Variation and pigmentation in the millipede, *Xystocheir brachymacris* Shelley, 1996, from the northern Sierra Nevada foothills, California, USA (Polydesmida: Xystodesmidae: Xystocheirini)

Rowland Shelley  
*North Carolina State Museum of Natural Sciences, rowland.shelley@naturalsciences.org*

Jamie M. Smith  
*North Carolina State Museum of Natural Sciences, jamie.smith@naturalsciences.org*

Deren J. Ross  
*Auburn, derenross@sbcglobal.net*

Follow this and additional works at: [http://digitalcommons.unl.edu/insectamundi](http://digitalcommons.unl.edu/insectamundi)
Variation and pigmentation in the millipede, *Xystocheir brachymacris* Shelley, 1996, from the northern Sierra Nevada foothills, California, USA (Polydesmida: Xystodesmidae: Xystocheirini)

Rowland M. Shelley, Jamie M. Smith
Research Laboratory
North Carolina State Museum of Natural Sciences
MSC #1626
Raleigh, NC 27699-1626 USA

Deren J. Ross
13005 B Lincoln Way
Auburn, CA 95603 USA

Date of Issue: August 29, 2014
Rowland M. Shelley, Jamie M. Smith, and Deren J. Ross
Variation and pigmentation in the millipede, *Xystocheir brachymacris* Shelley, 1996, from the northern Sierra Nevada foothills, California, USA (Polydesmida: Xystodesmidae: Xystocheirini)
*Insecta Mundi* 0371: 1–6

ZooBank Registered: urn:lsid:zoobank.org:pub:8D0DD217-DCC2-41DC-A295-69FCD8473DC2

**Published in 2014 by**
Center for Systematic Entomology, Inc.
P. O. Box 141874
Gainesville, FL 32614-1874 USA
http://centerforsystematicentomology.org/

*Insecta Mundi* is a journal primarily devoted to insect systematics, but articles can be published on any non-marine arthropod. Topics considered for publication include systematics, taxonomy, nomenclature, checklists, faunal works, and natural history. *Insecta Mundi* will not consider works in the applied sciences (i.e. medical entomology, pest control research, etc.), and no longer publishes book reviews or editorials. Insecta Mundi publishes original research or discoveries in an inexpensive and timely manner, distributing them free via open access on the internet on the date of publication.

*Insecta Mundi* is referenced or abstracted by several sources including the Zoological Record, CAB Abstracts, etc. *Insecta Mundi* is published irregularly throughout the year, with completed manuscripts assigned an individual number. Manuscripts must be peer reviewed prior to submission, after which they are reviewed by the editorial board to ensure quality. One author of each submitted manuscript must be a current member of the Center for Systematic Entomology.

**Chief Editor:** Paul E. Skelley, e-mail: insectamundi@gmail.com

**Head Layout Editor:** Eugenio H. Nearns

**Editorial Board:** J. H. Frank, M. J. Paulsen, Michael C. Thomas

**Review Editors:** Listed on the Insecta Mundi webpage

**Manuscript Preparation Guidelines** and **Submission Requirements** available on the Insecta Mundi webpage at: http://centerforsystematicentomology.org/insectamundi/

**Printed copies** (ISSN 0749-6737) annually deposited in libraries:
CSIRO, Canberra, ACT, Australia
Museu de Zoológia, São Paulo, Brazil
Agriculture and Agrifood Canada, Ottawa, ON, Canada
The Natural History Museum, London, UK
Muzeum i Instytut Zoologii PAN, Warsaw, Poland
National Taiwan University, Taipei, Taiwan
California Academy of Sciences, San Francisco, CA, USA
Florida Department of Agriculture and Consumer Services, Gainesville, FL, USA
Field Museum of Natural History, Chicago, IL, USA
National Museum of Natural History, Smithsonian Institution, Washington, DC, USA
Zoological Institute of Russian Academy of Sciences, Saint-Petersburg, Russia

