MYRIAPODOLOGICA

Virginia Museum of Natural History

Vol. 3, No. 1 ISSN 0163-5395 January 31, 1994

REDISCOVERY OF THE MILLIPED GENUS *PORATOPHILUS* SILVESTRI, 1897 (SPIROSTREPTIDA: HARPAGOPHORIDAE)

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ABSTRACT

The genus *Poratophilus*, a perennial enigma in diplopod systematics ever since its proposal in 1897, is redescribed from a new species, *P. gorteri* (Transvaal), which is closely related to the type species *P. australis* Silvestri. This genus has been hitherto, chiefly inferentially, placed near *Harpagophora* and *Zinophora*, and examination of the gonopods substantiates a close relationship with the latter of these two. Differences in the 1st male legs of the three African genera of Harpagophoridae are noted and illustrated.

INTRODUCTION

The nomenclature in all groups of organisms is plagued by the existence of specific and generic names which, although validly proposed, have been for one reason or another unrecognizable to subsequent investigators. All too often, the material upon which the names were based was lost or otherwise unavailable. Such names are frustrating because they cannot be confidently utilized and because they are potential preemptors of younger names.

The literature on Diplopoda is replete with more than its share of such enigmatic names, one reason being that after the first half-century of descriptive work the source of diagnostic characters changed from general body form to male genitalia. Most species and genera proposed prior to that watershed event thus had to be redescribed in terms of the new character-system in order to be recognizable. Sometimes, even when genitalic features were described and figured, some factor prevented adequate later perception of the organism portrayed, which then drifted wraithlike through taxonomic literature for decades, often ignored, sometimes contentiously debated.

An outstanding example of the latter situation obtains in the case of *Poratophilus*, a monotypic genus set up by Filippo Silvestri in 1897 to accommodate the species *P. australis*. Working at a time when many of today's better-known families had not been distinguished, Silvestri referred his genus to the Spirostreptidae, and nearly two decades would elapse before *Poratophilus* found its proper place in the related family Harpagophoridae, to which it was referred by Attems in 1914. Silvestri's published account of *australis* was sufficiently

complete and detailed that Attems had no reservations about its familial affinities, noting only that "Die Abbildung des Endes des hinteren Gonopoden müsste genauer sein." Attems apparently was unable to restudy the type specimen for his 1914 monograph although he took this precaution with respect to types in the Zoologisches Museum in Berlin and illustrated the genitalia for many of them.

Shortly afterwards, the status of *Poratophilus* was considered by Johann Carl (1917), who utilized the name for three new species from South Africa. Echoing Attems' comment about the posterior gonopod ("La diagnose de ce genre . . . etait restée incomplete pour ce qui concerne les gonopodes posterieurs"), Carl noted similarity of his new taxa with Attems' several species of *Harpagophora* except for their having one "coxal spine" (today considered the femoral process of the telopodite) instead of the two characteristic of *Harpagophora*. Finding concurrence of this structure in the drawing given for *P. australis*, Carl utilized this name despite some major differences in the form of the "anterior gonopods". About the time that Carl's paper appeared, Attems was working up the vast myriapod collection of the South African Museum, and was confronted with a number of new species clearly congeneric with those of Carl. His published commentary on the status of *Poratophilus* merits quotation in full (1928: 376):

"When I published the 'Afrikanische Spirostreptiden' a single species (*australis*) was known, and that very incompletely, from an insufficient description by Silvestri. Since then Carl has described three new species in a very clear manner; I doubt whether these three species belong to the same genus as *australis*. The drawings given by Silvestri are so incomplete that one cannot make a detailed comparison with the drawings of Carl, but it seems that the form of the gonopods is generically different from that in the three recent species, which undoubtedly belong to the same genus as the five species described here as new. Whether Carl's species and mine belong to *Poratophilus* in the sense of Silvestri could only be verified by a re-examination of the type of *australis*, which is impossible for me now; and I prefer to leave all the species in the genus *Poratophilus*, proposing the name *Philoporatia* for the eight new species if *australis* should prove itself to be generically distinct."

