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First recorded introduction of the milliped order Stemmiulida (Eugnatha: Nematophora): Potential establishment in Florida, USA, and new records from Mexico; northward range extension into southern Tamaulipas

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Abstract. Based on two “uni-ocellate” females, the world’s first introductions of the milliped order Stemmiulida are recorded from Florida, United States (US). One individual was collected in 1976 in Gainesville, Alachua County (Co.), in northcentral peninsular Florida, and the other was taken in 1991 some 408 km (255 mi) to the south-southeast in Pompano Beach, Broward Co. The absence of further individuals and additional samples suggests that the introductions did not result in viable populations, and stemmiulidans are not presently established in the state; the Gainesville site was reinvestigated in 2012 without finding additional specimens. New records from Mexico include the first from Chiapas, Oaxaca, Tabasco, Yucatan, San Luis Potosí, and Tamaulipas states, with the northernmost ordinal locality now becoming Rancho del Cielo, northwest of Gómez Fariás, in the last. A northward range expansion of about 460 km (288 mi) from the previous limit, Xalapa, Veracruz, the site lies a mere 40 km (25 mi) south of the Tropic of Cancer and only some 320 km (200 mi) south of the Rio Grande and the US border at McAllen, Hidalgo Co., Texas. Indigenous Stemmiulida are not expected in the forested Rio Grande Valley of southernmost Texas, but their occurrence in the adjoining Mexican state renders such a discovery more plausible than before.

Keywords. Alachua Co., Broward Co., ocellus/ocellate, Rio Grande Valley, Tamaulipas, Tropic of Cancer, Veracruz

Introduction

The monofamilial diplopod order Stemmiulida (superorder Nematophora) is perhaps the most distinctive in the chilognath subterclass Eugnatha, as except for a couple of anophthalmous species, it is unfailingly diagnosed by the presence of one or two pairs of large ocelli caudal to the antennae (Fig. 1-4). Stemmiulida inhabit tropical America, Africa, and India/Sri Lanka, and are also known from Vietnam, Indonesia (Halmahera), and the Island of New Guinea (Hoffman 1977, 1980, 1982, 1999; Mauriès 1985, 1989; Mauriès and Golovatch 2006; Mauriès et al 2010; Shelley and Golovatch 2011). In the New World, the order ranges from Cuba and central Veracruz (Xalapa), Mexico, to southcentral Peru (Huanuco Dept.) and Brazil south of the Amazon River (Loomis 1968, Hoffman 1999, Bueno-Villegas et al. 2004, Shelley and Golovatch 2011). It is unknown north of the Tropic of Cancer, has not been encountered in

the Bahamas, and is absent from Florida, the continental United States (US/USA), and North America (Chamberlin and Hoffman 1958, Hoffman 1999, Shelley 2001, Shelley and Golovatch 2011).

Stemmiulida are also one of only two eugnathan orders for which at least potential humanly introduced populations are unknown, the other being Siphoniulida, assigned to Nematophora by Shear (2011). Copious publications, too many to cite here, document exogenous, allochthonous species in the orders Polydesmida (Merocheta) and Julida and Spirobolida (Juliformia), and known and likely ones exist in Cambalidea and Spirostreptidea (Juliformia: Spirostreptida *s. l.*) (Enghoff 1982, 1993; Mauriès 1983; Shelley 1998; Golovatch et al. 2007, 2011) and Chordeumatida (Shelley 1990, 2002; Hoffman 1999; Shear and Shelley 2004) and Callipodida (Nematophora) (Demange 1946; Korsós 1992, 1994; Korsós et al. 2002; Stoev and Enghoff 2006, Stoev et al. (2008), Shelley and Golovatch (2011). While recently perusing samples in the FSCA (codens below), RMS discovered two stemmiulidan samples collected 21 and 36 years ago in peninsular Florida with one “uni-ocellate” female each. Both are assignable to *Stemmiulus* Gervais, 1844, in today’s taxonomy (Mauriès and Golovatch 2006, Shear 2011), but without males, we can neither determine species nor verify whether female only samples are conspecific. The localities are approximately 408 km (255 mi) apart, so the specimens can only be interpreted as two accidental human importations, and the paucity of individuals, coupled with the absence of more recent Floridian samples, suggests that viable populations have not become established. However, the fact that these stemmiulidans got into Florida and were collected alive shows that importation of this order is possible, so we put them on record in case additional representatives are discovered in the state. We also present photos of the Broward County (Co.) female, depigmented after 21 years in preservative, along with a more recently collected, partly pigmented, “doubly-ocellate” stemmiulidan from Puerto Rico. Sample data are as follows:

FLORIDA: *Alachua Co.*, Gainesville, SW 23rd St., Honey Plant facilities, “*Cynodon dactylon* (L.)” [Bermuda Grass], F, 7 May 1976, W. E. Wyles. *Broward Co.*, Pompano Beach, “*Heliconia* sp.”, F, 13 March 1991, E. Tannehill.

Seven nominal genera were once recognized in Stemmiulida (Hoffman 1980), but Mauriès and Golovatch (2006) reduced this to just two – *Scoliogmus* Loomis, 1941, monotypic for *Scoliogmus teres* Loomis, 1941, in Puerto Rico, and *Stemmiulus* Gervais, 1844, for the remaining 153 nominal species. The other five generic names – *Diopsiulus* Silvestri, 1897; *Prostemmiulus* Silvestri, 1916; *Paurochaetus* Silvestri, 1916; *Plusiochaetus* Silvestri, 1916; and *Nesoiulus* Brolemann, 1920 – were placed in synonymies under *Stemmiulus* and their species were formally transferred into this genus. Mauriès et al. (2010) accepted this arrangement and erected *Eostemmiulus* for the first Vietnamese representative, but Shear (2011) called for further argumentation before the concept of only two genera could be fully accepted. Stemmiulida have generally received little attention from diplopodologists, and decades will likely pass before isolated females like these can be authoritatively determined, but recording even unidentifiable females from Florida is desirable to further document the state’s known and potential arthropod fauna.