**Electronic copies** (Online ISSN 1942-1354, CDROM ISSN 1942-1362) in PDF format:
Printed CD or DVD mailed to all members at end of year. Archived digitally by Portico.
Florida Virtual Campus: http://purl.fcla.edu/fcla/insectamundi
University of Nebraska-Lincoln, Digital Commons: http://digitalcommons.unl.edu/insectamundi/
Goethe-Universität, Frankfurt am Main: http://nbn-resolving.de/urn/resolver.pl?urn:nbn:de:hebis:30:3-135240

**Copyright** held by the author(s). This is an open access article distributed under the terms of the Creative Commons, Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original author(s) and source are credited. http://creativecommons.org/licenses/by-nc/3.0/

**Layout Editor for this article:** Eugenio H. Nearns
Variation and pigmentation in the millipede, *Xystocheir brachymacris* Shelley, 1996, from the northern Sierra Nevada foothills, California, USA (Polydesmida: Xystodesmidae: Xystocheirini)

Rowland M. Shelley, Jamie M. Smith
Research Laboratory
North Carolina State Museum of Natural Sciences
MSC #1626
Raleigh, NC 27699-1626 USA
rowland.shelley@naturalsciences.org, jamie.smith@naturalsciences.org

Deren J. Ross
13005 B Lincoln Way
Auburn, CA 95603 USA
derenross@sbcglobal.net

**Abstract.** A newly discovered population of *Xystocheir brachymacris* Shelley, 1996 (Polydesmida: Xystodesmidae: Xystocheirini), in Placer County (Co.), California, exhibits an unusual grayish-black color dorsally with mottled, ovoid patches at paranotal bases; it constitutes northern generic and specific range extensions of ~28.4 km (17.6 mi). The gonopods differ from those in the El Dorado Co. population in having shorter/acuminate prefemoral processes and blade-like, rather than spatulate, processes “B” that angle away from the solenomere instead of overhanging it. Additionally, a strong distomedial prefemoral lobe, absent from the El Dorado population, arises from the stem in Placer Co. males. Authorship of Xystocheirini is properly attributed to Hoffman, 1980.

**Key words:** branch, El Dorado Co., Placer Co., process “B”, projection, Sierra Nevada, solenomere, *Xystocheir*.

**Introduction**

The endemic millipede genus *Xystocheir* Cook, 1904 (Polydesmida: Xystodesmidae: Xystocheirini), occupies two regions of California – the western and central Coast Range from northern Mendocino to northern Monterey Counties (Cos.) with an allopatric species in San Luis Obispo Co. (SLO), and the western slope and foothills of the Sierra Nevada from El Dorado to Tulare Cos. It surrounds San Francisco and San Pablo Bays, and a subcontinuous “isthmus” extending from Solano to Sacramento Cos. connects the principal areas (Shelley 1996, 2002). Only one sample, the type, exists of the SLO species, but the Pacific Coastal fauna is otherwise well known and copiously represented in United States repositories, particularly in California. Less material exists of the “Sierran” species, and the northernmost – *X. brachymacris* and *X. solenofurcata*, both by Shelley (1996) and inhabiting El Dorado and Amador Cos. – are represented by only four samples each. On 21 February 2014, DJR visited Sugar Pine Reservoir OHV (Off Highway Vehicle) area, Tahoe National Forest, Placer Co., and discovered a population of small-bodied, grayish-black xystodesmids (Fig. 1) unlike any reported. The smooth, glossy dorsums correspond to the condition in *X. brachymacris* in adjacent El Dorado Co., but Shelley (1996) only had access to blanched, preserved specimens when he described the millipede. *Xystocheir* is new to Placer Co., where the known xystodesmids – *Wamokia discordis* and *W. remota*, both by Bucket and Gardner (1968) (Xystocheirini), *Selenocheir sinuata* Shelley, 1994 (Chonaphini), and *Sigmocheir furcata* Shelley, 1995 (Sigmocheirini) (Buckett and Gardner 1968; Shelley 1994, 1995, 1999, 2002; Hoffman 1999) – possess relatively bold, striking colors. The small body-size and dark coloration suggest a new species, but the gonopodal telopodites exhibit the general branching pattern of *X. brachymacris* with different configurations and proportions (Fig. 2–6). We therefore interpret the millipedes as a new population and variant of *X. brachymacris*, which constitute a short northern range extension of the Sierran region. The new individuals alter Shelley’s (1996) diagnosis, so we present a new account that incorporates attributes of this form. Specimens are deposited in the North Carolina State Museum of Natural Sciences, Raleigh.
Taxonomy

