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Centipedes and Millipeds (Arthropoda: Diplopoda, Chilopoda) from
Saba Island, Lesser Antilles, and a Consolidation of Major References
on the Myriapod Fauna of “Lesser” Caribbean Islands

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Abstract. The chilopod, *Cryptops hortensis* (Donovan, 1810) (Scolopendromorpha: Cryptopidae), and the diplopods, *Pseudospirobolellus avernus* (Butler, 1876) (Spirobolida: Pseudospirobolellidae) and *Oxidus gracilis* (C. L. Koch, 1847) (Polydesmida: Paradoxosomatidae), are newly recorded from Saba Island, Lesser Antilles, which also harbors one additional scolopendromorph and four more chilognath millipeds. Except for the plausibly native scolopendrid centipede, *Scolopendra alternans* Leach, 1813, all are human introductions. Concentrated sampling is needed in the cloud/elfin forest atop Mt. Scenery, where indigenous millipeds may reside, and with extraction techniques throughout the island, to potentially document the diplopod subclass Penicillata. Nine small Caribbean islands in addition to Saba have been incorrectly reported as lacking diplopod records because publications citing them were overlooked by past authors. Works documenting myriapods from small Caribbean islands are consolidated.

Keywords. Faunistics, new records, introduced species, non-native, tropics

Introduction

In addition to the actual classification, Hoffman (1980) provided voluminous commentaries on the orders, the status of diplopodology at the time, and the history of diplopod taxonomy, in which he cited the “extensive polyglot literature” that confronts anyone conducting research on the organisms. When delving into the morass of faunal and systematic references, it is nearly impossible to find all that are relevant to virtually any taxon or geographic region. Shelley and Golovatch (2011, Table 1), for example, listed 36 Caribbean islands or island groups for which neither published milliped records nor samples were known, but despite substantial research, they missed the works of Jeekel (1999, 2000, 2009) and incorrectly listed 10 “lesser” islands that he addressed: Aruba, Bonaire, Culebra, Curaçao, Los Testigos, Mona, Montserrat, Saba, St. Barthélemy, and St. Martin/Sint Maarten. This contribution therefore comprises two parts: (1) documentations of Saban myriapods with new and published localities; and (2) a consolidated listing, as complete as possible, of principal works addressing these arthropods on small Caribbean islands, so future workers can avoid similar errors in this region of the world.

(1) The Saban Fauna

Slowik and Sikes (2011) addressed Saban environments, and readers are referred there for details of this minute island (17°38'N, 63°14'W, 13 km²), the smallest “special municipality” in the Kingdom of the Netherlands. While sampling spiders, they collected three milliped species, two new to the island, and one new centipede that we report along with Jeekel’s published records. In contrast to the diverse

aranean fauna, with 76 native and endemic species reported to date (Slowik and Sikes 2011), most Saban myriapods are widespread “tramp” species that represent human introductions. As there is no evidence that Saba was once connected to the northern Antillean arc (Westermann 1957), a predominantly allochthonous myriapod fauna is expected, but the cloud/elfin forest atop Mt Scenery, a dormant volcano that, at 877m (2,877ft) elevation, is the highest point in the Netherlands, provides suitable habitat for indigenous, if not endemic, forms. Sampling focusing on this lush environment is in order.

The ensuing list of diplopods, all in the subclass Chilognatha, infraclass Helminthomorpha, conforms to the arrangement of Shelley (2003a). Representatives of the infraclass Pentazonia, order Glomeridesmida, inhabit large and small Caribbean islands, but because of its geological history (Westermann 1957, Westermann and Kiel 1961), Saba seems unlikely to harbor the order unless representatives have rafted from islands that derived from Gondwanan “proto–South America” in the Cretaceous/Paleocene (Mesozoic/Cenozoic), ~66 million years ago (Shelley and Golovatch 2011). Representatives of the subclass Penicillata, most effectively discovered by extraction techniques like Berlese samplings, are anticipated, but more extensive litter sampling is needed to be confident of their absence. All new samples are deposited in the North Carolina State Museum of Natural Sciences, Raleigh, USA; the total number of individuals (inds.) is provided when determinations are possible from either sex.