Subsequently, *P. distinctus* Carl was reported from southeastern Zaïre by Attems (1935, 1938), and two related new species were described by Kraus from Tanzania (1958a) and Angola (1958b). In the first of these two papers, Prof. Kraus formalized Attems' suggestion by adopting *Philoporatia* as a valid genus and designating *Poratophilus similis* Carl, 1918, as its type species ("Der Name *Poratophilus* Silvestri 1897 ist wegen der mangelhalf bekannten genotypischen Art [*australis* Silvestri 1897] vorlaufig unsicher. Es ist hochst zweifelhalf, ob die als *Poratophilus* beschriebenen weiterem Arten wirklich dieser Gattung angehören. Wir ziehen es deshalb vor, den Namen *Philoporatia* Attems 1928 zu gebrauchen.").

The conclusions of Attems and Kraus were perfectly well founded anatomically. Unfortunately, a complicating factor had been inconspicuously set in motion by Chamberlin in 1927, a new genus *Zinophora* based on the species *munda*, whose gonopods looked remarkably like those of *Philoporatia*. This concordance was noted by Otto Schubart during preparation of his chapters in "South African Animal Life" and reported in Part 3 (1966: 156). Despite the great similarity in genitalic structure, Schubart kept *Zinophora* apart from *Poratophilus* (of which he considered *Philoporatia* to be only a subgenus) because the ozopore series commenced on segment 6 in *Z. munda*, on segment 5 in the others. On this basis he also included Carl's *similis* in *Zinophora*, not noticing that it had been selected as

type of *Philoporatia* by Kraus in 1958 and that the name *Philoporatia* would have to become a subjective junior synonym of *Zinophora*.

About this time most students of Diplopoda began to agree that the place of origin of the ozadene and ozopore series was not, per se, a character of generic value. This view was expressed in my "Classification of the Diplopoda" (1980: 87,95), in which synonymy of those two names was asserted. A few years later, the history of these names was reviewed in detail by Demange (1983) in his useful synopsis of *Zinophora*.

Although events from 1966 onward disposed of *Philoporatia* in a conclusive way, *Poratophilus* itself slipped back into obscurity. Despite a lot of field work in South Africa after 1897, *P. australis* was never recollected, and several diplopodologists (myself included) harbored suspicions that the type specimen had not been collected in "Africa meridionalis" at all. A number of specimens in the Kaiserliche Zoologisch und Anthropologisch-Ethnographisch Museum zu Dresden, described in Silvestri's 1897 paper, were known to have incorrect locality data; perhaps the holotype of *australis* was in this category too. Nonetheless it was allied with *Zinophora* and *Harpagophora* in the nominal tribe Harpagophorini in my 1980 classification. I alluded very briefly to the "*Poratophilus* problem" and optimistically concluded that ". . . surely some day fresh material matching Silvestri's original account will turn up, and a modern Oedipus will be able to solve the riddle."

Events sometimes fall out in surprising and gratifying ways. In February, 1991, I received a small package of specimens sent for identification by Dr. G. J. M. A. Gorter, a South African mycologist studying the trichomycetes of local millipeds. One of the samples contained a freshly collected male of a species unquestionably congeneric with *australis*! The prophesy was thus fulfilled, and the key to the riddle came by chance into the hands of the prophet. Silvestri's much debated enigma is now described in detail, and its status and affinities are opened to consideration.