With the FSCA being in Gainesville, the Alachua Co. locality was reinvestigated by GBE in June 2012. The area has changed considerably since the original collection, with additional buildings, a student coop. organic garden, and a densely overgrown protected natural area where none existed previously. The periphery of this area was examined using a rake to turn over debris on the ground and lift up compost piles, but no millipeds were found.

We also cite the following stemmiulidan samples from Mexico, which add six states to the ordinal occurrence; codens are **AMNH**, American Museum of Natural History, New York; **FSCA**, Florida State Collection of Arthropods, Gainesville; and **UCDC**, Bohart Entomological Museum, University of California at Davis. Of particular note are those from Tamaulipas, the northeasternmost state; indigenous New World occurrence now lies a mere 40 km (25 mi) south of the Tropic of Cancer. Specifically, Rancho del Cielo, northwest of Gómez Farias in southern Tamaulipas and some 460 km (288 mi) north-northwest of Xalapa, Veracruz, is now the northernmost locality in the Western Hemisphere (Fig. 5). Only 320 km (200 mi) south of the Rio Grande and the US border at McAllen, Hidalgo Co., Texas, it suggests that Stemmiulida may inhabit the Rio Grande Valley region of that state. As riparian forests on the US side in Cameron, Hidalgo, and Starr cos. have been reasonably well sampled without discovery of stemmiulidans, we believe indigenous US occurrence is unlikely, but since the order definitely inhabits the adjoining Mexican state, such a discovery is more plausible than before.



Figures 1-4. 1) Broward Co., Florida, stemmiulidan, depigmented after 20 years in preservative. 2) The same, close up of left ocellus. 3) *Stemmium heatwolei* (Vélez, 1967) from Arecibo, Puerto Rico. 4) the same, close up of right ocellus.

MEXICO: *Campeche*: 2.4 km (1.5 mi) SW Bolonchen, Cueva de Bolonchen, 31 December 1971, D. McKenzie (FSCA); 5 km (3.1 mi) SW Bolonchenticul, Grutas de Xtacumbilxunan, 19 April - 30 June 1973, 25 May 1974, B. Denson, M. Kawakatsu, R.W. Mitchell, J.R. Reddell, S. Wiley, D. McKenzie (FSCA); and 10 km (6.3 mi) W Hopelden, 27 July 1973, J.R. Reddell, J.W. Rowland (FSCA). *Chiapas*, 8 km (5 mi) NE Chiapas, 22 August 1966, J. and W. Ivie (AMNH) **New State Record**. *Oaxaca*, Temescal, 18 July 1960, J.S. Buckett, M.R. and R.C. Gardner (UCDC); and Vega del Sol, Valle Nacional, 14 July 1966, J.S. Buckett, M.R. and R.C. Gardner (UCDC) **New State Record**. *San Luis Potosí*, Talmazunchale, 24 June 1954, N.B. Causey (FSCA) **New State Record**. *Tabasco*, Teapa, Grutas del Cocona, 25 August 1972, R.W. Mitchell, W.H. Russell (FSCA) **New State Record**. *Tamaulipas*, 9.6 km (6 mi) NW Gómez Farias, Rancho del Cielo, 2 June 1967 and 9 and 25 March 1969, J.R. Reddell, F. Howell, S. Fowler, C. Tucker, R.W. Mitchell (FSCA) **Northernmost record from the New World**; 7 km (4.4 mi) S Gómez Farias, 18 February 1973, T.R. Mollhagen (FSCA); and 0.5 km (0.3 mi) NNW San Rafael de los Castrol, August 1969, W.H. Russell (FSCA) **New State Record**. *Yucatan*, Uxmal ruins, 6 August 1973, R.W. and D.R. Mitchell (FSCA); Chichen Itza, 8 August 1973, J.R. Reddell (FSCA); Mayapan Ruins, 14 August 1973, J.R. Reddell (FSCA) **New State Record**.

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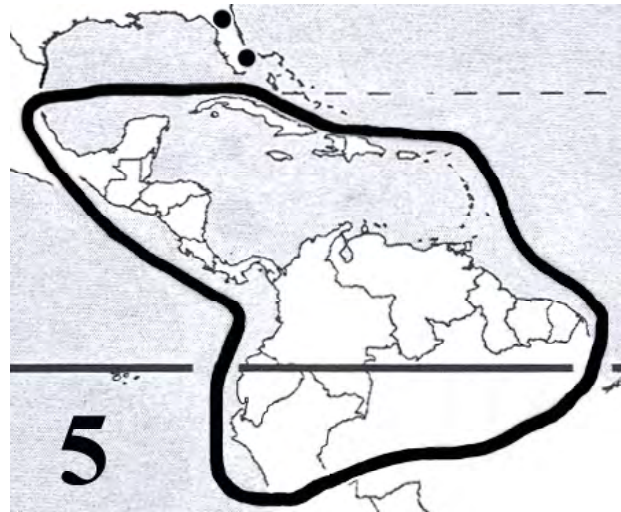


Figure 5. Floridian localities of Stemmiulida in relation to the indigenous range in the Western Hemisphere, adjusted northward in eastern Mexico to account for occurrence in southern Tamaulipas. The depicted boundary appears to run along the Tropic of Cancer in the Gulf of Mexico, but it crosses into Mexico just south of this meridian.

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