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THE AMERICAN SPECIES OF *ESCARYUS*, A GENUS OF HOLARCTIC CENTIPEDS (GEOPHILOMORPHA: SCHENDYLIDAE)

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ABSTRACT

Eight North American species of *Escaryus* are regarded as valid. A historical summary is provided for the genus, as well as observations on the taxonomic significance of various characters heretofore utilized to distinguish genera of schendylids. Known Palearctic taxa are listed. *Escaryus ethopus* Chamberlin, *E. liber* Cook & Collins, *E. missouriensis* Chamberlin, *E. monticolens* Chamberlin, *E. paucipes* Chamberlin, and *E. urbicus* (Meinert) are redescribed and figured from type material and/or additional specimens. *Escaryus delus* Chamberlin is considered to be a junior synonym of *E. ethopus*. *Escaryus cryptorobius* and *E. orestes* are described as new species, both from Whitetop Mountain, Virginia. *Escaryus japonicus* is removed from the North American list, the Alaskan specimen upon which Chamberlin's 1952 record was based having been found to be an individual of *E. ethopus*.

Examination of type material of species thought possibly referable to *Escaryus* shows that the nominal genera *Lionyx* Chamberlin 1960 and *Zygona* Chamberlin 1960, originally proposed in the Schendylidae, must be referred instead to the Geophilidae.

INTRODUCTION

The circumboreal genus *Escaryus* is of special biogeographic and phylogenetic interest because it is one of the few (and by far the largest) groups of the family Schendylidae whose members are obligate psychrophiles. Most schendylids are confined to tropical or subtropical parts of the world, and it is not clear why the species of *Escaryus* have become

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adapted to high latitudes and cool climates. In any case, one consequence of psychrophily has been that such species are poorly represented in most museum collections (few collectors of the soil and litter fauna are active contemporaneously with schendylids during the colder months of the year) and present knowledge of the genus is notably deficient.

So far 33 nominal species have been described in *Escaryus* (most of them known from only one locality) from a vast generic range that spans the Holarctic region from the Caucasus Mountains to the Appalachians. Four species occur southward as far as Virginia, and one exceptional form appears to be restricted to the Interior Lowlands of North America. Our recent discovery of undescribed species in the mountains of Virginia, and the opportunity of the first author to study type material of most of the known Nearctic species provided the incentive and means for this contribution toward a better knowledge of the American species of *Escaryus*. Since our personal experience with these animals in life gives every assurance that specialized collecting techniques will disclose a number of additional localized forms, the present treatment may be considered a baseline to be expanded by future studies of Nearctic chilopods.

In the following pages we provide a brief historical summary of *Escaryus*, a key to the North American taxa we believe to be valid, detailed descriptions and illustrations for all of them, the proposal of two new species from montane Virginia, and a survey of the distribution of the genus.

The research upon which this treatment is based was initiated during the tenure of a Smithsonian Post-doctoral Fellowship to the first author, who wishes to express his appreciation to the authorities of the Institution for the opportunity to conduct his studies there in 1988. Dr. Jonathan A. Coddington is due special thanks for ongoing help and counsel, and for making the facilities of his laboratory available. Dr. Victor Fet very kindly provided translations from literature in the Russian language. Both authors are indebted to Prof. William A. Shear for providing a review of the manuscript in its final stages.

Materials, Methods, and Acknowledgments

During the preparation of this synopsis, we have been able to examine material of *Escaryus* preserved in the Museum of Comparative Zoology, Harvard University (MCZ) through Dr. H. W. Levi; the Biosystematics

Map 1. The known distribution of *Escaryus* in North America, generalized, the Baffin archipelago and Greenland are omitted. Five species are known from northeastern United States, two from Alaska, and one from Utah. It is very likely that the generic range is continuous between Alaska and Utah, and possibly also entirely across Canada.

Research Institute, Ottawa (CNC) through B. Skidmore; and the U. S. National Museum of Natural History (USNM) through Dr. Jonathan A. Coddington. Holotypes of the two new species which we collected in Virginia have been deposited in the Virginia Museum of Natural History (VMNH), paratypes are shared with MCZ and USNM.

Descriptive terminology is largely that developed by R. E. Crabill in numerous papers during the 1960s, and based on classical derivations. A few more recent terms are utilized, one of them being **toxicodene** (proposed in our 1991 paper on *Marsikomerus* for the venom-producing gland associated with the prehensors) and the new **median** and **lateral labromeres** for the structures previously referred to in English as "midpiece" and "sidepieces" of the labrum.

Numerical distribution of structures on the right and left sides of a surface is indicated by the numbers joined by a "plus" sign, i.e., "6+6" setae. Observed range is indicated by the extreme values joined by a dash, i.e., "37-43" segments, *except* in the case of mandibular dentition, indicated by a three-number formula such as "3-4-4."

Specimens were temporarily mounted in creosote for microscopic study after immersion in acetic acid for a few hours. All of the illustrations were made by the first author, using a compound microscope equipped with a camera lucida drawing tube.

SYSTEMATICS

Family **Schendylidae** Cook

Schendylidae Cook, 1896, Proc. U. S. Nat. Mus., vol. 18, p. 70.– Chamberlin, 1947, Ent. News, vol. 58, p. 146.

Schendylinae: Brolemann & Ribaut, 1912, Nouv. Arch. Mus. Hist. Nat. Paris, ser. 5, vol. 4, p. 53.– Attems, 1929, Das Tierreich, lief. 52, p. 58.– Crabill, 1961, Ent. News, vol. 72, p. 29.

The content and extent of this family heretofore has been expressed in two ways. In the usage of Cook and Chamberlin, it is held to be different from a supposedly allied taxon Ballophilidae. Attems, and following him, Crabill, combined the two as equivalent subfamilies of a more inclusive Schendylidae. For the present, we adopt the precedent of Cook, with the qualification that both taxa may be rediagnosed on the basis of characters

other than those traditionally employed. Just over 62 generic and subgeneric names have been proposed in the family as here defined, how many of these represent actual generic groups cannot be stated with present knowledge. Probably generic names published in other families will be found to be based on schendylids, just as we have found the reverse to be true (cf. p. 6).

Historical summary of Nearctic taxa

Apparently the first American schendylid to be described was named *Geophilus gracilis* by Oscar Harger in 1872, from material collected in Connecticut. As this name was preoccupied, it was replaced a few years later by Meinert (1886) who proposed the substitute name *Geophilus urbicus* for a species that he believed to be the same as *gracilis*. At that time, most geophiloid centipeds were referred to the genus *Geophilus* and family Geophilidae, even though the generic name *Schendyla* had been proposed in 1866 by Bergsøe & Meinert for a common European species. Classification of geophiloids was based largely upon rather superficial peripheral characters until Meinert's discovery of constant differences in mandibular structure. This breakthrough was successfully exploited by O. F. Cook, who in a significant early paper coauthored with G. N. Collins (1891) proposed the new schendylid genus *Escaryus* for two new species which were described and illustrated in detail and accuracy quite novel in chilopod taxonomy at that time.

