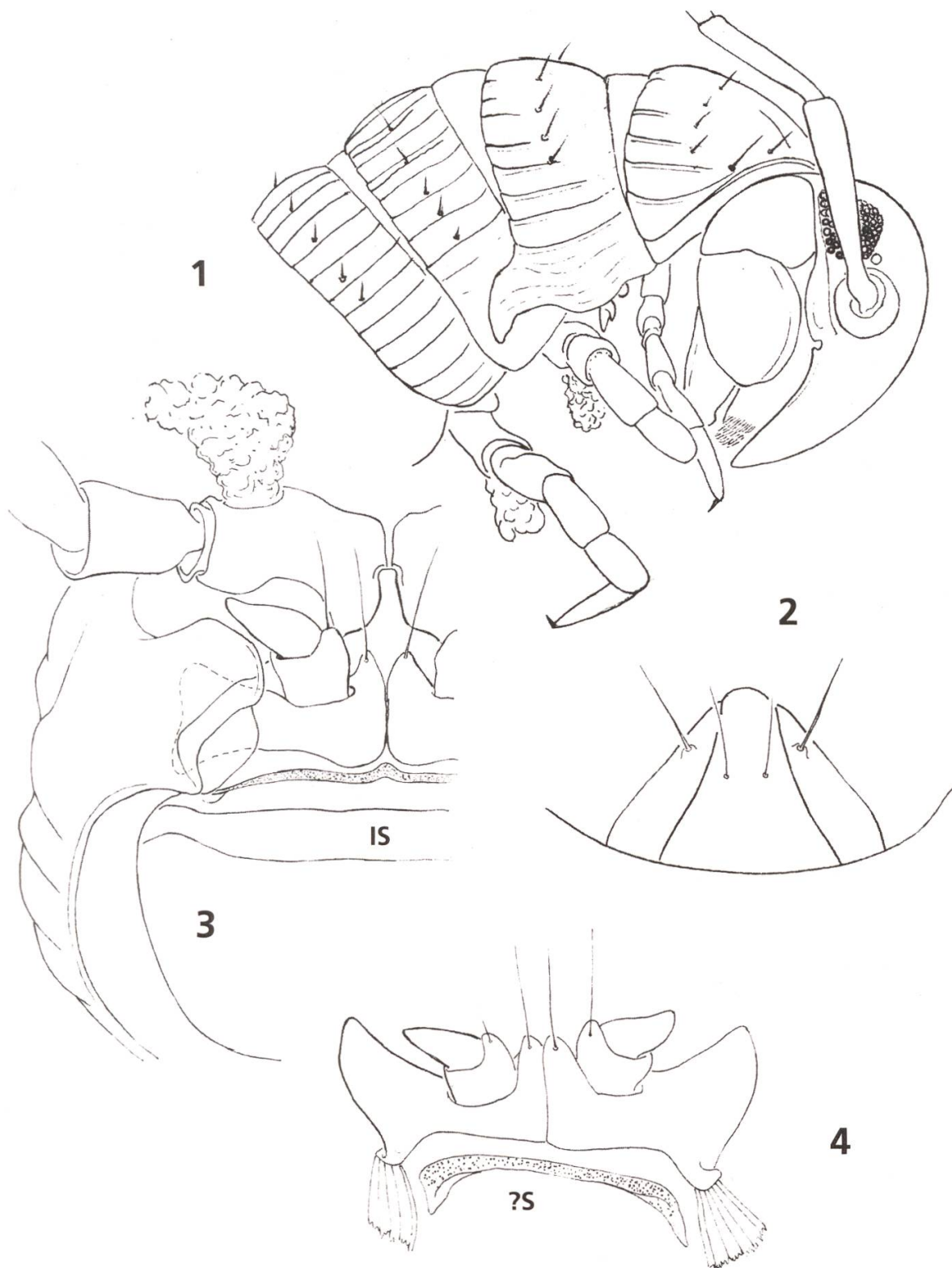
Discussion:

A second adult female, ca 37 mm long, has the same segment count (59+1) as the described female, with which it also agrees in all structural details. A subadult female with 58+1 segments (2 apodous) is ca 30 mm long, the second segment is not modified, segments 2–4 are not enlarged, and 2nd pair of legs is not reduced. An even smaller female (ca 28 mm) has 56+1 segments (2 apodous).

Two observed characters require further examination. The small, thin, transverse element at base of the 2nd legs (Fig. 4, ?S) is topographically the sternal remnant, yet it had no muscular attachments. Muscles however *are* inserted at the lateral ends of the two elements considered to be the coxae of these legs. Do these points of attachment represent the original ends of the sternum, having become fused to the basal podomeres upon de-emphasis of the sternum itself?

The undeveloped condition of the cyphopods is remarkable, granting that the specimen appears otherwise mature. The typical callipodid condition is of a prominent muscular inverted tube extended posteriad in the 3rd segment. Is it possible that in this species at least the tube varies in relative development in response to maturation of oocytes, somewhat analogous to the endometrial cycle in mammals? Examination of females collected at later seasons might provide some insights.

It has been observed on several occasions (Hoffman & Lohmander 1964, Hoffman 1972) that in many species of this order females attain their definitive length and segmentation while sexually immature. During a "maturational molt" the 2nd–4th rings are enlarged, the 2nd pair of legs is drastically reduced, and ovipositors become functional. I am not sure that Verhoeff was aware of this curious metamorphosis, which occurs in many of the genera that he placed in his keys under the heading "2. Beinpaar der Weibchen vollkommen



Figs. 1-4. – 1: Head and body segments 1-4, lateral aspect; – 2: Hypoproct; – 3: Right side of 3rd segment, anterior aspect, showing greatly reduced and modified appendages of the 2nd pair of legs. IS: intercalary sclerite. Lateral end of basal podomere concealed behind the pleurotergal lobe shown by dotted line. Presumed sternal remnant stippled; – 4: Reduced 2nd pair of legs, drawn from oblique anteroventral aspect, thus appearing foreshortened and differing in relative shapes from the same structures in Fig. 3. ?S: presumed sternum of these legs.

ausgebildet". One may speculate that virtual disposal of the 2nd pair of legs is another facet of the diplopod tendency to condense the anterior segments: making room as it were in response to functional needs.

I have been unable to locate the original type material. During the first decade of the 20th Century, Verhoeff was active in the Berlin museum, where many of his early type series are deposited. But no types of *Cyphocallipus* are documented in the type catalog of Moritz & Fischer (1973), nor could I locate any during several personal searches. He must have had a series, having given a range in segment number for *C. excavatus*, and presumably also females since he placed the genus in a taxon characterized by having normally formed 2nd legs in that sex. There is a sample of this species – at least a *Cyphocallipus* – in the Verhoeff Collection in the Zoologische Staatssammlung, München, but collected at Alicante, Spain, much later than the types of *excavatus*. The identity of this material is uncertain, as Verhoeff dismembered the complex gonopods and dispersal of the fragments through the preparation makes comparison difficult.

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Address of the author:

Prof. Dr. Richard L. Hoffman
Virginia Museum of Natural History
21 Starling Avenue
Martinsville, VA 24112, USA