Order Polydesmida Pocock, 1887
Suborder Leptodesmidea Brölemann, 1916
Superfamily Xystodesmoidea Cook, 1895
Family Xystodesmidae Cook, 1895
Subfamily Xystodesminae Cook, 1895
Tribe Xystocheirini Hoffman, 1980

Hoffman (1999) mistakenly attributed tribal authorship to Cook without a date, perhaps because he confused this name with Xystodesmidae/inae, which Cook (1895) did author, or because Cook (1904) subsequently authored the genus. However, the first usage of Xystocheir at the family-group level was by Hoffman (1980), as he then noted, and authorship is properly attributed to him.

Genus Xystocheir Cook, 1904

Xystocheir brachymacris Shelley, 1996


Figures 1–7

Type specimens. Male holotype and two male and one female paratypes (National Museum of Natural History, Smithsonian Institution, Washington, DC) collected by W. D. Shepard, 19 April 1992, ca. 1.6 km (1.0 mi) NE Pacific House, El Dorado Co., California.

Color (of Placer Co. population) (Fig. 1). Collum, metaterga, and paranota subuniformly glossy grayish-black with lightly speckled ovoid areas adjacent to paranotal bases, pigmentation extending onto caudolateral paranotal extensions and medial surfaces of peritremata; lateral margins of peritremata and caudal edges of metaterga light gray; epiproct speckled dark gray. Epicranium speckled dark gray, continuing through interantennal region and entire lengths of frons and genae; antennae somewhat translucent light gray, sterna and legs translucent whitish.

Figure 1. Dorsal view of Placer Co. male of X. brachymacris.
**Variation in Xystocheir brachymacris**

**Diagnosis.** Epicranium and metaterga smooth and glossy or lightly granular throughout body, without trace of papillation; sides of collum not uplifted; caudolateral paranotal corners subacuminate and slightly prolonged, extending directly caudad or hooked gently mediad. Gonopodal prefemoral process a distinct projection, widely detached from telopodital stem, long and upright, blade-like or spiniform, extending to around midlengths of acropodal branches, apically broad or narrow. Acropodite with two terminal branches, process “A” absent; solenomere positioned between prefemoral process and branch “B”, extending to around ¾ length of latter, upright but curving/bending slightly caudad apically; process “B” either entirely blade-like and angling caudad and away from solenomere distally, or narrow basally, expanding beyond midlength, and curving broadly anteriad over distal extremity of solenomere, distally spatulate, apically broad (Fig. 2–6). Cyphopod without lateral accessory body (Fig. 7).

**Figures 2–7.** Genitalia of *X. brachymacris*. 2) Telopodite of left gonopod, medial view. 3) The same, lateral view. 4) The same, anteriomedial view. 5–6) El Dorado Co. male. 5) Left gonopod, medial view. 6) Telopodite of the same, lateral view. 7) Cyphopod of El Dorado Co. female. B, process “B”; CV, caudal valve; O, operculum; pfp, prefemoral process; R, receptacle; S, solenomere. Figures 5–7 reproduced from Shelley (1996, fig. 39–41) with permission of NRC Research Press.
Variation. Measurable males from Placer Co. (n=4) vary from 24.0–29.7 mm in length and 4.2–5.6 mm in width; females (n=4) vary from 26.8–27.3 mm in length and 5.5–5.7 mm in width.