Four years later, Cook (1895) published an outline of a new classification of geophilomorphs which he dispersed through nine families, seven of them, including the Schendylidae, proposed as new. As Cook had already published one of the other two families, and redefined the Geophilidae in a new and restricted sense, his innovative paper of 1895 established him as the "father of geophilomorph taxonomy" and most of his family groups remain in use today much as he first diagnosed them. At the time of its proposal, the Schendylidae contained five nominal genera: *Schendyla*, *Pectiniunguis*, *Escaryus*, *Nannophilus*, and *Ctenophilus*, all but the first two sired by Cook. As thus constituted, the family was represented by species in West and North Africa, Europe, eastern North America, and Baja California.

The first key to schendylid genera was published also by Cook in 1904, and included the new genus *Holitys* from New Mexico. An elegant revision of the family, replete with magnificent illustrations but deficient

in its treatment of the Nearctic fauna, was authored by Brolemann & Ribaut in 1912. In 1929 the Schendylidae was treated in Count Attems' synopsis of the order Geophilomorpha, a useful work but one of necessity based to a large extent upon literature compilation and therefore of somewhat equivocal reliability (error was also introduced by Attems' willingness to employ pragmatic shortcuts: *E. sibiricus* Cook, 1899, was cited as type species of the genus because he happened to have material of that species, but none of *E. phyllophilus* Cook & Collins, which had been designated as type species by Cook in 1895). This volume provided keys and descriptions for the schendylid genera and species known up to that time.

The first major update treating Nearctic Schendylidae was a key to the Mesamerican genera (Chamberlin, 1943), which included the eight taxa he had described over the preceding three decades as well as one each published by Bollman and Verhoeff. A much improved key, embracing all American schendylid genera known to that time, was later published by Chamberlin (1947) in a paper that proposed the nominal new genus and species *Cymochilus panamicola*. In a summary of the Chilopoda of Alaska, Chamberlin (1946) listed three species of *Escaryus: E. albus* Cook, and the two new species *E. delus* and *E. paucipes*. He provided also a short key separating these three taxa from each other and from the two Asiatic species *E. sibiricus* Cook and *E. japonicus* Attems. A few years later (1952) Chamberlin recorded the presence of the latter species also in Alaska, a point which we address in the following account of *E. ethopus* (p. 56).

In 1960, Chamberlin published two short papers in which supposed new American schendylid taxa were proposed. The first (1960a) embodied the description of a new genus and species, *Lionyx hedgpethi*, as well as a key to a number of genera selected without any apparent relevance except that many of them had littoral species or were in some way related to *Lionyx*. At least the key distinguished four genera whose species have numerous coxopleural pores: *Escaryus*, *Lionyx*, *Sogolabis*, and *Apunguis*. Unfortunately, of these four, *Lionyx* must be excluded from the Schendylidae, as a recent examination of the type species *L. hedgpethi* (USNM) shows it to belong in the family Geophilidae. The second paper (1960b) defined the new genera and type species *Gosendyla socarnia* (Utah) and *Zygona duplex* (Arizona). The first of these appears to be very closely related to, if not congeneric with, *Escaryus* and will be discussed under the generic heading, but *Zygona* (as established by study

of the type species) is not referable to the Schendylidae and must be relocated into another family, probably the Geophilidae. The two most useful papers of recent date are those published by R. E. Crabill in 1953 and 1961. The first of them is a synopsis of the Schendylidae of northeastern North America which provided keys, descriptions, distributional data, and literature references for the two genera and four species of the family known from that region. As such, and despite the absence of illustrations, it provided a good introduction to the status of *Escaryus* in the eastern part of its Nearctic range. The 1961 paper (which was in press when Chamberlin's 1960 work appeared) provided a catalogue of the schendylids known up to that time from Mexico and North America, and a key to the genera, which to some extent overlaps with that devised by Chamberlin (1943) for the taxa of Mexico and Central America. Moreover, Crabill's key was of necessity compiled in part by reference to Chamberlinian descriptions which contain errors both of commission and omission. Nonetheless this catalogue and key represented "state of the art" at the time of their preparation, and are the best existing references on American schendylids.

An important treatment of all known Eurasian forms of *Escaryus* was published in 1972 by L. P. Titova, who accounted for no fewer than 23 species and a number of subspecies and varieties. Although the descriptions were accompanied by illustrations of mouthparts and other characters, these lack the detail now considered to be essential for definition of species in this genus and it has been difficult to associate Titova's escaryids with possibly related Nearctic taxa. Moreover the publication of the paper in Russian renders it essentially inaccessible to investigators not versed in that language.

Species incorrectly referred to *Escaryus*

Escaryus albus Cook, 1904, was based on two specimens from the Pribilof islands, Alaska. More than a half century later, these types were examined by R. E. Crabill who reported (1961) that they are in fact immatures of "some species of *Strigamia*." According to the original description, the two were found among specimens of *S. chionophila* (Wood), and it is surprising that Cook would have misidentified them to family particularly as he obviously had some reason for sorting them out of numerous strigamias. We suggest that this case be held open to further investigation, not that Crabill's identification is suspect, but that some

clerical or curatorial error may have occurred (a by-no-means unusual event in myriapod collections): are the ostensible types of *albus* really the original specimens seen by Cook?

Genus *Escaryus* Cook & Collins

Escaryus Cook & Collins, 1891, Proc. U. S. Nat. Mus.– Cook, 1895, Proc. U. S. Nat. Mus., 18: 71.– Attems, 1903, Zool. Jahrb. Abt. Syst., 18: 196.– Attems, 1904, Zool. Jahrb. Abt. Syst. 20: 124.– Cook, 1904, Harriman Alaska Exped., 8: 76.– Attems, 1928, Ann. South African Mus., 26: 138.– Attems, 1929, Das Tierreich, 52: 94.– Chamberlin, 1946, Ann. Ent. Soc. America, 39: 178.– Chamberlin, 1947, Pan-Pacific Entom., 23: 37.– Chamberlin, 1947, Ent. News, 58: 147.– Crabill, 1953, Journ. New York Ent. Soc., 61: 95.– Crabill, 1961, Ent. News, 72: 35, 68.– Shinohara, 1970, Zool. Mag. (Dobut. Zass.) Tokyo, 79: 53.– Titova, 1972, Ecol. Invert. Terrest. (Moscow), 94: 116.

Name: *Escaryus* is of secondary classical origin, an anagram of the place name Syracuse (New York).

Type species: *Escaryus phyllophilus* Cook & Collins, 1891 [= *Geophilus urbicus* Meinert, 1886], by subsequent designation of Cook, 1895: 71.