Methods

Thirty-three sites in 11 macrohabitats were investigated between 9-16 March and 18-26 May 2008 (Slowik and Sikes 2011, fig. 1, table 1). Leaf litter samples were sifted and processed with Berlese funnels, or not sifted and processed with a Winkler extractor. Collections were made within 5, 10, and 20m areas of the recorded locations (“sampling extents”). Night collecting, aided by a headlamp or UV light, occurred in close proximities to roads and on the main trail to the top of Mt. Scenery. Pitfall traps (10cm diameter) were active for three weeks and collected by the second author from 18–26 May 2008. Additional specimens were collected by J. Slowik, who surveyed spiders, and G. Alpert, who surveyed ants. Repositories and details of sampling procedures for other organisms are available in Slowik and Sikes (2011).

Class Diplopoda: Subclass Chilognatha: Infraclass Helminthomorpha

Subterclass Colobognatha

Order Polyzoniida

Family Siphonotidae

***Rhinotus purpureus* (Pocock, 1894a)**

Published record. “road to the Bottom, at S-curve” (Jeekel 1999).

New localities. Mt. Scenery Trail Trailhead (17.62873°N, 63.23748°W, ±18’), 339–350m, 5m sampling extent, by hand at night with UV light, 1 ind., 11 March 2008, DS Sikes, JA Slowik, GD Alpert. Dancing Place Trail Trailhead (17.62452°N, 63.23713°W, ±10’), 328m, 20m sampling extent, Berlese of leaf litter, 6 inds., 13 March 2008, DS Sikes, JASlowik, GD Alpert.

Remarks. Among small Caribbean islands, this widespread, purplish colobognath is also known from Dominica, Guadeloupe, La Désirade, Les Saintes, Marie Galante, Martinique, Montserrat, St. Kitts, St. Vincent, and Tobago (Pocock 1894a, Hoffman 1999, Jeekel 1999).

Subterclass Eugnatha

Superorder Juliformia: Order Spirobolida

Family Pseudospirobolellidae

?*Pseudospirobolellus avernus* (Butler, 1876)

Published records. None.

New locality. *Mt. Scenery Trail Trailhead* (17.62873°N, 63.23748°W, ± 18'), 339–350m, 10m sampling extent, at night, F, 12 March 2008, DS Sikes, JA Slowik. **New Island Record.**

Remarks. This determination, tentative without an adult male, is based on the elevated metazona and the short, rounded, non-produced epiproct. *Pseudospirobolellus avernus* occurs on small, oceanic islands and is known from Dominica, Guadeloupe, and St. Martin/Sint Maarten in the Lesser Antilles (Loomis 1934; Hoffman 1981, 1999).

Superorder Merocheta: Order Polydesmida: Suborder Strongylosomatidea

Family Paradoxosomatidae

Asiomorpha coarctata (Saussure, 1860)

Published record. “road to the Bottom at S-curve” (Jeekel 1999).

New localities. None.

Remarks. An introduced southeast Asian species, *A. coarctata* is the most common exogenous paradoxosomatid in the Caribbean region. Hoffman (1999) stated that it occurs in “virtually all of the West Indies,” and it has been recorded specifically from Antigua, Aruba, Bahamas (New Providence), Barbados, Bonaire, Cayman Islands (Cayman Brac, Grand Cayman), Curaçao, Dominica, Grenada, Grenadines (Bequia, Carriacou, Union), Guadeloupe, Isla de la Juventud (formerly Isla de Pinos), La Désirade, Les Saintes, Margarita, Marie Galante, Martinique, Montserrat, Nevis, St. Barthélemy, St. Croix, St. Eustatius, St. John, St. Kitts, St. Lucia, St. Martin/Sint Maarten, St. Thomas, and Tobago (Pocock 1894a; Chamberlin 1918, 1922; Loomis 1934; Jeekel 1963, 1999; Mauriès 1980a; Hoffman 1999). Despite its regional abundance, *A. coarctata* may not be prevalent on Saba, as DSS and associates encountered only *O. gracilis* (next account).

Oxidus gracilis (C. L. Koch, 1847)

Published records. None.