SYSTEMATICS

Tribe Harpagophorini Attems

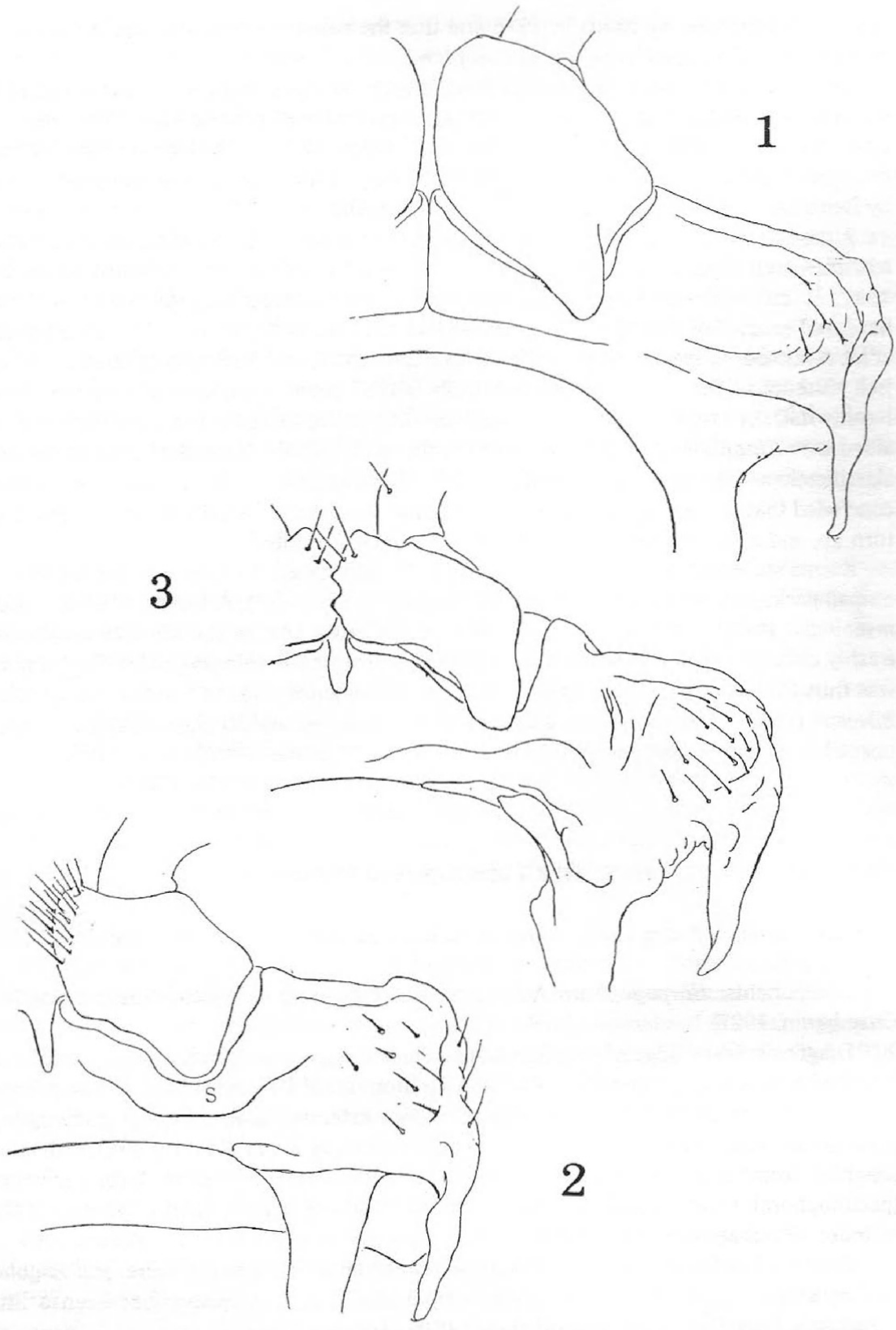
Harpagophorini Hoffman, 1980, *nomen translatum ex* family Harpagophoridae Attems, 1909.

Components: *Harpagophora* Attems, 1909; *Poratophilus* Silvestri, 1897; *Zinophora* Chamberlin, 1927.

Diagnosis: Distal edge of penultimate mandibular segment trilobed, proximal (posteriormost) lobe enlarged and curved mesad (Fig. 7). Sternum of 1st pair of legs of male present. Stigmatic fossae small, shallow, subtriangular, not extended laterad beyond midlength of prefemora. Prostatic groove of male gonopod terminating on a distal branch (solenomere) separate from that which bears a series of hyaline, blade-like setiform structures (pectinophore). Lateral coxal folds turned mesad on aboral side forming a "gonocoel" that includes all but apex of femoral spine.

Distribution: South Africa, northward as far as Tanzania, southern Zaïre, and Angola.