Diagnosis: Labrum, especially median labromere, with well-developed dentations. Innermost block of dentate lamellae of mandibles subtended on mesal side by a group of "accessory teeth" having the form of sclerotized denticles or hyaline fimbriae. Coxosternal palps of 1st maxillae rudimentary (practically absent from some species), telopodital palps present, variable in size; claws of 2nd maxillae bipectinate. Sternal pores absent. Coxopleura of ultimate segment with numerous pores, each corresponding to a separate coxal organ; last pair of legs with seven podomeres, which are incrassate and invested with numerous tiny setae in the male sex, slender and less pilose in the female, pretarsus (claw) present, unguiform. Anal pores present. Gonopods biarticulate in both sexes.

Species: 33 taxa are here recognized, eight endemic to North America and 25 to the Palearctic Region (the nominal subspecies of *E. retusidens* named by Folkmanova, 1956, are considered to merit full specific status as they appear to be sympatric): *Escaryus altavicus* Titova, 1972

(Kazakhstan); *E. chadaevae* Titova, 1972 (Russia: Kemerovo Region); *E. chichibuensis* Shinohara, 1955 (Japan: Chichibu); *E. cryptorobius* n. sp. (USA: Virginia); *E. dentatus* Titova, 1972 (Russia: Primorski Krai); *E. ethopus* (Chamberlin, 1920) (USA: Alaska); *E. hirsutus* Titova, 1972 (Japan, Sakhalin Id.); *E. igarashii* Shinohara, 1955 (Japan: Chichibu); *E. jacoti* Verhoeff, 1934 (Korea); *E. japonicus* Attems, 1927 (Japan, eastern and central Russia); *E. kirgizicus* Titova, 1972 (Kirgizstan: Tien-Shan Mountains); *E. koreanus* Takakuwa, 1937 (Korea, eastern USSR); *E. krivolutskiji* Titova, 1972 (Russia: Primorsky Krai); *E.. kusnetzowi* Lignau, 1929 (Kazakhstan); *E. latzeli* (Sseliwanoff, 1881); (Kirgizstan: Tien-Shan Mountains); *E. liber* Cook & Collins, 1891 (northeastern USA); *E. makizimae* Takakuwa, 1935 (Japan: Iida); *E. missouriensis* Chamberlin, 1942 (central USA); *E. molodovae* Titova, 1972 (Japan: Sakhalin Island); *E. monticolens* Chamberlin, 1947 (USA: Utah); *E. oligopus* Attems, 1904 **(stat. nov.!)** (Kirgizstan); *E. orestes* n. sp. (USA: Virginia); *E. ornatus* Folkmanova, 1956 **(stat. nov.!)** (Russia, Ukraine); *E. pallidus* Folkmanova, 1956 **(stat. nov.!)** (Russia, Ukraine); *E. paucipes* Chamberlin, 1946 (USA: Alaska); *E. perelae* Titova, 1972 (Russia: Primorsky Krai); *E. polygonatus* Titova, 1972 (Russia: Primorsky Krai); *E. retusidens* Attems, 1904 (Kazakhstan); *E. sachalinus* Takakuwa, 1935 (Japan: Sakhalin Island); *E. sibiricus* Cook, 1899 (Russia: Vladivostok); *E. urbicus* (Meinert, 1886) (northeastern USA); *E. vitimicus* Titova, 1972 (Russia: Buryatia); *E. yakumoensis* Takakuwa, 1935 (Japan: Hokkaido).

Distribution: Northeastern North America, from Virginia and Kansas north to New York, Massachusetts, and Minnesota; Utah; Yukon Territory, Canada; coastal and central Alaska; northern Japan; Korea; Russian Far East; Siberia; Confederation of Independent States west as far as Crimea, Moldavia, and the Caucasus Mountains. It is entirely possible that the distribution of the genus is continuous throughout this entire area (Map 1).

Generic criteria in the Schendylidae: It is well-known that genera are arbitrarily defined, and their composition is usually the result of a concensus. While we do not intend to discuss the philosophical implications of this subject on a broad canvas, a few observations about the definition of schendylid genera in the recent past will be germane to the treatment of *Escaryus*.

Knowledge of the North American fauna of Chilopoda stems to a very large extent from the work of R. V. Chamberlin, who particularly in his

later years adopted an extremely exclusive view of generic limits. As evident from his published papers, a single structural difference from some known and presumably related taxon was sufficient basis for establishment of a new genus (usually contrasted only with one occurring at some great distance from that being proposed). In a large number of cases, the "diagnostic" character for a new genus was one of reduction - thus *Gosendyla* was based on a species said to be similar to those of *Escaryus* in all respects except for the absence of a claw on the last pair of legs and *Morunguis* was said to differ from *Simoporus* only by the absence of sternal pore fields. The list could be greatly extended.

Admittedly geophilomorph centipeds are not replete with external character systems, and one is obliged to look carefully for ways to group species, but the danger of developing purely mechanical classifications is quite real if appeal is made to "present or absent" polarities. In the Schendylidae, as with other centipeds, the problem is to discover combinations of characters (or at least single characters) which have some fundamental significance, and are not subject to random adaptive suppression. *Escaryus* seems to be set off by two substantial conditions conjointly: the presence of numerous small pores on the coxopleurae of the last pair of legs, and bipectination of the second maxillary claw. So far the polarities of such characters among the Geophilomorpha have not been established, rendering cladistic analysis premature at this time, but the question may be reasonably posed: does a single difference (such as the loss of tarsal claws from the last pair of legs) from among an entire suite of characters, justify generic status for a single species? Recognition of such genera as *Gosendyla* hinges upon the investigator's subjective response to this point. The same rationale would apply equally well to the nominal Japanese genus *Falcaryus* (Shinohara, 1970), which was likewise based on a relatively trivial difference, possibly even an artifact.

The presence or absence of sternal pores has been frequently employed to distinguish nominal genera, without a distinction being made among cases in which all sterna are porose, only half of them, or perhaps only a few, as opposed to none. Perhaps distinctions arbitrarily made along the lengths of structural spectra should be regarded as undesireable for generic definition, if the variability *within* the "positive" expression of a trait is greater than between its minimal expression and its absence. We anticipate that more sophisticated future approaches to chilopod taxonomy – including both more detailed descriptions and the study of variability in populations – will vastly reduce the number of Chamberlin-

ian generic names. For the present, we defer to traditional approach and define *Escaryus* in a sense that admits *Gosendyla* as a separate genus. It should be obvious, however, that the groups within *Escaryus* defined by the first key couplet actually reflect far more phylogenetic significance than does the mere loss of tarsal claws. Dr. Chamberlin would have undoubtedly split *Escaryus* into two genera along those lines, had he but been aware of them.

Species Groups: Attems (1929) proposed to divide the species into two groups on the size of the ultimate leg claw (as large as, or smaller than, those preceeding). Takakuwa (1935) however found a spectrum of relative sizes among Japanese species, and remarked that "Es scheint mir sehr schwierig, diese Gattung, wie Prof. Attems versucht, in zwei Gruppen einzuteilen." We tend to concur in this observation, as the grouping proposed carried the liability of any based on a single criterion subject to variation.