New localities. *Windward Side*, Ecolodge, M, 16 May 2006, D. Bass. *Mt. Scenery Trail Trailhead* (17.62873°N, 63.23748°W, ±18'), 339–350m, 5m sampling extent, by hand at night with UV light, 7M, 6F, 11 March 2008, DS Sikes, JA Slowik, GD Alpert; Berlese of brushpile litter, 7M, FF, juvs., 12 March 2008, DS Sikes; and pitfall traps in ravine and by cliff in forest, 5M, 6F, 12–15 March 2008, J. Slowik. **New Island Record.**

Remarks. Though body forms are similar, females of these two paradoxosomatids can be reliably identified based on the midbody paranota, whose caudolateral margins are prolonged and acuminate in *A. coarctata* and flat, subcontinuous with the caudal metatergal margins, and apically blunt in *O. gracilis* (Shelley and Lehtinen 1999, figs. 1, 4). This distinction holds for the midbody region only, around segments 9–13; the caudal paranota resemble each other with those of *O. gracilis* becoming progressively prolonged and acuminate caudally, particularly in Saban specimens.

Suborder Polydesmidea

Family Fuhrmannodesmidae

Hexadesmus lateridens Loomis, 1933

Published records. “Behind the Mountain”; “Great Hill” (Jeekel 1999).

New records. None.

Remarks. Described from Cuba, *H. lateridens* is also known from the Grenadines (Carriacou) and St. Kitts (Loomis 1933, 1934; Jeekel 1999), although Hoffman (1999) thought these records might refer to another species because they are based on females. It also occurs in the Galapagos, and Shear and Peck (1987) suggested that it may be parthenogenetic, which is important for synanthropic species.

Family Pyrgodesmidae

Poratia digitata (Porat, 1869)

Published record. “behind the Mountain, top” (Jeekel 2009).

New records. None.

Remarks. In the Caribbean, *P. digitata* is also known from the Bahamas (Andros), Curaçao, St. Eustatius, and St. Martin/Sint Maarten (Loomis 1970, Golovatch and Sierwald 2001, Shelley 2004, Jeekel 2009). In the United States, it has been introduced into peninsular Florida, Louisiana, and Texas, and has been found in greenhouses in Champaign and Cook counties, Illinois (Shelley 2004).

Class Chilopoda

Subclass Pleurostigmophora: Order Scolopendromorpha

Family Scolopendridae

Scolopendra alternans Leach, 1813

Published record. Saba in general (Shelley 2006); Windward Side (Shelley 2002a).

New localities. None.

Remarks. The most common Antillean scolopendrid, *S. alternans* is the only indigenous New World species of *Scolopendra* lacking an “anterior transverse suture” on the first tergite, a feature shared with the equivalently sized and nearly as common introduced species, *S. subspinipes* Leach, 1815. They are readily distinguished by the number of ventral spines on the ultimate prefemora, 0–3 arranged linearly in *S. subspinipes* versus numerous, scattered ones in *S. alternans*, and by the presence (*S. alternans*) versus absence (*S. subspinipes*) of short spines, sometimes elevated on a slight tubercle, on the dorsal distomedial margins of the penultimate and antepenultimate prefemora. *Scolopendra alternans* is known from a host of Caribbean islands and island groups including Antigua, Bahamas (Andros, Cat, Exuma, Little Inagua, New Providence, North and South Bimini, Salt Cay, San Salvador), Barbuda, British Virgin Islands (Caiba, Guana, Pete’s I., Tortola), Dominica, Guadeloupe, Montserrat, St. Barthélemy, St. Eustatius, St. Kitts, St. Lucia, and US Virgin Islands (St. Croix, St. Thomas) (records summarized in Shelley 2002a). It also inhabits the Keys and southernmost peninsular Florida, USA. Rafting from Cuba, as documented for the similarly distributed tree snail, *Liguus fasciatus* (Müller) (Roth and Bogan 1984, Deisler-Seno 1994, Shelley 2002a), is the most plausible explanation for its occurrence in this corner of North America. Rafting may also explain its occurrence on Saba.

Family Cryptopidae

Cryptops hortensis (Donovan, 1810)

Published records. None.