Remarks: The distinction between *Zinophora* and *Harpagophora* has been a little tenuous and arbitrary (one femoral spine on the gonotelopodite as opposed to two), and possibly a thorough revision of all African harpagophorids will result in generic lines being drawn with the use of other or additional characters. *Harpagophora* in particular may be polyphyletic. For the present, I utilize the existing arrangement without prejudice, as expressed in the following key. The apparent close relationship between *Poratophilus* and



Figs. 1-3. Coxosterna of 1st pair of male legs, oral aspect. 1. *Harpagophora spirobolina* (Karsch). 2. *Poratophilus gorteri*, n. sp. 3. *Zinophora diplocrada* (Attems). Abbreviation: S, coxal "shelf" subtending apex of prefemoral process.

Zinophora was perceived already by Schubart (1966: 156).

The distinctions between the three nominal genera that are evident in gonopod structure are reinforced by differences in form of the 1st legs of the male sex, as shown in Figures 1-3. The points cited in the following key to genera have been verified by examination of several species of both *Zinophora* and *Harpagophora* at my disposal and relevant illustrations in Schubart's 1966 treatment of South African taxa.

Key to the genera of Harpagophorini

1. Gonotelopodite with two spiniform processes; syncoxosternum of first pair of male legs medially suturate between coxal elements (Fig. 1); anterior corner of collum of males broadly rounded . . . . . *Harpagophora*
— Gonotelopodite with a single spiniform process; syncoxosternum of 1st male legs without trace of median suture; anterior corner of collum of males acutely produced. 2

2. Prefemora of 1st pair of legs of males of size typical for the family and not in contact medially, the proximal process subtended by a distinct shelf projecting from oral coxal surface (Fig. 2, S). Telopodite of gonopod with a thin, laminate distal process closely associated with other apical elements; distal ends of coxal folds complexly lobed and folded against each other. . . . . *Zinophora*
— Prefemora of 1st pair of legs of males notably reduced in size and broadly in contact medially, the proximal process not subtended by a projecting support shelf (Fig. 3). Telopodite of gonopod with slender elongate process located substantially proximad to and widely separated from the other apical elements (Fig. 14); distal ends of coxal folds simple, without lobes or processes (Fig. 12) . . . . . *Poratophilus*

Poratophilus

Poratophilus Silvestri, 1897: 16. Type species: *Poratophilus australis* Silvestri, 1897, by monotypy.

Diagnosis: Paracoxites of gonopods elongated; coxal folds apically laminate and simple; subterminal process of telopodite long and slender, placed proximad to the distal processes. Prefemora of 1st legs of males reduced in size, broadly in contact medially.

Species: Two (possibly subspecies of a single taxon).

Range: Known only from Transvaal, South Africa.

Key to the species of *Poratophilus*

Paracoxites relatively small, not extending laterad beyond level of anterior (median) lateral fold of gonopod, latter broadly rounded apically; body with 46-48 segments . . . . . *australis* Silvestri

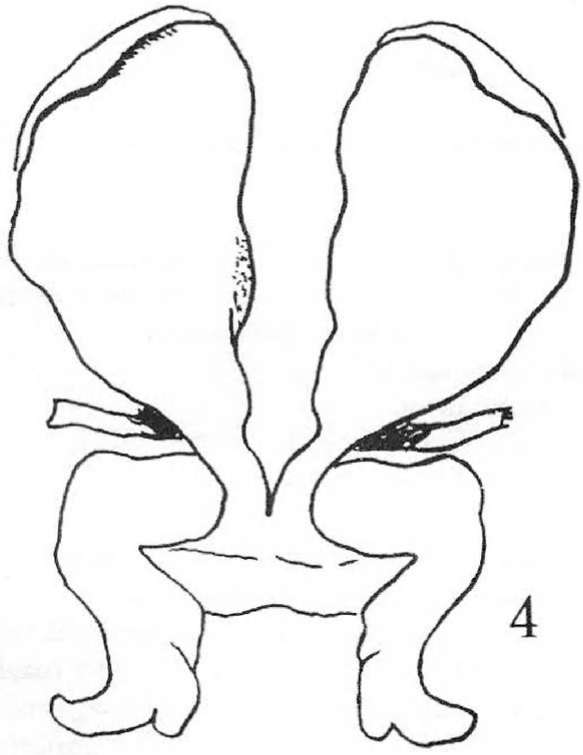
Paracoxites relatively large, extending laterad well beyond lateral edge of anterior coxal fold, latter attenuated apically and ending in an acute point; body with 50-51 segments . . . . . *gorteri* n. sp.