On the other hand, we believe that the combination of characters shared by *Escaryus ethopus* and *E. missouriensis* (specified in the first couplet of the key to species below) so strongly suggests a close and exclusive relationship between these two taxa that we propose a basic dichotomy of the Nearctic species into two groups. Unfortunately, it cannot be asserted that the species placed in the "Urbicus Group" comprise a correspondingly monophyletic unit, as synapomorphic characters have not been identified with confidence for many of them. Obviously an adequate organization of the genus must await the revision of Asiatic taxa, the published descriptions of which do not provide necessary anatomical information.

The lack or inadequacy of material has compelled use of segment counts in several key couplets. This reliance upon a superficial character results in various associations of species which must not be construed as indicative of relationships. Eventually a new key can be developed that does not rely upon single-character couplet dichotomies.

Key to the Nearctic species of *Escaryus*

1. Paraclypeal suture incomplete (Figs. 126 and 107); lateral labromeres with reticulated surface texture (Figs. 141 and 110); anterior sterna without sacculi on front border; body large and robust, up to 65–73 mm long and 2 mm wide (Ethopus Group) 2

– Paraclypeal suture complete (Fig. 44); lateral labromeres without reticulated surface (Fig. 55); anterior sterna with transversely oval sacculi (except in *E. paucipes*); body length no greater than 40 mm, width less than 1.5 mm. (Urbicus Group) 3

2. 55–59 pairs of legs; coxopleura with approximately 44–100 small pores of uniform size; clypeus without plagulae; mandibles with 15–20 accessory teeth; pretergum of ultimate pedal segment with pleurite present; femur and tibia of prehensors without tooth; claw of 2nd maxillae with about 19 pectines, coxosternum with about 28+24 setae . . . . . *E. missouriensis* Chamberlin

– 41–47 pairs of legs; coxopleura with from 35–65 pores of variable size; clypeus with two paramedian plagulae; mandibles with about 11 accessory teeth; pretergital pleurite of ultimate pedal segment absent; femur and tibia of prehensors dentate; claw of 2nd maxillae with about 11 teeth and coxosternum with about 16+15 setae . . . . . *E. ethopus* Chamberlin

3. 31 to 35 pairs of legs 4

– 41 to 49 pairs of legs 5

4. Coxopleura with 23–27 pores; tarsal claws with squamose surface; body 19 mm long and 1 mm wide with 31–35 pairs of legs; palps of telopodites of 1st maxillae as shown in Figure 61; coxosternal palps of 1st maxillae rudimentary, sternum of last pedal segment as wide as long and invested with numerous short setae; lateral labromeres with 2+1 dentiform lobes ("teeth"), femur of last pair of legs 20% longer than its diameter; pretergital pleurite of the last pedal segment present; femur of prehensorial telopodite dentate on inner surface; 2nd article of 1st maxillary telopodite with 4+4 setae; ultimate antennomere with numerous claviform setae on its internal surface; 13th antennomere without large specialized ochraceous sensory setae; claw of 2nd maxillary telopodite with 6–8 pectines; accessory teeth of mandible hyaline . . . . . *E. cryptorobius*, n. sp.

– Coxopleura with 8–10 pores; surface of tarsal claws smooth; body 14 mm long and 0.50 mm wide with 33 pairs of legs; palps of telopodites of lst maxillae developed as shown in figure 136; palps of coxosternum of lst maxilla well defined; sternum of last pedal segment 15% wider than long and without small setae; lateral labromeres with 6+6 teeth; femur of ultimate legs 80% longer than its diameter; pretergum of ultimate pedal segment without pleurites; femur of prehensorial telopodite without tooth; 2nd article of telopodite of lst maxilla with 1+1 setae; ultimate antennomere with a few claviform setae on its internal surface; 13th antennomere with large ochraceus sensory setae; claw of telopodite of 2nd maxilla with four pectines; accessory teeth of mandibles sclerotized and opaque . . . . . *E. paucipes* Chamberlin

5. Body with 47–49 pairs of legs . . . . . *E. liber* Cook & Collins

– Body with 39–45 pairs of legs 6

6. Coxopleura with as many as 35 pores, each coxopleuron with two apical pores much larger than the others; body length to 32 mm, and width to 1.3 mm; males with 41 pairs of legs, females with 39–43 pairs . . . . . *E. urbicus* (Meinert)

– Coxopleura with a maximum of 20 pores, none of which are evidently larger than the others; length of body 18 mm width 0.9 mm; 43–45 pairs of legs 7

7. Tarsal claws with squamose surface; 43 pairs of legs (female); pectinate lamella of mandibles with 18 teeth; median prolongation of 1st maxillary coxosternum with 4+3 setae; telopodite of 1st maxillae with 4+4 setae . . . . . *E. monticolens* Chamberlin

– Tarsal claws with smooth surface; female with 45 pairs of legs, males with 43 or 45 pairs; pectinate lamella of mandibles with 11–12 teeth; median prolongation of coxosternum of 1st maxilla with 2+1 to 2+2 setae; telopodite of 1st maxilla with 3+1 to 2+2 setae . . . . . *E. orestes* n. sp.

Urbicus-Group

Escaryus urbicus (Meinert)
(Figures 1-10, Maps 2, 3)

Geophilus urbicus Meinert, 1886, Proc. Amer. Phil. Soc. 23: 218. Holotype female (MCZ 966/TC 4) from Cambridge, Massachusetts, Winter 1872-73, Schwarz leg.– Cook & Collins, 1891, Proc. U.S. Nat. Mus. 13: 393.– Cook, 1896, Amer. Nat. : 240.– Attems, 1903, Zool. Jahrb. Abt. Syst. 18: 197.– Attems, 1929, Das Tierreich, 52: 327.

Escaryus phyllophilus Cook & Collins, 1891, Proc. U. S. Nat. Mus., 13: 392. Holotype (present location, if extant, unknown) from Kirkville, New York.– Cook, 1895, Proc. U. S. Nat. Mus. 18:71.– Cook, 1896. Amer. Nat.: 240.– Cook, 1899, Proc. Ent. Soc. Wash., 4: 304.– Attems, 1903, Zool. Jahrb. Abt. Syst., 18: 196.– Attems, 1904, Zool. Jahrb. Syst. 20: 124.– Chamberlin, 1909, Ann. Ent. Soc. America, 2: 177.– Attems, 1927, Zool. Anz., 72: 303.– Attems, 1929, Das Tierreich, 52: 95, 97.

Escaryus urbicus Cook, 1896, Amer. Nat., 240.– Cook, 1904, Harriman Alaska Exped. 8: 76.– Chamberlin, 1912, Canadian Entom., 44: 66.– Williams & Hefner, 1928, Bull. Ohio State Univ., 33(7): 135.– Bailey, 1928, Bull. New York State Mus., 276: 19, 43, 44.– Chamberlin, 1947, Pan-Pac. Entom., 23: 37.– Crabill, 1953, Journ. New York Ent. Soc., 61: 96.– Crabill, 1958, Ent. News, 69: 93, 94.– Crabill, 1961, Ent. News, 72: 71.– Kevan, 1983, Canad. Journ. Zool., 61: 2945.