Locality. Dancing Place Trail Trailhead (17.62452°N, 63.23713°W, ±10’), 328m, 20m extent, leaf litter Berlese, 1 ind., 13 March 2008, DS Sikes, JASlowik, GD Alpert. **New Island Record.**

Remarks. The specimen, demineralized and lacking the caudal legs, is in poor condition, but the tarsungula overlap when closed and the first tergite overlaps the caudal margin of the cephalic plate, so we are comfortable with the generic and specific determinations. A European species, *C. hortensis* has been introduced into urban environments across the continental US (Shelley 2002a); Demange (1981) reported *C. h. pauciporus* Brölemann, 1908, from Guadeloupe.

(2) Major Publications addressing myriapods from “lesser” Caribbean Islands (all except the Greater Antilles [Cuba, Hispaniola, Puerto Rico, Jamaica])

The only islands that have received somewhat focused investigations, for which faunistic works of varying depths are available, are Antigua, Barbados, Cayman Islands, Dominica, St. John, and Guadeloupe, the most thoroughly studied island (Pocock 1888, Chamberlin 1924, Hoffman 1960a, Loomis 1970, Mauriès 1980a, Jeekel 1980, Lewis 1989, Hounsoume 1994). Scattered species have been reported or described from the (Lesser) Antilles/West Indies/Caribbean Islands in general and the following indi-

vidual islands: Antigua, Aruba, Bahamas (Andros, Cat, Eleuthera, Great Inagua, New Providence, San Salvador [= Watling I.]), Barbados, Beata, Bonaire, British Virgin Islands (Tortola), Cayman Islands (Cayman Brac, Grand Cayman, Little Cayman), Culebra, Curaçao, Dominica, Grenada, Grenadines (Bequia, Carriacou, Mustique, Union), Guadeloupe, Isla de la Juventud, La Désirade, Los Testigos, Les Saintes, Margarita, Marie Galante, Martinique, Mona, Montserrat, Nevis, Saba, St. Barthélemy, St. Eustatius, St. Kitts (= St. Christopher), St. Lucia, St. Martin/Sint Maarten, St. Vincent, Swan Islands, Tobago, and US Virgin Islands (St. Croix, St. John, St. Thomas) (Porat 1876; Pocock 1888, 1894a, b; Cook 1896; Brölemann 1900; Chamberlin 1914, 1915, 1918, 1922, 1923, 1924, 1947, 1950, 1952; Loomis 1934, 1936, 1938; Bücherl 1942, 1974; Crabill 1959, 1960; Hoffman 1960a, b, 1999; Jeekel 1963, 1980, 1999, 2000, 2001, 2004, 2009; Vélez 1967; Würmli 1978; Mauriès 1980a, b, 1988; Demange 1981; Krabbe 1982; Krabbe and Enghoff 1985; Demange and Pereira 1985; Lewis 1989; Shelley 1996, 2000a, b, 2002a, b, 2003b, 2004, 2006, 2007a, b; Pereira et al. 1997, 2000; Schileyko and Minelli 1998; Shelley and Lehtinen 1999; Shelley and Kiser 2000; Foddai et al. 2000; Enghoff 2001; Shelley and Edwards 2002, 2004; Marek et al. 2003; Chagas 2003; Chagas and Shelley 2004; Bonato et al. 2003, 2009; Stoev and Geoffroy 2004; Shelley et al. 2005, 2006).

Centipedes only are known from: Anguilla, Bahamas (Bimini, Exuma, Little Inagua, Salt and Rum Cays), Barbuda, British Virgin Islands (Caiba, Guana, Jost van Dyke, Peter, Prickly Pear, Sombrero, Virgin Gorda), Nevis, and Turks and Caicos (Grand Turk, S. Caicos, W. Caicos) (Chamberlin 1952; Crabill 1960; Pereira and Minelli 1993; Foddai et al. 2000; Shelley 2002a, 2006; Chagas and Shelley 2003; Shelley et al. 2005). As noted by Shelley and Golovatch (2011), no diplopods, either native or introduced, have been reported from Turks and Caicos, the only independent country in this category in the entire Western Hemisphere. However, chilopods have been recorded from both island groups of the country, and millipeds surely also occur there.

The only treatises that hold relevance are those on scolopendromorph centipedes (Kraepelin 1903, Attems 1930). Though not in the Caribbean, there are also two works of note on Bermudan myriapods (Pocock 1890, Chamberlin 1920).

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