Poratophilus australis Silvestri
Figs. 4, 5

Poratophilus australis Silvestri, 1897: 16, pl. 3, figs. 5-11. Male and female syntypes (formerly Mus. Dresden, thought to have been destroyed by fire in 1943) labeled only "Africa meridionalis".

Original description (translated): "Female: reddish-brown, pores black, head and preanal segment reddish. Epicranial suture distinct, face rugose, about six labral pores. Antennae attenuate, second article longest, third longer than fourth, sixth shorter than fifth, seventh hardly visible. Interocular space about equal to length of an eye, ocelli about 58, in 8 rows. Collum laterally broad, anterior corner rounded, posterior obtuse, striation absent. Prozona of remaining segments with concentric striae anteriorly, punctate and obliquely striate posteriorly; suture fairly deep; metazona with small sparse punctations dorsally, below the pores faintly striate. Sterna smooth. Preanal segment with long, attenuate, somewhat upturned tail extending beyond anal valves. Latter margined; hypoproct small, rounded. Legs rather short, with ventral setae. Male: mandibular stipes produced below, truncate, somewhat incised. Anterior corner of collum somewhat produced. Legs longer, articles 4 and 5 with soles. Sternum of gonopods elongate, trapeziform, distal margin of anterior and posterior plates rounded; telopodite ["par anticum"] with a long curved arcuate process above, distal part bifurcate. Number of segments 46-48."

I provide (Figs. 4, 5) reproductions of Silvestri's original gonopod illustrations.



Figs. 4, 5. Gonopods of *Poratophilus australis* Silvestri, adapted from Silvestri's original drawings. 4. Coxae, anterior aspect. 5. Telopodite, posterior aspect.

Poratophilus gorteri, n. sp.
Figs. 2, 6-15

Material: Male holotype and immature female topoparatype (Va. Mus. Nat. Hist.) from Mabalingwe, Waterberg District, Transvaal, South Africa, 25 November 1990, J. G. M. A. Gorter, don.

Diagnosis: Differing from the closely related *P. australis* by the points stated in the preceding key and shown in Figs. 12 and 13.

Holotype: Adult male with 51 segments, broken into four rigidly curved pieces, length estimated at 100 mm; width of collum 9.1 mm, of 6th segment, 9.3 mm; most segments higher than wide, vertical diameter at midbody 9.9 mm, horizontal diameter 9.6 mm; diameter of segment 41, 8.9 mm. Color of recently preserved specimen: metazona deep mahogany brown, prozona white at anterior margin, shading into light brown at midlength and into dark brown at suture; legs light brown basally, grading into purplish brown on last two podomeres, antennae colored much like legs. Epiproct and paraprocts uniformly light brown, similar to basal podomeres.

Occiput and posterior third of epicranium finely and densely striate longitudinally, the striae continued across the prominent occipital suture; lower face smooth and glabrous except for light transverse clypeal striation and distinct punctures. Clypeal foveolae 3-3, labral pores about 10-10. Genae moderately coriarious, without lateral margin. Interantennal space 2.7 mm; interocellarial space 2.6 mm, maximum length of ocellarium 1.8 mm. Ocellaria reniform-triangular, ocelli arranged in 10 rows: 11-11-10-9-7-5-4-3-2-1 = 63 (shorter rows somewhat irregular and difficult to count with absolute certainty). Antennae moderately long (6.9 mm), antennomeres in decreasing order of length: 2>3=4=4>7=1, 2nd subcylindrical and nearly as long as 3rd and 4th together, 6th broadly expanded distad and almost triangular in outline; 8th very small, with 4 sensory cones; articles 6 and 7 with transverse apical sensory pit.