Material: Female holotype, with 41 pairs of legs, preserved in alcohol, presently in rather poor state of preservation, labeled "*Geophilus urbicus* Meinert HOLOTYPE. Cambridge, Winter 1872-73 Schwartz." Also eight specimens from VIRGINIA: Giles County: Mountain Lake, 3800 ft., 1 January 1952, R. L. Hoffman leg., 1 female 27 mm long with 41 pairs of legs and 1 male 26 mm long with 41 pairs of legs (both identified as *urbicus* by R. E. Crabill and in his personal collection, presently housed

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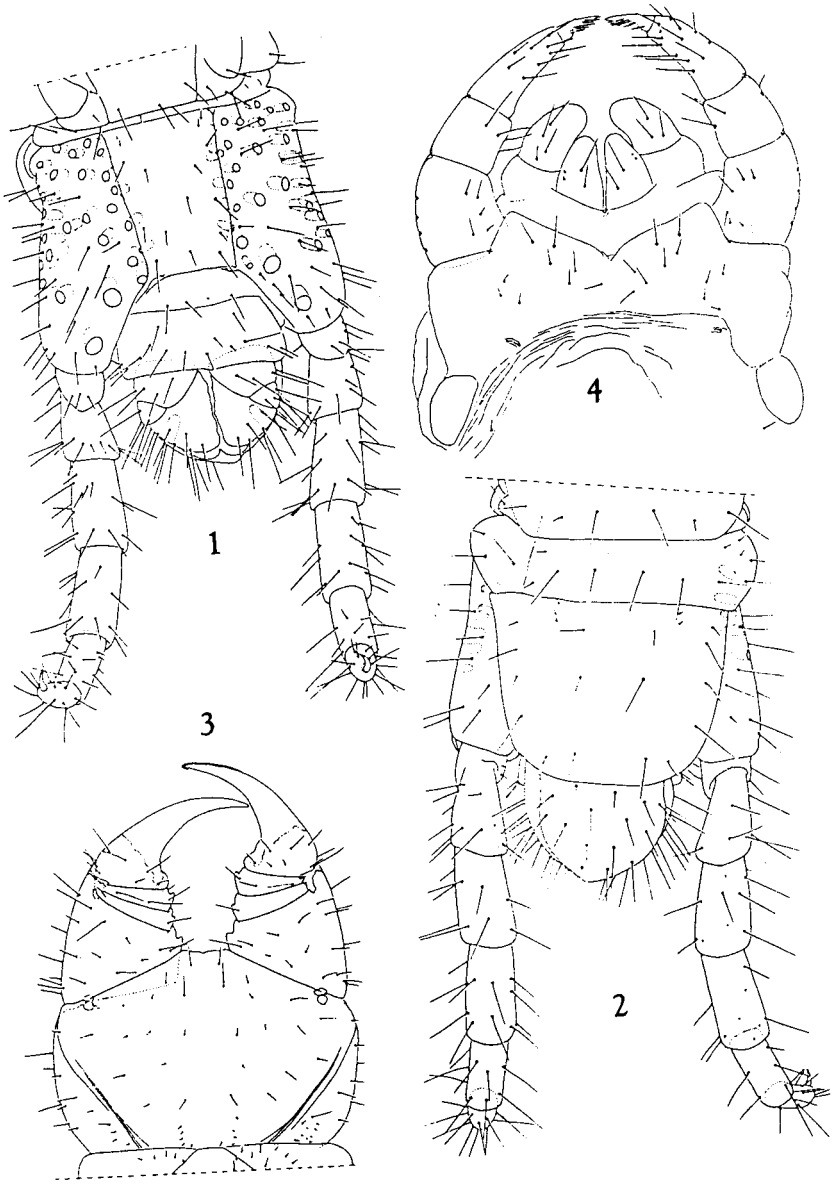
Figures 1-4. *Escaryus urbicus* (female from Mountain Lake, Va.). 1. Ultimate pedal and postpedal segments, ventral view. 2. The same, dorsal aspect. 3. Prehensorial segment, ventral view. 4. 1st and 2nd maxillae, ventral view.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in USNM). Bland County: west side Walker Mountain along Va. Hwy. 670, 3 miles southeast of Mechanicsville, 1 March 1972, R. L. Hoffman and L. S. Knight, one female 31 mm long with 43 pairs of legs (USNM). Nelson County: "The Priest," 4 miles SSE of Montbello, pitfall at 3900 ft., 20 February 1992, two immatures with 39 pairs of legs and one immature with 41 (VMNH); 25 October-23 November, 1991, one immature female with 39 pairs of legs (VMNH); also one female 33 mm long with 39 pairs of legs, 20 January-28 February 1992 (VMNH).

In addition to the foregoing, we have seen three specimens in Dr. Crabill's personal collection which are probably referable to *E. urbicus* but which cannot be identified with certainty owing to poor condition of the slide preparations: Virginia: Alleghany County: Warm Springs Mountain, ca. 5 miles west of Clifton Forge at 3800 ft., 23 January 1953, R. L. Hoffman, one male, two females (REC 1574-76).

Diagnosis: *E. urbicus* belongs to the group of species in which the paraclypeal suture is complete and the lateral labromeres are not reticulated. It is similar to *E. monticolens* and *E. orestes* but differs by the characters stated in couplets 6 and 7 of the foregoing key.

Description (female from Mountain Lake): length 27 mm, width 1.0 mm, body with 41 pairs of legs.

Antennae approximately three times as long as cephalic capsule; pilosity of antennomeres similar on dorsal and ventral surfaces, basal four or five with large setae, those more distal with setae progressively smaller and more numerous apically. Apical article with about 20 claviform setae on the distal border internally and externally. Apex of this article with a group of about six very small setae, apparently not divided. Articles 2, 5, 9, and 13 provided with very small specialized setae similar to those on the apex of the 14th; 2nd with 1-3 setae dorsally and 1-2 ventrally, 5th with 1-2 and 2-3, 9th with 2 and 2-3, 13th with 2-3 and 1-2.

Cephalic sclerite slightly longer than wide. Entire surface of clypeus uniformly reticulate, chaetotaxy represented by 1+1 postantennal, 4+4 median transverse, and 1+1 prelabral setae; paraclypeal suture complete (Fig. 9). Labrum with a total of 12 "teeth," 8 on median arc and 2 on

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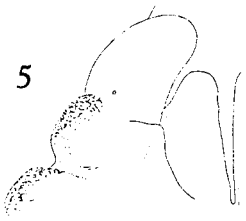
Figures 5–9. *Escaryus urbicus* (female from Mountain Lake, Va.). 5. Left side of 1st maxillae, dorsal view. 6. Apex of right telopodite, 2nd maxillae, ventral view. 7. Dentate and pectinate lamellae of mandible. 8. Labrum. 9. Clypeus and basal antennomeres (*a* - paraclypeal suture). Figure 10. *Escaryus urbicus* (male from Mountain Lake, Va.). Last pedal segment and postpedal segments, ventral view.



