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## *A New Xystodesmid Milliped Genus and Species from Oregon and Washington (Polydesmida)*

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### ABSTRACT

*Thrinaphe hargeri*, n. gen., n. sp., a convex harpaphine xystodesmid milliped from the lower Willamette Valley of Oregon and the Cascade Mountains of Washington and Oregon, is characterized by three terminal branches to the gonopodal telopodite — the prefemoral process, tibiotarsus, and solenomerite. *Thrinaphe* differs from *Harpaphe*, the other tribal representatives with this number of projections, in the length of the prefemoral process and in the origin of the third projection. The prefemoral process overhangs the opposite telopodal margin in *Thrinaphe* and terminates well short of this point in *Harpaphe*; the third projection arises on the prefemur in the latter taxon and is thus a "secondary prefemoral process," whereas it arises on the acropodite and is labeled the "tibiotarsus" in *Thrinaphe*. The structures are not homologous and not in themselves indicative of affinity between the genera. Redefinition of *Harpaphe* is required for contrast with *Thrinaphe*.

### NARRATIVE

The xystodesmid milliped fauna of the Pacific Coastal region of northwestern North America is dominated by *Harpaphe haydeniana haydeniana* (Wood) (Harpaphini), which is overwhelmingly abundant, occurring in practically every woodland. The tribe Chonaphini also occurs from southern Oregon to southern Vancouver Island, British Columbia, and is represented by *Tubaphe levii* Causey, in rain forests of the Olympic Mountains and the western fringe of Vancouver Island (Shelley 1990, in press *a*), and, sporadically, by *Chonaphe armata* (Harger), in coastal Washington and Oregon. On a field trip to Oregon in June 1991, I discovered an undescribed harpaphine species in

the Cascade Mountains that requires a new genus. It resembles *Isaphe convexa* Cook, in Idaho and Montana, because of its strongly convex body form, but its gonopods have three terminal projections instead of two, as in the latter species. The new genus thus joins *Harpaphe* Cook as the only harpaphine genera with three telopodal branches, but the different positions of the third projections indicate that they are not homologous. The structure arises on the prefemur in *Harpaphe* and hence is a "secondary prefemoral process," whereas it originates on the acropodite in the new genus and is arbitrarily labeled the "tibiotarsus," distinguishing it from the solenomerite, which carries the prostatic groove. Buckett and Gardner (1968) referred to the third branch of *Harpaphe* as the "femoral process" and the acropodite as the "tibiotarsus," but the former term is objectionable because the structure clearly arises from the distal extremity of the prefemur, below the prostatic groove, instead of from the femoral region of the acropodite. Redefinition of *Harpaphe* is therefore required to correct the terminology and distinguish it from *Thrinaphe*.

Despite the abundance of preserved millipeds from the Pacific Northwest in American and Canadian repositories, the new form has been collected only eight times, all from the Cascade Mountain Range or the lower Willamette Valley. It therefore appears to occur in the interior and may be absent from the Coast Range, where most sampling has taken place. The generic name reflects the number of telopodal projections, and the specific honors Oscar Harger (1843-1887), whose collection of myriapods in the Blue Mountains of eastern Oregon in 1871, and subsequent descriptions of four new species (Harger 1872), were among the first of the western North American fauna (Shelley, in press *b*). Acronyms of sources of preserved study material are as follows:

FSCA - Florida State Collection of Arthropods, Gainesville.

NCSM - North Carolina State Museum of Natural Sciences, Raleigh.

UCD - Bohart Entomological Museum, University of California at Davis.

UWBM - Thomas Burke Memorial Washington State Museum, University of Washington, Seattle.