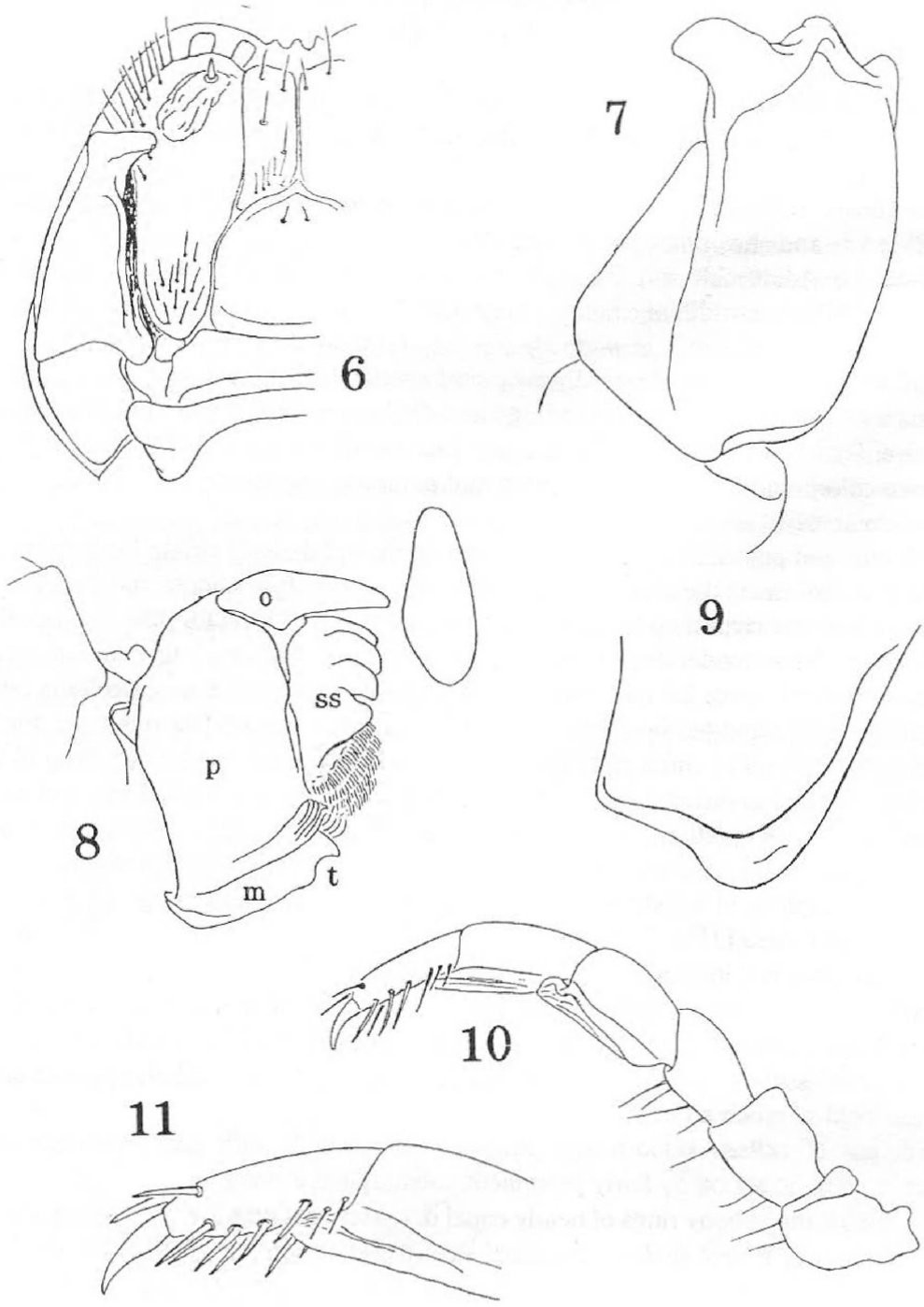
Second segment of mandible with three lobes on its outer distal margin, the ventralmost strongly curved mesad (Fig. 7); psectromere with 11 complete pectinate lamellae and traces of two more proximal incomplete series, its sectile edge with four broadly rounded marginal lobes (Fig. 8); molar surface with shallow but distinct subapical depression. Gnathochilarium of typical spirostreptoid form (Fig. 6), stipes with prominent oblique distal convexity with notably striate surface, a lateral field of long setae adjacent to mandibular projection and a proximal field of much shorter setae.

Surface of collum smooth and polished; lateral ends with only moderate anterior projection (Fig. 9) set off by fairly prominent submarginal groove.