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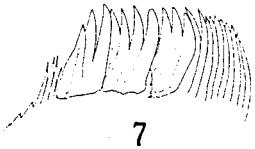

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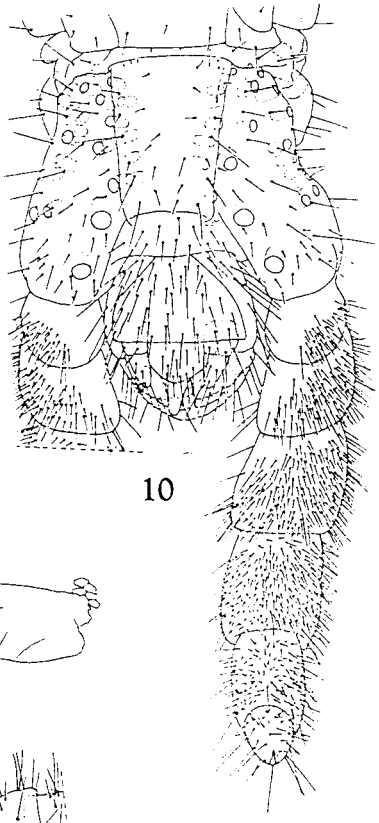

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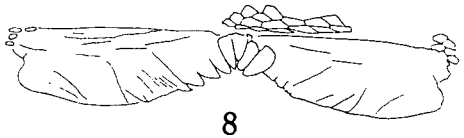

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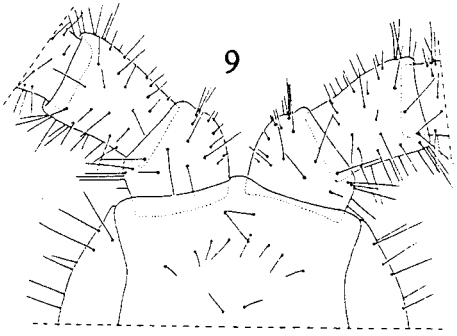

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each lateral labromere. Form of labrum and relative size and shape of teeth shown in Figure 8.

Dentate lamella of mandible divided into three blocks with formula 3-4-3, innermost block subtended on mesal side by a group of 2-5 small hyaline fimbriae; pectinate lamella with 12 hyaline teeth (Fig. 7). Coxosternum of lst maxillae lacking setae and bearing rudimentary palps; median prolongations of coxosternum subtriangular, well-developed and provided with 4+3 large setae. Telopodites biarticulate, first article with very small palp which slightly surpasses base of 2nd article (Fig. 5), latter with 4+3 setae on its ventral side and 2+1 sensory papillae on the dorsal (Figs. 4, 5). Coxosternum of 2nd maxillae with 10+10 setae arranged as shown in Figure 4. Apical claw of telopodite well developed and bipectinate with five pectines on ventral edge (Fig. 6) and six on dorsal. Shape and setation of telopodite articles as shown on Figure 4.

Prehensorial telopodites not surpassing anterior edge of cephalic sclerite when flexed. Internoapical border of trochanteroprefemur, femur, and tibia with dark-colored, well developed tooth. Tarsungula with a convexity basally on median side, but no true tooth present. Toxicodene with cylindrical calyx. Shape and setation of telopodites, coxosternum, and pleural sclerites as shown in Figure 3.

Pedal chaetotaxy similar throughout body length. Claws with squamose surface. Each claw ventrobasally with two large, subequal parungues, one anterior and one posterior; between these, close to posterior, a very much smaller third parunguis.

Sterna of segments 3 through 11 or 12 with shallow median longitudinal depressions, paler in color than rest of sternal surface. 3th-13th sterna with a small, semicircular sacculus centered on anterior edge.

Pretergum of ultimate pedal segment with visible suture between pleurites, presternum apparently medially divided. Tergum trapezoidal, basal width greater than length; form and setation as shown in Figure 2. Sternum notably (40%) longer than wide, lateral edges slightly convergent posteriad; form and setation as shown in Figure 1. Coxopleura with approximately 28+28 pores of irregular size distributed over ventral and lateral surfaces, among which are 2+2 much larger and very distinct pores located near posterior internolateral border of each coxopleuron; general shape, setation, and pore distribution as shown in Figures 1 and 2. Podomeres of ultimate legs slender, with sparse setation, their shape and chaetotaxy, and relative size of apical claw with respect to metatarsus shown in Figures 1 and 2.

Sternum of intermediate postpedal segment with slightly convex posterior edge, that of tergum strongly convex; posterior edge of genital segment I slightly concave on both sides of median line; basal segment of gonopod with 4 setae, distal with 2-3; chaetotaxy and shape of these segments represented in Figures 1 and 2.

Male (Mountain Lake, Virginia): Length 26 mm, width 0.9 mm, body with 41 pairs of legs. Structure agreeing closely with that of female except for posteriormost segments as noted below:

Sternum of last pedal segment slightly narrower (30% longer than wide as opposed to 40% in female); shape and chaetotaxy as in Figure 10. Coxopleura with about 26+26 irregular sized pores, their appearance as shown in Figure 10. Podomeres of ultimate legs very broad, ventrally invested with numerous short setae; dorsally with larger and fewer setae, form and setation of these legs represented in Figure 10.

Posterior border of lst genital segment slightly convex. Gonopods with about seven setae on each basal article, seven on each distal (Fig. 10).

Variation: The largest specimen measured (female, Nelson County, Virginia) was 33 mm in length and 1.6 mm wide. Other adults are as small as 26 mm.

Over most of the known range, *E. urbicus* has either 41 or 43 pairs of legs. At one site in the Blue Ridge of Virginia, however, a local population shows a marked decrease (in four of five specimens) to 39. The number of known localities for this species is so far too few to warrant generalizations about geographic variation, but the accumulation of additional material will surely reveal data of interest in this respect.

Distribution: Northeastern United States (Map 2). Published records (Crabill, 1953, 1958) include Cambridge, Massachusetts; Syracuse and Ithaca, New York; Minnesota and Ohio, without locality; Baxter's Hollow, Sauk Co., Wisconsin; and Clifton Forge, Alleghany Co., Calf Mountain, Augusta Co., and Mountain Lake, Giles Co., Virginia. To these we now add the records for Nelson and Bland counties, Virginia, cited above under "Material", the latter representing the southernmost locality known for *urbicus*. Almost certainly, however, the species extends much further down the Appalachians at increasingly higher elevations.

Remarks: The descriptions of the female holotype by Meinert and of the likewise female holotype of the synonymous name *phyllophilus* by Cook & Collins did not provide information of diagnostic value at the species level. We did not redescribe the holotype of *urbicus* because its state of preservation obscured several important characters, and based the

present account on an unquestionably conspecific well-preserved female instead. The male of this species has not heretofore been recorded.