#### *Thrinaphe*, new genus

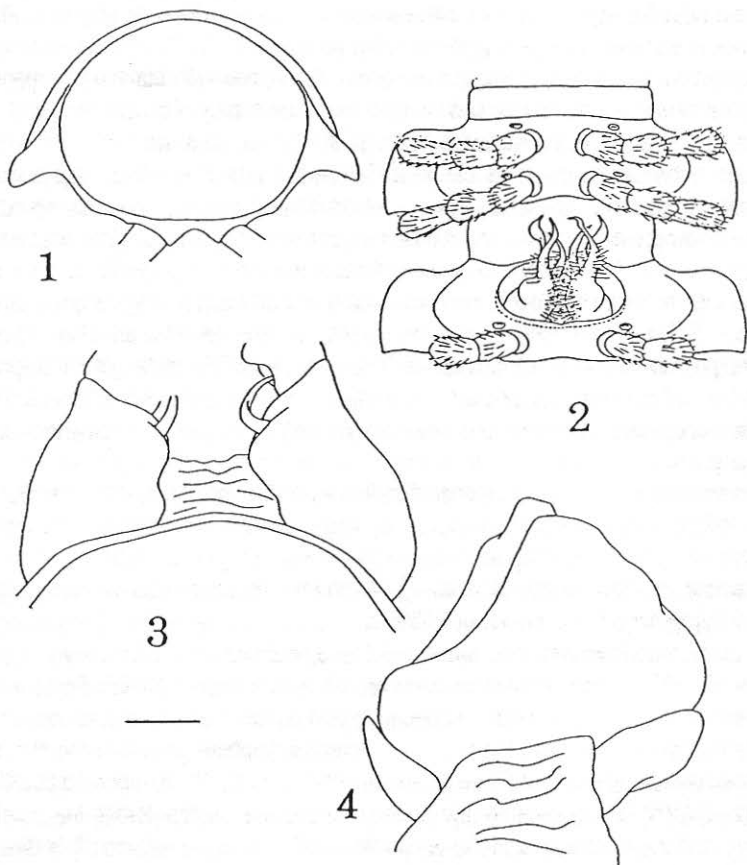
*Type species. Thrinaphe hargerii*, new species.

*Diagnosis.* Characterized by the strongly convex body form with paranota angling sharply ventrad, accentuating slope of the dorsum; telopodites with 3 terminal branches; prefemoral process long, leaning across prostatic groove and medial face of telopodite, extending beyond opposite telopodal margin and overhanging inner edge of tibiotarsus; latter laminate, arising proximad on acropodite, leaning anteriad basally and curving broadly caudad distally, outer margin irregularly serrate; solenomerite

curving broadly anteriorad, overlapping tibiotarsus and enclosing circular space in medial view.

*Description.* A genus of relatively large, strongly convex harpaphine Xystodesminae with the following characteristics:

Body composed of head and 20 segments in both sexes. Head of normal appearance, smooth. Epicranial suture sharp, distinct. Antennae relatively short, with 4 conical, terminal, sensory cones and microsensilla on penultimate antennomere. Facial setae with epicranial, subantennal, frontal, genal, clypeal, and labral series, interantennal absent.



Figs. 1-4, *Thrinaphe hargeri*. 1, profile of midbody segment, caudal view. 2, gonopods *in situ*, ventral view of holotype. 3, sternum and gonopodal coxae of holotype, anterior view. 4, left cyphopod of female from Multnomah Co., OR, caudal view. Setation omitted from all drawings. Scale line for figs. 1 and 2 = 1.0 mm; for fig. 3 = 0.25 mm; for fig. 4, 0.5 mm.

Terga smooth; strictures broad, distinct. Collum large and broad but not extending beyond ends of following tergite. Paranota strongly depressed, creating appearance of highly convex, vaulted body. Peritremata relatively broad, moderately elevated from paranotal surface; ozopores opening sublateral.

Caudal segments normal for family.

Sides of metazonites with variable ridges above coxae. Pregonopodal sterna of males with only small lobes between 4th legs and moderate depression on 6th segment. Postgonopodal sterna flat and glabrous, unmodified. Gonapophyses short, apically expanded. Male coxae unmodified, female coxae with subconical, ventrodiscal lobes on caudal legs; prefemora with ventrodiscal spines arising on legs of midbody segments, becoming longer and decurved caudad.

Gonopodal aperture relatively small, ovoid. Gonopods with standard harpaphine features, sternal apodeme long and straight, telopodite subequal to coxa in overall bulk. Coxae moderate-size, connected by slender sternal remnant, with sublinear field of regular setae below origin of cannula. Telopodite with 3 terminal projections — prefemoral process, tibiotarsus, and solenomerite. Prefemoral process spatulate, angling over prostatic groove and medial face of telopodite, overhanging inner margin of tibiotarsus. Latter thin and laminate, arising proximad on acropodite, shorter than solenomerite, curving broadly caudad distally, outer margin irregularly serrate or jagged. Solenomerite longer than tibiotarsus, curving broadly anteriad distal to midlength, tapering to subacuminate tip, margins smooth. Prostatic groove arising in pit in base of prefemur, running along medial face of latter and crossing to lateral side at base of tibiotarsus, curving onto solenomerite and running down midline to terminal opening.