Subsegments of body rings of nearly equal diameter, metazona only imperceptibly wider, segmental stricture very shallow. Prozonal surface with numerous fine striations generally merged into network of transversely elongate meshes; metazona smooth and polished dorsally, with very fine sparse punctation, surface below pores with numerous fine longitudinal striae, enlarging into small ridges in going ventrad. Ozopores large and conspicuous. Sterna without trace of transverse striae. Anterior stigmata located in shallow elongate-triangular depression which extends laterad only to about level of outer edge of prosternum (or to outer end of coxa).

Ultimate segment produced into elongate, distally upturned epiproct; paraprocts slightly convex, margins set off by shallow but distinct depression; hypoproct small, transversely subtriangular.

Legs (Fig. 10) long (to 7 mm at midbody), apices of femora visible from above when legs are extended. Coxae and prefemora of different form on most segments: those of anterior



Figs. 6-11. *Poratophilus gorteri*, n. sp., anatomical details. 6. Posterior aspect of left side of head showing gnathochilarium and basal mandibular segments. 7. 2nd segment of mandible, enlarged and more lateral aspect to show three projections on distal margin. 8. Distal segments of mandible, posterior aspect. Small separate drawing shows outline of odontomere in distal aspect. 9. Lateral end of collum, right side. 10. Leg from midbody segment. 11. Tibia and tarsus of preceding, enlarged to show setation. All drawings from holotype, at various magnifications. Abbreviations: O, odontomere of mandible; P, psectromere; SS, sectile sclerite; M, mola; T, transverse subterminal furrow setting off apex of mola.

legpair narrowed ventrad, broadened and flattened dorsally, those of posterior legpair modified in reverse. Coxae with coalesced trochanterial element. Postfemora and tibiae of all legs except first two pairs with large and prominent ventral soles which extend distad beyond end of each podomere. Tarsi of anterior legs with typically four macrosetae on anterior side and three on posterior, toward midbody (Fig. 11) the numbers increase to five and four respectively. One large supraonychial seta, and one smaller accessory seta. Ventral surface of coxae, prefemora, and femora each with two or three setae in a single median row.

Coxae of first pair of legs (Fig. 2) coalesced without trace of median suture; median sternal element not visible and presumably completely absorbed into a syncoxosternal sclerite; base of tracheal apodemes discrete. Anterior surface with a small field of large setae laterally on each side. Prefemora small, broadly in contact medially with moderate subtriangular basal projection.

Gonopods similar to those in *Zinophora*, sternum transverse, sclerotized, prominent; paracoxites massive, broader than long; median (anterior) coxal fold broadly rounded distolaterad, apically acuminate and terminating in an acute point (Fig. 12); lateral (posterior) coxal fold expanded distally into a nearly circular flat lamina that conceals flexure of telopodite and femoral spine (Fig. 13), neither fold lobed nor closely appressed. Telopodite with large, falcate process originating at flexure, its apex directed laterad within the lateral coxal fold. Apex of telopodite with a primary branch (R1) ending in (1) a very thin hyaline plate (pectinophore) embellished with a single series of long, setiform projections (Fig. 14, pct) and a thin slender solenomere (Fig. 15, slm) with a prominent triangular projection at its base, and a secondary branch (R2), basally slender, apically expanded, on posterodorsal edge somewhat distant from primary.

Paratype: Immature female, 75 mm long, 9.8 mm in diameter, with 50 segments, none of them legless but cyphopods undeveloped. Structure corresponding to that of holotype except for sexual features such as shape of collum, absence of soleation, smaller and shorter legs and antennae.

Remarks: At low power magnification, it is difficult to distinguish the solenomere as separate from the pectinophore – the relationship is easiest seen from an oblique aboral aspect at about 90X (from which Figure 15 was drawn). With a little dexterity a fine pin may be inserted between the two structures to demonstrate their independence.

ACKNOWLEDGEMENTS

Aside from a very obvious obligation to Dr. G. M. J. A. Gorter for providing the material on which this paper is based, I am much indebted to my friend and colleague S. I. Golovatch for reviewing an early draft of the manuscript.