Escaryus orestes, new species
(Figures 11–26, Maps 2, 3)

Material: Male holotype (VMNH) 19 mm long with 43 pairs of legs, female paratype A (VMNH) 18 mm long with 45 pairs of legs, female paratype B (VMNH) 18 mm long with 45 pairs of legs, male paratype A (USNM) 17 mm long with 45 pairs of legs, male paratype B (MCZ) 17 mm long with 43 pairs of legs, also one immature 9 mm long with 43 pairs of legs; all from Whitetop Mountain, Washington County, Virginia, at an elevation of about 5400 feet ASL, 12 May 1988, L. A. Pereira and R. L. Hoffman leg.

Name: *Orestes*, the classical Greek word meaning "mountaineer," is bestowed in reference to the type locality.

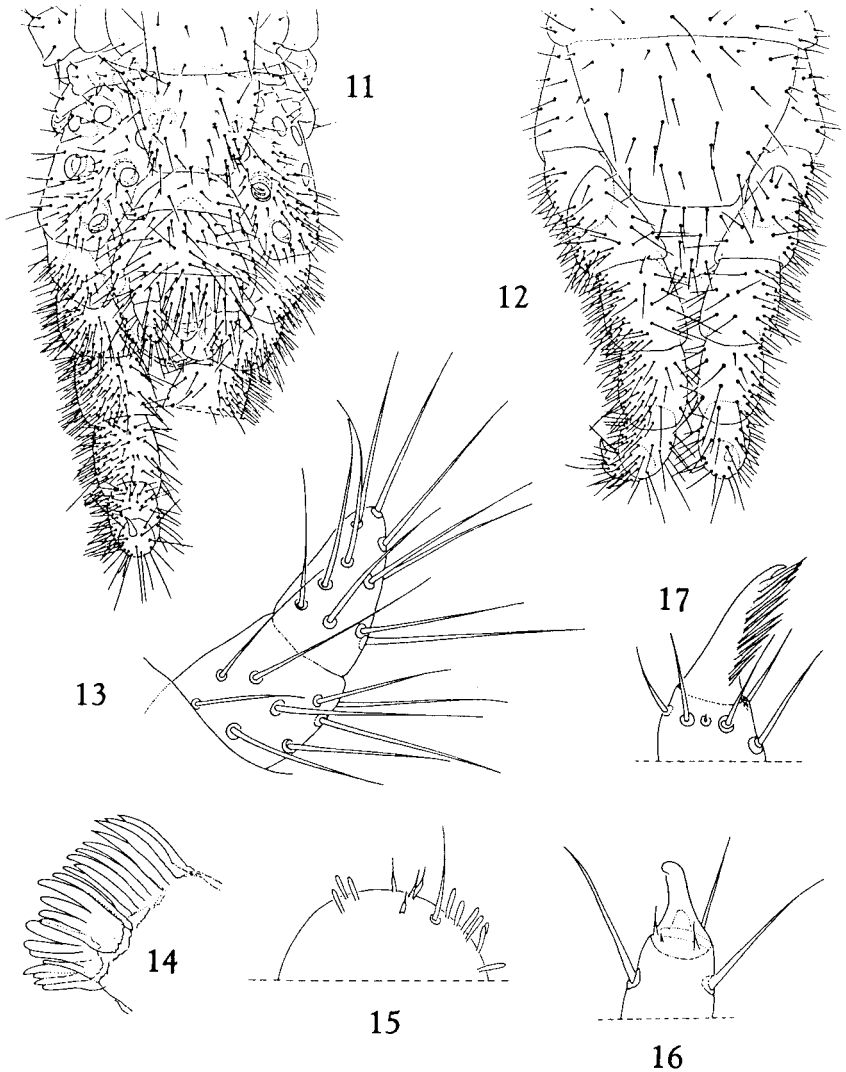
Diagnosis: This species appears to be closely related to *E. monticolens*, but differs in surface sculpture of the tarsal claws and details of mouthparts as specified in key couplet 7.

Description: Male holotype 19 mm long, 0.8 mm wide, with 43 pairs of legs. Color of specimen newly-preserved in alcohol ochraceus-orange, cephalic sclerite and prehensorial segment of a slightly darker color.

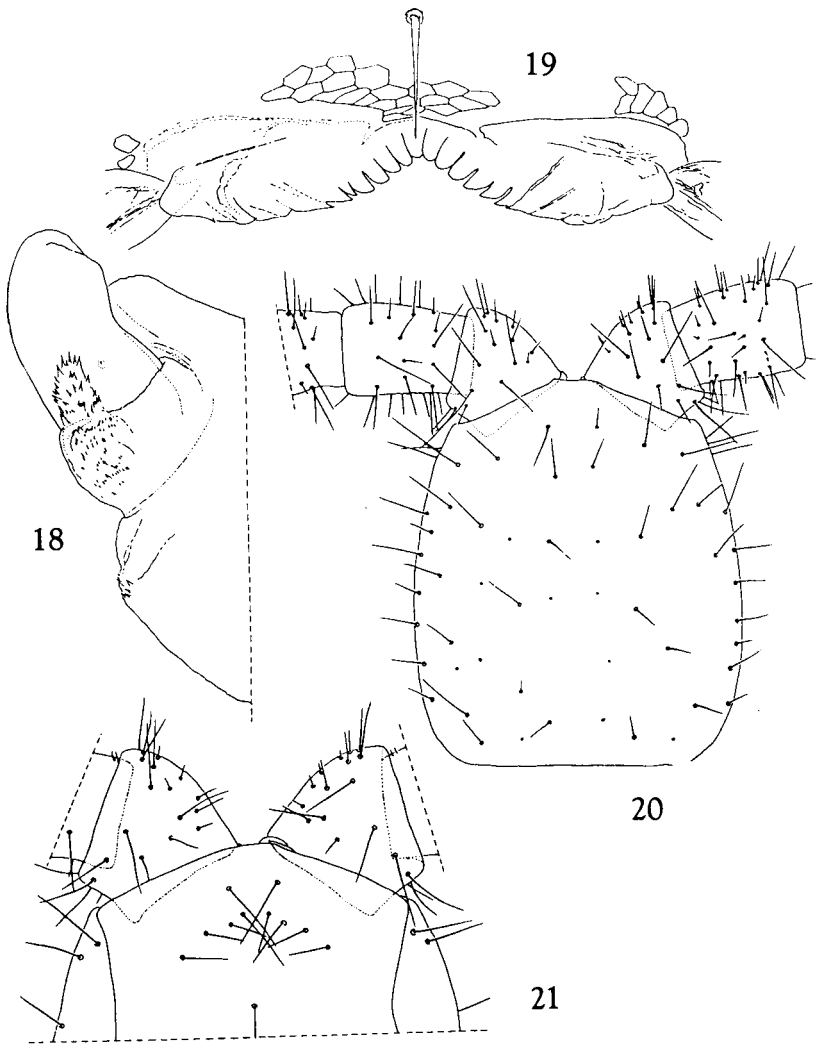
Antennae about 3.2 times as long as cephalic sclerite, chaetotaxy similar on dorsal and ventral surfaces. Ultimate article with approximately 20 claviform sensory setae on external border and about 15 on internal. Apical extremity of this antennomere with about 7 very small, apparently undivided setae (Fig. 15). Articles 2, 5, 9, and 13 with very small specialized setae similar to those on apex of ultimate antennomere, those on ventral side located in an internal lateroapical area, those on dorsal occupy external lateroapical and median apical positions. Distribution of setae (ventral/dorsal): 2nd, 1/2, 5th, 2/1-2, 9th, 1-2/2-4, 13th, 2/3-4. Ventral setae of 5th article, Figure 26.

