

Myriapodologica

A SERIES OF OCCASIONAL PAPERS PUBLISHED AT RADFORD UNIVERSITY

ISSN 0163-5395

Vol. 1, No. 4

January 30, 1980

Prosopodesmus panporus, an interesting new species of
polydesmoid millipede from the Royal Botanic Gardens,
Kew, England

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In the course of a survey of the established fauna of the Royal Botanic Gardens, Kew, one of us (A.J.R.) has found several millipedes new to Britain. The species described here is well established in four of the houses at Kew and has several features of interest. The arrangement of its ozopores is unique in the order Polydesmida; this character and the form of the gonopods mark it out as a species new to science and yet it is clearly a species introduced from some tropical region from which it has not yet been collected.

TAXONOMY

Haplodesmidae

Prosopodesmus.

Prosopodesmus Silvestri, 1910, Zool, Anz., vol. 35, p. 360.

Prosopodesmus panporus, sp. nov.

The following is a composite description based on all the material in our possession. Specific reference to one or another of the types is made in the legends to the figures.

Body almost pigmentless, white to cream-white. Males with 19 segments, 3.3 - 3.8 mm long, 0.45 - 0.50 mm broad; females with 20 segments, 3.8 - 4.3 mm long, 0.50 - 0.51 mm broad.

Head almost completely covered by a fan shaped (sectorial) collum; metazonite of second ring broader than the metazonites of all subsequent rings, the paranota forwardly directed, embracing the head and collum, their lateral edges confluent with the sides of the collum and continuing the lines of same; the division between the collum and the second ring in life is not immediately evident in dorsal view.

The antennae are inserted close together on the vertex; when at rest, they occupy deep grooves diverging dorsally and then passing posteriorly, their distal antennomeres overhung by the sides of the collum and the paranota of the second ring. The forehead triangle enclosed within the diverging antennal bases and the anterior edge of the collum is raised into seven tubercles, one at the apex, two in the next row and four forming the base beneath the collum edge. The sixth antennomere is the longest and broadest; the fifth is slightly shorter. Each of these two larger antennomeres carries a group of sensory cones on their distal dorsal extremities.

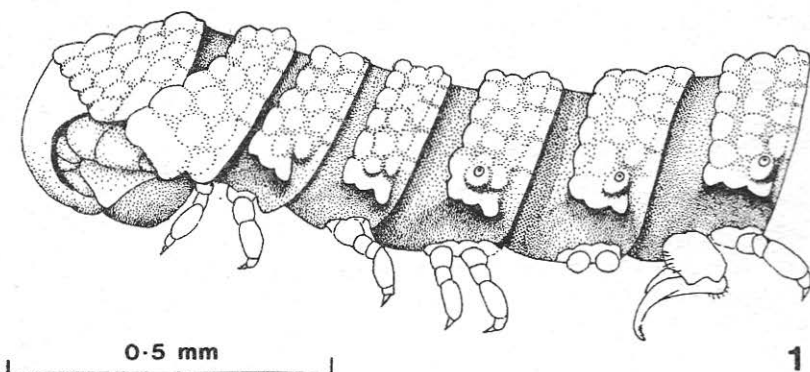


Fig. 1. *Prosopodesmus panporus*, n. sp. Lateral view of the anterior part of the male of a mating pair collected in the Palm House, 15 April 1976 (paratype 5).

The dorsal surface of the collum is raised into an even pavement of tubercles; those of the outermost row are flatter than the remainder and form the incised anterior edge of twelve lobes; these are followed by four rows of more convex tubercles. The succeeding metazonites are strongly arched and are raised into three transverse rows of regular tubercles uniform with those of the collum. The metazonites of the third and fourth rings are much less broad than those of the second ring and slightly less broad than the fifth and all subsequent rings except the telson. The paranota are placed slightly below the mid-lateral level and are incised into three lobes; the middle lobe is slightly broader but not more protrusive; the posterior lobe is more clearly separated from the other two and is directed slightly postero-laterally.