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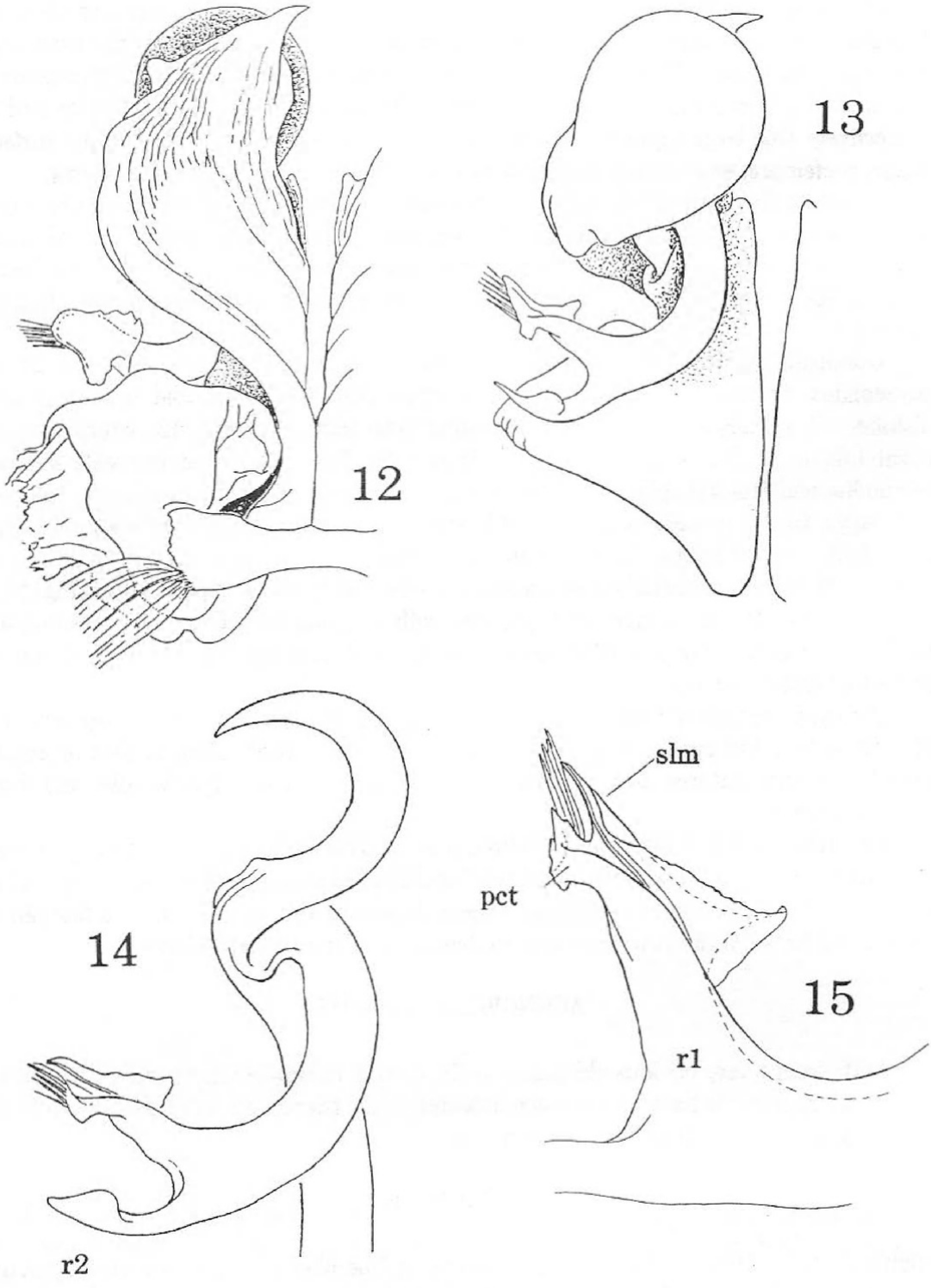

Figs. 12-15. *Poratophilus gorteri*, n. sp., gonopod structure. 12. Left gonopod, anterior aspect. 13. Right gonopod, posterior aspect. 14. Distal two-thirds of right telopodite, posterior aspect. 15. Primary branch of telopodite, enlarged to show fine structure of apical parts. Abbreviations: pct, pectinophore; R1, primary branch; R2, secondary, subterminal branch; slm, solenomere.

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