Cephalic sclerite slightly longer than broad, its shape and setation as shown in Figure 20. Entire surface of clypeus uniformly reticulated; 1+1 postantennal, 4+4 medial, and 1 prelabral setae present (Fig. 21). Labrum with a total of 27 dental lobes, the outermost on lateral labromeres very small and with very acute tips (Fig. 19).

Dentate lamella of mandible divided into three blocks with formula 4-4-4, innermost block subtended on mesal side by a group of 4-5 hyaline



Figures 11–17. *Escaryus orestes* (male holotype). 11. Last pedal segment and postpedal segments, ventral view. 12. The same segments, dorsal view. 13. Right gonopod, ventral view. 14. Dentate and pectinate lamellae of right mandible. 15. Apex of ultimate right antennomere showing specialized and claviform setae. 16. Apex of 10th right leg, ventral view. 17. Apex of right telopodite of 2nd maxillae, ventral view.



Figures 18-21. *Escaryus orestes* (male holotype). 18. Left side of 1st maxillae, ventral view. 19. Labrum. 20. Cephalic sclerite and basal antennomeres. 21. Clypeus.

fimbriae of variable size; pectinate lamella with 10-12 hyaline teeth (Fig. 14). Coxosternum of maxillae I without setae and with rudimentary, almost nonexistant, palps, recognizable only by surficial characters similar to those of telopodital palps (Fig. 18); median prolongations of coxosternum subtriangular, well-developed and provided with 2+2 large setae. First article of telopodite with very small palps, distal article with 3+2 setae (Figs. 18, 24). Coxosternum of maxillae II with 9+8 setae located as shown in Figure 24. Apical claw of telopodite well-developed, bipectinate, with 6 dorsal and 10 ventral pectines (Fig. 17).

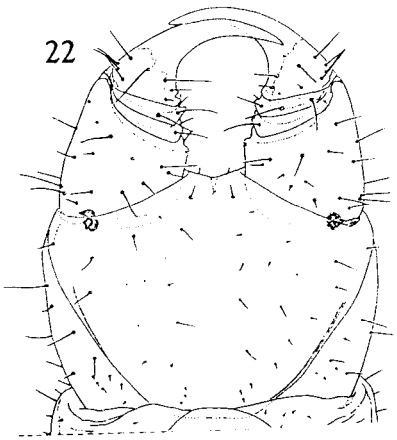
Closed telopodites of prehensors extend approximately as far forward as anterior margin of cephalic sclerite. Basal plate with 8+9 large and small setae. Each prehensomere with a basal tooth, those of femur and tarsungula much smaller than the others. Toxicodene well developed, with cylindrical calyx. Chaetotaxy of coxosternum and telopodites as shown in Figure 22.

Pedal chaetotaxy uniform throughout length of body, except on last pair of legs. Surface of tarsal claws smooth. Each claw with two ventrobasal parungues, an anterior and a much smaller posterior, with a third still smaller very close to base of the latter, all three similar to setae elsewhere on legs in color and shape (Fig. 16).

Sterna of segments 3-12 with a small, very shallow median longitudinal depression similar in color to rest of surface; sterna of segments 4-12 with a small semicircular sacculus centered on anterior edge.

Pretergum of last pedal segment without suture between its pleurites, presternum medially divided. Tergum trapezoidal, its base much wider than its length, posterior edge approximately straight, shape and setation shown in Figure 12. Sternum slightly broader than long, lateral sides convergent posteriad, posterior edge weakly concave, vestiture present as scattered moderate to large setae of the form shown in Figure 11. Coxopleural pores 15+15, opening on lateral and ventral surfaces only; setation consisting of large and small setae, the latter being concentrated in a ventroapical area (Figs. 11, 12). Podomeres of terminal legs broad, ventrally with numerous setae externomedially, similar setae occur on lateroexternal surface; ultimate article with a weakly developed apical claw; form and chaetotaxy of these podomeres shown in Figures 11 and 12.

Posterior edge of tergum of intermediate postpedal segment convex, that of sternum concave; genital segment I with posterior border nearly straight; basal article of gonopods with 9-10 setae, distal with 11 (Fig. 13). Penis with l+l setae dorso-apically. Shape and chaetotaxy of these seg-



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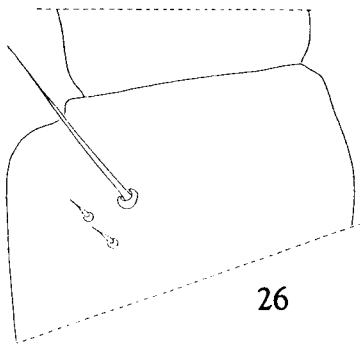

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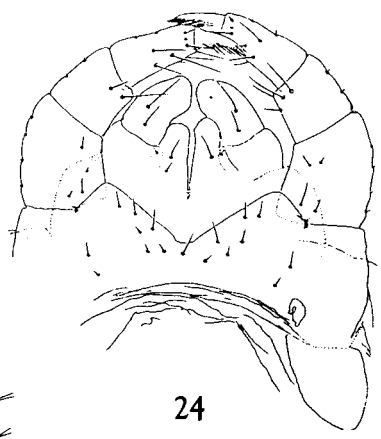

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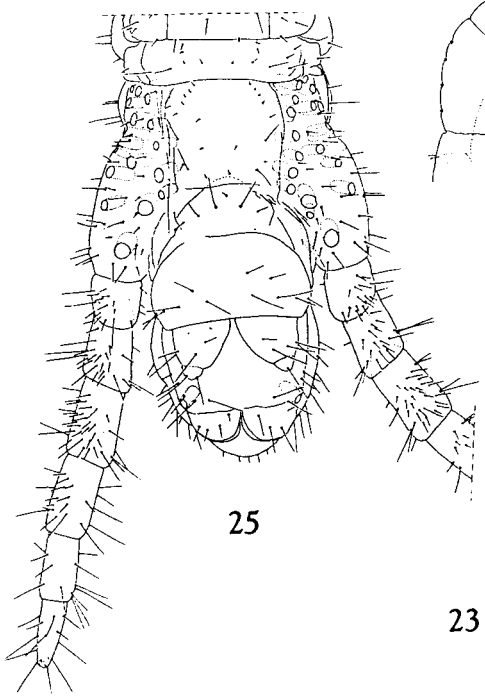

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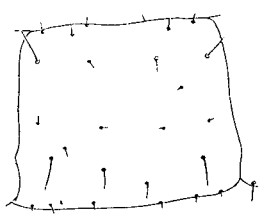

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