The prefemoral process is a distinct structure, well separated from the telopodital stem, in both the El Dorado and Placer populations, being broad and extending beyond midlength of the solenomere in the former and subspiniform and terminating short of midlength in the latter (Fig. 1–3, 5–6). The basic generic acropodital pattern consists of three distal branches with the solenomere between the anterior and caudal projections, labeled “A” and “B,” respectively. Branch “A” is absent in X. brachymacris, so the solenomere is anterior and situated between the prefemoral process and branch “B.” In El Dorado forms (Fig. 5–6), “B” is elongate, distally expanded/spatulate, and overhangs the solenomere that curves toward it apically; the projection is blade-like and angles caudal away from the solenomere in Placer Co. males (Fig. 2–4). In both populations, the prefemoral region of the telopodital stem extends distad as a hirsute lobe on the caudal side beyond the origin of the acropodite, and in Placer Co. forms, it connects basally with a longer and broader anteriorly directed lobe. The only noticeable variation among El Dorado specimens is a broader, more expanded prefemoral process, curving slightly caudal, on the male from Blodgett Forest, El Dorado Co.

Ecology. The Blodgett Forest male was found under a log; the Placer Co. specimens were concentrated in a 2–3 sq. m. (20–30 sq. ft.) surface area near a stream in a mixed alder/conifer forest (Fig. 8–9). Individuals were collected at 7:30 PM, approximately one hour after dark, in mixed-conifer/alder litter within about 9.2 m (30 ft.) of Pagge Creek, a perennial stream. Tree species in order of dominance were ponderosa pine (Pinus ponderosa Douglas), incense cedar (Calocedrus decurrens (Torr.)), Douglas fir (Pseudotsuga menziesii (Mirb.)), white fir (Abies concolor (Gordon)), and white alder (Alnus rhombifolia Nutt.). Soil beneath the litter, where no specimens were found, consisted of loose sandy clay loam.

Distribution. We present (Fig. 10) an updated distribution map of Xystocheir with localities of X. brachymacris, the northernmost Sierran species, shown by black dots. Localities in Placer and El Dorado Cos. are approximately 28.4 km (17.6 mi) apart and separated by the Rubicon and Middle Fork American rivers; the Placer Co. specimens therefore extend the generic and specific ranges by this dimension. In addition to the types, the following samples were examined:

CALIFORNIA: El Dorado Co., 20.8 km (13 mi) E Georgetown, Blodgett Forest, M, 6 May 1972, J. B. Heppner (FSCA); and Snowline Camp, along U.S. Hwy. 50 just W Pollock Pines, M, 21 June 1948, J. W. MacSwain (CAS). Placer Co., 20 km (12.5 mi) NE Foresthill, Sugar Pine OHV area, Tahoe National Forest (39° 7’ 4.06” N, 120° 45’ 30.30” W), 1,186 m (3,890 ft.), 7M, 21 February 2014, D. J. Ross (NCSM), and M, 4 F, 1 March 2014, D. J. Ross (NCSM).

Figures 8–9. Broad environmental views of the riparian, mixed alder/conifer habitat at the Placer Co. X. brachymacris locality. 8) Side view showing sample area (arrow) on level ground above slope to Pagge Creek. 9) View looking up Pagge Creek with collecting area at right edge of photo.
Remarks. Representatives of *Xystocheir* do not display the bold colors characteristic of other California xystodesmid genera; theirs tend to be subtle and muted, like soft light orange, green, and olive (Shelley 1996). The drab, gray coloration of Placer Co. *X. brachymacris* is consistent with the generic pattern but distinctive in being unique to this population; whether it is also shown by El Dorado specimens is unknown.

Acknowledgments

We thank NRC Research Press for permission to reproduce figures 39–41 in Shelley (1996). C. H. Richart and B. A. Snyder conducted pre-submission reviews.

Literature Cited


Received May 31, 2014; Accepted August 23, 2014.
Review Editor Larry Hribar.