Cyphopodal aperture narrow, encircling 2nd legs. Cyphopods oriented transversely and obliquely dorsoventrally in aperture, large in size because of large valves. Receptacle small, wing shaped, distal margin hirsute. Operculum relatively large.

*Distribution.* The Cascade Mountains of southern Washington and northern Oregon, extending westward into the lower Willamette Valley of Oregon (Fig. 9).

*Species.* One is known; others may exist in remote sites in the Cascades.

*Relationships.* The presence of three branches does not in itself indicate affinity between *Thrinaphe* and *Harpaphe*, because with different origins, the structures are not homologous. However, there are only three harpaphine genera in the Nearctic, *Isaphe* Cook being the third (Shelley, manuscript in press), which appear to constitute a monophyletic group because the prefemoral process angles across the prostatic groove and the medial face of the telopodite in all three taxa, whereas it is directed away from the telopodite stem in Asiatic harpaphines. No clear synapomorphies are known between any two of the Nearctic genera, so they represent an unresolved trichotomy.

*Thrinaphe harger*, new species

Figs. 1-6

*Type specimens.* Male holotype and one male paratype (UCD) collected by K. Goeden, 25 October 1968, 8 mi. SW Hood River (town), Hood River County, Oregon.

*Diagnosis.* With the characters of the genus.

*Holotype.* Length 31.9 mm, maximum width 6.0 mm, W/L ratio 18.8%, depth/width ratio 76.7%. Body essentially parallel sided for most of length, tapering caudad.

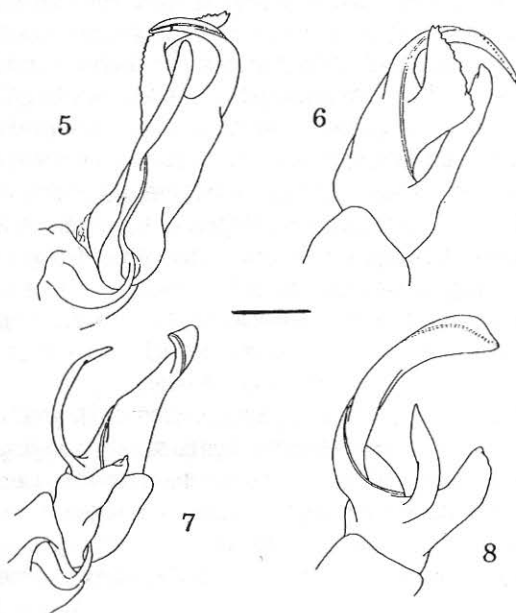
Head capsule smooth, polished; epicranial suture distinct, terminating just above interantennal region. Width across genal apices 3.7 mm, interantennal isthmus 1.1 mm. Antennae relatively short and slender, reaching only to just beyond caudal margin of 2nd tergite, becoming progressively more hirsute distally, with 4 apical sensory cones and microsensilla on distal margin of 6th antennomere, first antennomere subglobose, 2-6 clavate, 7 short and truncate; relative lengths of antennomeres 2>6>3>4=5>1>7. Genae not margined laterally, ends narrowly rounded and projecting well beyond adjacent cranial margins, with faint central impressions. Facial setae as follows: epicranial 2-2, interantennal absent, subantennal 1-1, frontal 1-1, genal 2-2, clypeal about 18-18, labral about 20-20, merging with clypeal series and continuing for short distance along genal margins, about 4 setae per side.

Terga smooth, polished. Collum broad, ends not produced beyond those of following tergite. Paranota strongly depressed, arising high on sides and angling sharply ventrad, accentuating slope of dorsum (Fig. 1); anterior corners rounded, caudolateral corners blunt on all segments, angling slightly caudad on segment 15 and becoming progressively more angled caudad. Peritremata moderately distinct, moderately elevated above paranotal surface; ozopores located caudal to midlength, opening sublateral.