Ozopores occur on all diplopodous segments, 5 - 17 in the male, 5 - 18 in the female and there is a pair of rudimentary pores on the single apodous ring (ring 18 of the male and 19 of the female). The pores are borne on the outermost pair of tubercles, of the middle row of the fifth and of the posterior row of the sixth to the last podous ring. The poriferous tubercles of the fifth metazonite obscure the middle lobe of the paranotal edge in dorsal view; those of the remaining diplopodous rings obscure the posterior paranotal lobes. The poriferous tubercles are directed slightly posteriorly, a tendency most obviously developed on the last two or three diplopodous rings where they project posterolaterally beyond the posterior limit of the metazonite.

The anterior row of tubercles on the metazonites slightly overhang the anterior edge. The third row of tubercles stop just short of the posterior edge which is incised into flat fields corresponding in number to the tubercles; these flat posterior portions of the metazonite could just conceivably be described as a fourth row of rather flat tubercles. There are eight tubercles in the first and second rows of the anterior rings, passing to ten on the sixth and eventually twelve from the eighth onwards. The posterior row on rings one to five include 9 tubercles increasing to 11 from the sixth to the last ring, the outermost pair carrying the ozopores, which on the fifth ring are borne on the outermost pair of tubercles of the second row. The telson carries the same three rows of tubercles although the numbers in the second and third rows naturally diminish towards the apex. The tubercles along the posterior edge of the telson overhang as 6 + 6 lobes.

The entire surface of the tubercles and the region between them is raised into microtubercles and micropapillae, as also is the surface of the prozonites (figs 2 &

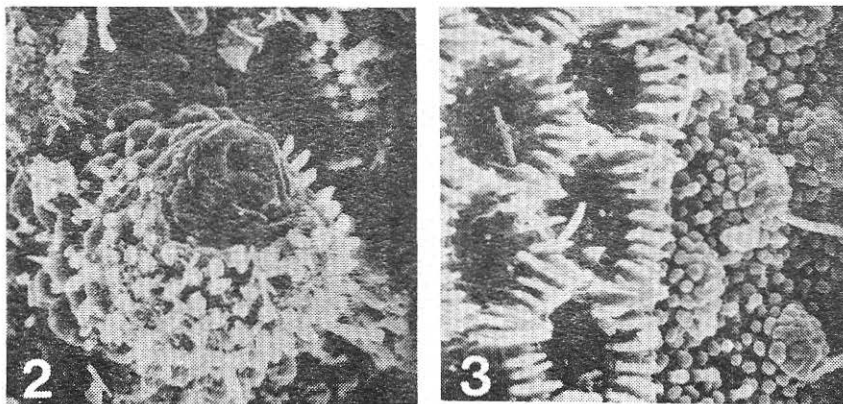


Fig. 2. *Prosopodesmus panporus*, n. sp. Electron scan photograph of the porostele and ozopore on the last podous segments of a female, X 775. Fig. 3. Detail of the junction of prozonum and metazonum of the 14th ring of the same female, prozonum on the right, X 1,500.

3). The only macrosetae are carried on the telson, anal valves and scale; there are 4 + 4 inserted just beneath the twelve-lobed posterior edge of the telson, level with the dorsalmost 3 + 3 of these lobes. A further four prominent setae are housed in a collar at the apex of the telson just below the medianmost lobes. Each of the anal valves carries 2 + 2 setae and a further pair are carried by the trapezoidal anal scale. None of these macrosetae is visible from the dorsal side due to the ventrally directed curvature of the telson.

The gonopods are shown in figs 6 - 8 along with those of *P. jacobsoni*. In *P. panporus* they are simple uniramous structures terminating in prominent teeth, one apical, two sub-apical arising at about the same level and a further two (sometimes a third rudimentary tooth) along the external edge of the ramus just below the first sub-apical pair. Figs. 6 - 8 indicate different appearances of these teeth when viewed from different aspects.