Sides of metazonites finely granular, with 2-3 faint, shallow grooves on anteriormost segments and variably low, rounded ridges above coxae, sharpest on segments 1-5, fading on caudal segments. Strictures sharp, relatively broad. Pregonopodal sterna with pair of low, rounded knobs between 4th legs; 6th sternum moderately depressed to accommodate apices of telopodites. Postgonopodal sterna glabrous, without modifications, with only very faint transverse grooves originating between leg pairs, caudal margins gently curved. Pregonopodal legs moderately hirsute, postgonopodal legs becoming progressively less hirsute caudad. Prefemora of legs 1-7 and all coxae without modifications, 9th and 10th prefemora with short, blunt ventrodistal lobes, becoming spiniform on 11th legs and progressively larger and more decurved through leg 17, remaining decurved and strongly spiniform on caudal legs; tarsal claws gently curved. Hypoproct broadly rounded, paraprocts with margins strongly thickened.

Gonopodal aperture ovoid, relatively narrow, 1.5 mm wide and 0.6 mm long at

midpoint, indented slightly anteriolaterad, anterior margin and sides flush with metazonal surface, caudolateral corners and caudal margin slightly elevated. Gonopods *in situ* (Fig. 2) with telopodites projecting nearly directly ventrad from aperture, leaning slightly anteriad thus overhanging anterior margin of aperture and 6th sternum when segments compressed. Gonopod structure as follows (Figs. 3-6): Coxa subequal to telopodite in overall bulk, connected to opposite member by slender sternal remnant, with a field of a dozen or so regular setae below origin of cannula. Prefemur moderate



Figs. 5-8. 5-6, *T. hargeri*. 5, left gonopod of holotype, medial view. 6, the same, lateral view. 7-8, *Harpaphys haydeniana haydeniana*. 7, left gonopod of male from Lewis Co., WA, medial view. 8, the same, lateral view. Setaation omitted from all drawings. Scale line = 0.40 mm.

in size, subglobose, with moderately long, spatulate prefemoral process arising disto-medial, angling across medial face of telopodite, crossing prostatic groove, and overhanging inner margin of tibiotarsus, narrowing slightly distad, apically broadly rounded. Acropodite divided basally into solenomerite and tibiotarsus. Latter thin and laminate, shorter than solenomerite, broad basally but narrowing continuously distad, more so apically, leaning anteriad then curving broadly ventrocaudad, inner margin smooth, outer margin irregularly notched, jagged, with two slightly larger terminal teeth. Solenomerite leaning caudad basally then curving broadly anteriad, overlaying tibiotarsus and enclosing circular space in medial view, broad basally, narrowing smoothly and continuously to subacuminate tip, margins entire.

*Male paratype.* Aside from a different arrangement of notches on the outer margin of the tibiotarsus, the male paratype agrees with the holotype in all particulars.

*Female from Multnomah Co., OR.* Length 28.4 mm, maximum width 4.0 mm, W/L ratio 14.1%, depth/width ratio 67.5%. Agreeing closely with males in structural details except caudal coxae with distinct, subconical, ventrodorsal lobes and paranota more strongly depressed, creating appearance of more vaulted, nearly cylindrical body. Cyphopodal aperture relatively narrow, sides and caudal margin slightly elevated above metazonal surface. Cyphopods *in situ* with valves oriented transversely and obliquely dorsoventrally in aperture, openings visible. Receptacle (Fig. 6) relatively small and "wing-shaped," cupped around anteriomedial corner of valves, deeply divided at mid-length into two subequal halves, with several long setae arising from ventral margin. Valves large, subequal, irregularly shaped, with small lobes at ventralmost point. Operculum large, subequal in size to one side, or "wing," of receptacle.

*Variation.* As with the paratype, the only noticeable variation among the available males concerns the degree of serration and arrangement of teeth on the tibiotarsus, which can be more or less jagged than the condition in the holotype. The anterior margin of the prefemoral process is also lightly serrate in some males.

*Ecology.* The NCSM male was encountered in moist litter in a patch of deciduous trees along Dog River; the site contrasted markedly with the chiefly coniferous forests in the area and was of sufficient size that I noticed it while traveling along Oregon highway 35. The specimens from Multnomah County, Oregon, were collected from under rotting logs; those from Klickitat County, Washington, were found under rocks and logs.

*Distribution* (Fig. 9). Same as that of the genus. Specimens were examined as follows:

WASHINGTON: *Klickitat Co.*, along WA hwy. 141 near Husum, 45.786°N, 121.496°W, M, 11 April 1986, R. Crawford (UWBM); and Colowesh Bottom, adjacent to Horsethief Lake St. Pk., 45.65°N, 121.10W, 2M, F, 14 April 1976, J. P. Pelham (UWBM).