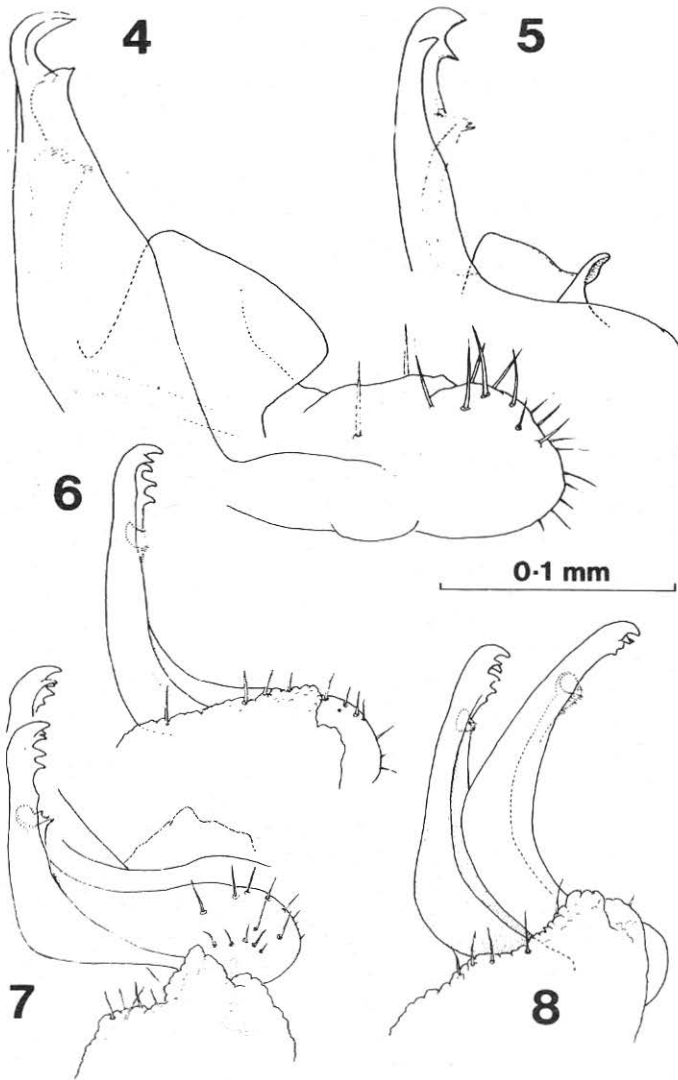
Table 1. Comparison of *Prosopodesmus panporus* sp. n. with *P. jacobsoni* Silvestri

<i>Prosopodesmus jacobsoni</i>	<i>Prosopodesmus panporus</i>
1. Males and females with 20 segments	Males with 19, females with 20 segments
2. Red-brown, 6.0 X 0.71 mm (nominata form)	Cream-white, males 3.3 - 3.8 mm X 0.45 - 0.50 mm
Yellowish, 7.7 X 0.95 mm (subsp. <i>hilaris</i> Brolemann)	Females 3.8 - 4.3 X 0.50 - 0.51 mm
3. Ozopores on segments 5, 7-19	Ozopores on segments 5-17(18) males, 5-18(19) females
4. First row of metazonal tubercles largest, third row smallest (a fourth row in <i>P. j. hilaris</i>)	Tubercles of all three rows of equal size (posterior edge of metazonite could be regarded as a fourth row of flatter tubercles).
5. Posterior edge of telson with ten lobes	Posterior edge of telson with 12 lobes.
6. Gonopods with a large lateral lamella on proximal half of telopodite. Two subapical teeth (Figs. 4 & 5).	No lateral lamella on telopodite. Four (sometimes a fifth) subapical teeth (Figs. 6, 7, 8).

Affinities: *Prosopodesmus panporus* resembles *P. jacobsoni* Silvestri, 1910, in many details, and also agrees in many respects with the short description of *Homodesmus parvus* Chamberlin, 1918, which Loomis (1950) recognised as a synonym of *P. jacobsoni*. The main differences between the descriptions of these two species of *Prosopodesmus* are listed in Table 1. Attems (1940) included *Prosopodesmus* in the family Cryptodesmidae of Karsch, subfamily Pyrgodesminae Silvestri (= Styloidesmidae Cook and Collins). Hoffman (1980) has repositioned the genus in the family Haplodesmidae.

The gonopod structure and the small size of the Kew animals are themselves sufficient to merit the erection of a new species. *P. panporus* is the same length but a little broader than *Macrosternodesmus palicola* and thus shares the distinction of being one of the smallest diplopods. *P. panporus* is unique in the order Polydesmida in possessing ozopores on the sixth segment and thereby exhibiting a complete series from the fifth to the penultimate segment; each and every diplopodous segment carries a pair of ozopores. Attems (1940) noted that the arrangement of ozopores in the old family Cryptodesmidae was more variable than in all other families. Nevertheless, whilst many genera of cryptodesmids depart from the normal pore formula in having a reduced number of pores, Attems listed only two genera, *Prosopodesmus* (= *Homodesmus*) and *Gonomastis* with a number of pores in excess of the normal formula and the species of both these genera are without pores on the sixth segment. However, the early tendency to assume generic status for a particular distribution of ozopores is now in doubt (see Hoffman, 1976 and Shear, 1974) which leads us to place the new species within the existing genus *Prosopodesmus* to which it is so evidently closely related on the evidence of the general form of the body and the gonopods.

Distribution: *Prosopodesmus jacobsoni* was first recorded from Java (Silvestri, 1910) and India (Verhoeff, 1936). Brolemann (1920) described a new subspecies, *P. jacobsoni hilaris*, from Zanzibar and, more recently, Schubart (1947) recorded the typical form from Brazil (Sao Paulo and Rio de Janeiro) as a synanthrope.



Figs. 4-8. Gonopods of *Prosopodesmus*. Fig. 4. *P. jacobsoni* Silvestri, right gonopod in external profile, drawn from holotype. Fig. 5. Right gonopod, redrawn from Fig. 7 of the original description (Silvestri, 1910). Fig. 6. *P. panporus* n. sp. External profile view of right gonopod of paratype 2 (the specimen is mounted with left side uppermost, but the drawing is reversed to compare more easily with the other two). Fig. 7. *P. panporus*, gonopods of the holotype *in situ*, viewed from the right and slightly ventrally. Fig. 8. *P. panporus*, gonopods of paratype 1 *in situ*, viewed from the right.

Homodesmus parvus was recorded by Chamberlin (1918) from Haiti, Puerto Rico and St. Eustatius and was later recognised as a synonym of *P. jacobsoni* by Loomis (1950). Most recently the species has been recorded from the Canal Zone and Panama by Loomis (1961, 1964) and from Miami, Florida (Loomis, 1970). Loomis (1968) considered the species to be indigenous to the oriental region and probably introduced into the western hemisphere.

Although *P. jacobsoni* appears to have been amenable to introduction and becoming established as a synanthrope, there are no records of it having become adapted for life in hothouses in temperate countries in the manner of the better known pyrgodesmid *Poratia digitata*. Presumably *P. panporus* lurks in some unworked tropical habitat.