OREGON: *Multnomah Co.*, Portland, MacLeay Park, M, F, 8 June 1952, V. Roth (FSCA) and 140th Ave. and Ellis St., Wilson Hill, 2M, 20 April 1957, L. Vanek (FSCA). *Hood River Co.*, 8 mi. SW Hood River (town), 2M, 25 October 1968, K. Goeden (UCD) TYPE LOCALITY; and 4 mi. S Parkdale, Dog R. Trail, M, 3 June 1991, R. M. Shelley (NCSM). *Marion Co.*, 2.5 mi. W Mehama, 2M, 16 March 1969, and 4M, 30 March 1969, E. M. Fisher (UCD).

*Remarks.* The male I collected coiled tightly upon being uncovered, and most preserved specimens also were tightly coiled, being stiff, rigid, and virtually impossible to unroll and dissect without fragmentation. In life, the NCSM specimen was a rather uniform brownish-gray dorsally, but the pigments fade rapidly in alcohol, and the

preserved material exhibits a banded pattern, with light metaterga alternating with darker prozona.

The paranota are so strongly depressed as to be barely noticeable as lateral projections, particularly in females, and many individuals seem almost cylindrical or "juliform." As *T. hargerii* is a rather stout harpaphine, this "juliform" appearance resembles a short spiroboloid, reminding me of representatives of the Atopetholidae in the southwestern United States and Mexico, for example *Orthichelus michelbacheri* (Verhoeff) in the Mohave Desert.

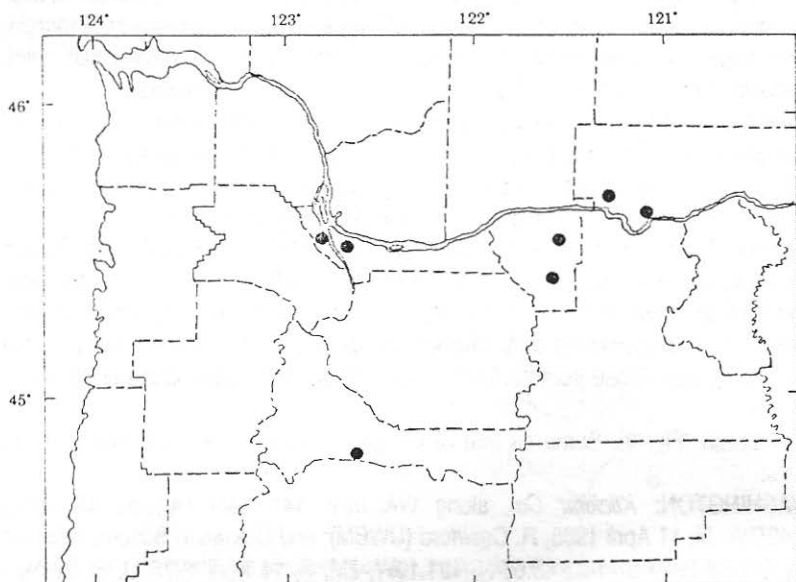


Fig. 9. Distributions of *Thrinaphe* and *T. hargerii*.

#### Genus *Harpaphe* Cook

*Type species.* *Polydesmus haydenianus* Wood, by original designation of Cook (1904).

*Diagnosis.* Characterized by moderately depressed paranota, interrupting slope of dorsum and projecting distinctly sublateral, thereby imparting flattened appearance to body form; telopodites with 3 terminal branches; primary prefemoral process short and broad, leaning over medial face of telopodite and obscuring prostatic groove but



terminating well short of, and not overlapping, outer telopodal margin; secondary prefemoral process arising distad on prefemur, long and slender, longer than primary projection, curving broadly caudad apically, not overlapping acropodite; latter curving broadly anteriad, more strongly so distad, apically blunt.

*Remarks.* Buckett and Gardner (1968) remarked that *Harpaphe* differed from related genera in that the gonopods possessed both a short, truncated prefemoral process and an elongate "femoral process" (= secondary prefemoral process), in addition to what they labeled the "tibiotalus" (= acropodite). The pattern of these three branches was not detailed because it did not seem significant at the generic level; their presence alone diagnosed *Harpaphe* before discovery of *Thrinaphe*.

#### ACKNOWLEDGMENTS

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- \_\_\_\_\_. in press *b*. The myriapod types of Oscar Harger. Brimleyana, in press.
- \_\_\_\_\_. in press *c*. The milliped genus *Isaphe* Cook (Polydesmida: Xystodesmidae). Can. J. Zool.

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