Type material: The type material of *P. jacobsoni* at Portici consists of two slides, one with separated parts including both gonopods (holotype), the other with two whole animals mounted dorsal surface uppermost (paratypes). The material we have deposited as types of *P. panporus* includes all the animals extracted by hand from 14 ounces of leaf litter from bed No. 1 of the Palm House on 16th May 1976 (see Table 1) and a mating pair collected from bed No. 2 of the Palm House on 15th April 1976 (paratypes 5 and 6). Details are as follows:

Holotype.	Male mounted in balsam laterally, gonopods clearly visible <i>in situ</i> .	Fig. 7	
Paratype 1	"	Fig. 8	
" 2	"	Fig. 6	
" 3	"		
" 4	Male mounted in balsam with dorsal surface uppermost; showing all porosteles and directly comparable with paratype of <i>P. jacobsoni</i> .		
Paratype 5	Male in spirit	Fig. 1	Mating pair,
" 6	Female in spirit (vulvae extruded).		Palm House, 15.4.76

The remaining adults and all the immature stadia from the sample of 16.5.76 are deposited as further paratypes. The holotype and paratypes 5 and 6 and onwards are deposited in the British Museum (Natural History), paratype 2 in the Hoffman collection and paratypes 1 and 4 at Portici.

BIOLOGY

Occurrence: First found on 16th March 1975 in bed No. 4 of the Tropical Aroid House No. 1 of the Royal Botanic Gardens, Kew; later in all beds of the central portion of the Palm House, from the East bed, house 9A of the 'T' range, in the centre of the Tropical Fern House (No. 2) and in all beds of the Tropical Aroid House (No. 1) during most months of 1976. Some were seen on the surface of the beds, others in the soil, leaf mulch, peat litter and wet gritty loam from which they were collected by hand, sieved or extracted by Tullgren funnel. Most of the beds had a winter temperature range from 70 - 80°F although the Palm House, apparently the most suitable habitat, varied from 54 - 72°F.

Age structure and life history: The stadia structure of four samples from the Palm House was established and the details are given in Table 2. The progression of stadia is normal for the Polydesmida. Several pairs *in coitus* were observed on 15th April 1976, five pairs in the Palm House and one in the Tropical Aroid House. The pairing position resembles that commonly observed in species of *Polydesmus* but with more of the posterior trunk region lying free. It will be evident from Table 1 that a new generation is born sometime in April, from adults which have moulted from overwintering penultimate stadia. The increasing proportion of mature males from March to May is perhaps due to females brooding eggs and therefore less susceptible to extraction by funnel.

Table 2. Stadia structure of samples of *Prosopodesmus panporus* from the Palm House of the Royal Botanic Gardens, Kew

Stadium	I	II	III	IV	V	VI	VII	VIII	New gen.	Old Gen.	Total	Ratio, mature ♂♂: mature ♀♀
Podous+apodous segments	4+2	6+2	8+3	11+3	14+2	16+1	17+1	18+1				
Total rings (including telson)	7	9	12	15	17	18	19	20				
Sample I (14.3.76) 7.5 oz. wet gritty loam bed No. 7 (sieved)	♂♂	.	.	1	5	17	11		None	34	64	11/4
	♀♀	.	.	.	5	10	11	4		30		
Sample II (9.5.76) bed No. 1	♂♂	5	11	2	.	.	2	27		29	88	27/22
	♀♀	.	.	.	1	.	18	22	18	41		
Sample III (16.5.76) 14 oz. leaf litter mulch, bed No. 1 a) sorted by hand	♂♂	35	30	6	.	1	2	38		41	142	38/22
	♀♀	.	.	.	.	1	7	22	71	30		
b) sorted by Tullgren funnel	♂♂	36	58	12	.	1	5	41		47	182	41/19
	♀♀	.	.	.	.	1	9	19	106	29		

ACKNOWLEDGEMENTS

We wish to thank Professor Richard L. Hoffman for advising us on the taxonomic position of the new species and for kindly reading our manuscript and making suggestions which have improved the clarity and precision of the description. Our thanks are also due to the Director of the Royal Botanic Gardens at Kew for permission to study the fauna, to Mrs. Edna Torgerson for her skill in taking electron scan photographs and to Professor E. Tremblay and Dr. G. Viggiani for allowing us to examine Silvestri's types from the Instituto di Entomologia Agraria, Portici.

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