

SCUTIGEROMORPH CENTIPEDES (CHILOPODA: SCUTIGEROMORPHA) OF THE DOMINICAN REPUBLIC, HISPANIOLA

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ABSTRACT

The fauna of scutigermorph centipedes in the Dominican Republic is studied for the first time based on a sample of 28 individuals collected at 21 localities in 12 provinces. This sample was found to represent two species: *Sphendononema guildingii* (Newport, 1844) and *Dendrothereua linceci* (Wood, 1867), both species with a wide geographic distribution in the Caribbean and tropical America. The widely introduced and synanthropic species of Mediterranean origin *Scutigera coleoptrata* (Linnaeus, 1758) has never been found in Hispaniola. The scutigermorph centipedes found as fossilized inclusions in the Dominican amber remain to be properly studied and identified.

Key words: Scutigeras, centipedes, Scutigermorpha, Chilopoda, fauna, amber fossils, Dominican Republic, Haiti, Caribbean.

Título: Centípedos escutigermorfos (Chilopoda: Scutigermorpha) de República Dominicana, La Hispaniola.

RESUMEN

Se estudia por primera vez la fauna de ciempiés escutigermorfos de la República Dominicana basados en una muestra de 28 individuos colectados en 21 localidades de 12 provincias. Se encontró que esta muestra representa dos especies: *Sphendononema guildingii* (Newport, 1844) y *Dendrothereua linceci* (Wood, 1867), ambas especies con una amplia distribución en el Caribe y América tropical. La especie ampliamente introducida y sinantrópica de origen mediterráneo *Scutigera coleoptrata* (Linnaeus, 1758) nunca ha sido colectada en La Hispaniola. Los ciempiés escutigermorfos encontrados como fósiles en el ámbar dominicano todavía no han sido apropiadamente estudiados e identificados.

Palabras clave: Scutigeras, ciempiés, Scutigermorpha, Chilopoda, fauna, fósiles en ámbar, República Dominicana, Haití, Caribe.

INTRODUCTION

The Scutigermorpha are the most distinctive of the five orders of centipedes belonging to the class Chilopoda. The unique characteristics of having spiracles positioned dorsally on the tergites, compound eyes, and multisegmented tarsi, places them in a separate subclass, Notostigmophora (Bonato *et al.*, 2011). In general appearance, scutigermorph centipedes have a uniform morphology characterized by a short (usually 2 – 3.5 cm, exceptionally up to 8 cm) cylindrical body, surrounded by long legs that allow for very rapid locomotion. Although born with only four segments, scutigermorphs grow by hemianamorphosis to have a fixed adult number of 15 segments, each bearing a pair of legs that increase in length from the anterior to

the posterior part of the body. The head has a pair of annulated antennae that are more slender than the legs and a pair of compound eyes composed of hundreds of ommatidia. The forcipules (maxillipedes) are flexible along a median hinge and, like all centipedes, have poison that is used in the capture of prey. All scutigermorphs are active predators of small invertebrates. Reproduction involves a courtship in which male and female circle around each other and fertilization occurs without direct mating through spermatophores that are laid down by the male and picked up by the female. Eggs are laid singly, covered with soil, and abandoned by the mother.

Scutigermorph specimens are generally scarce in collections because they are infrequently found in the forests or caves and also because the agility of their movements makes them difficult to capture. Despite their homogeneity in general body plan, scutigermorph species are highly variable morphologically, in size, coloration, and metameric structures such as numbers of tarsomeres and spines on particular podomeres, while at the same time they lack unequivocal diagnostic structures like the male gonopods of Diplopoda, although the shape of the female gonopods is useful (Würmli, 1974; Bolton *et al.*, 2009). This variability caused early scutigermorph taxonomy, often based on small samples instead of series of specimens, to produce a high number of invalid synonyms. It has been found that scutigermorph species are more variable and geographically more widely distributed than previously recognized (Würmli, 1974; Edgecombe, 2007). The key criteria for the identification of species are the pigmentation of the head and tergites, shape of female gonopods, and the configuration of spines, spicules and setae on the tergites (Edgecombe & Cupul-Magaña, 2008).

Scutigermorphs are known from the fossil record as far back as the Late Silurian, ca 418 million years ago, with additional early records in the Lower and Middle Devonian (Shear *et al.* 1998; Edgecombe, 2011), and thus are among the earliest terrestrial arthropods. In their ecological preferences, scutigermorphs are mostly tropical. In present times, their worldwide diversity includes only ca 95 valid species, classified in 26 genera and 3 families (Stoev & Geoffroy, 2004; Bonato *et al.*, 2011). The family Scutigerinidae is distributed in southern Africa and Madagascar, including three species classified in two genera. The family Psellioididae is Neotropical and Afrotropical and includes at least three species in a single genus. The largest family is the cosmopolitan Scutigeridae, including all remaining (ca 90) species.

A few scutigermorph specimens had been recorded early in the 20th century from Haiti. The first and only records of specimens are those given by Verhoeff (1904), who described *Pselliophora pulchritarsis* from a single female from an unspecified locality in Haiti, and later Chamberlin (1918), who described *Pselliophora haitiensis* from Grand Riviere, Haiti, based on four specimens, two of them immature. These names subsequently experienced several changes: Chamberlin (1921) proposed the new name *Pselliodes* for the preoccupied name of *Pselliophora* Verhoeff, 1904. Later, Würmli (1974) revised the Neotropical Psellioididae and made both species names (*Pselliodes pulchritarsis* (Verhoeff, 1904) and *Pselliodes haitiensis* (Chamberlin, 1918) synonyms of *Pselliodes guildingii* (Newport, 1844). More recently, *Pselliodes* Chamberlin, 1921 was proposed to be a junior synonym of *Sphendononema* Verhoeff, 1904 (Würmli, 2005), and thus the valid name of this species is *Sphendononema guildingii* (Newport, 1844).

Chamberlin (1918) described two new species from Cuba, namely *Pselliophora minor* and *Pselliophora cubensis*. The scutigermorph centipedes of Cuba were studied by Würmli & Negraa (1977) based on multiple specimens collected throughout the island. They reported two species, *Pselliodes nigrovittata* (Meinert, 1886) and *Scutigera linceci* (Wood, 1867). The review of the Neotropical Psellioididae by Würmli (1978) and the subsequent generic revision by Würmli (2005) made the two new species of Chamberlin and also *Pselliodes nigrovittata* synonyms of *Sphendononema guildingii* (Newport, 1844). The second species, *Scutigera linceci*,

has also been involved in some taxonomic flux not yet completely resolved and including many synonyms (Würmli, 1973). Its valid generic assignment is *Dendrothereua* Verhoeff, 1944 (see Edgecombe & Giribet, 2009) rather than *Scutigera*. Conventional practice, following Würmli (1973) and Würmli & Negrea (1977), recognizes a single species distributed from the southern United States to Panama, *Dendrothereua lincei* (Wood, 1867). This species name requires fixation with a neotype from its type area in Texas and further molecular sequencing to establish whether the observed long branches that separate populations from distant parts of its geographic range (Edgecombe & Giribet, 2009) warrant resurrection of synonymized names for cryptic species. Pending this revision, we follow standard usage and apply the specific name *D. lincei* (Wood) to the Dominican material.

Chamberlin (1918) also recorded *Pselliophora flavipes* (Bollman, 1893) from San Salvador, Bahamas, and *Scutigera superba* Meinert, 1886 from “West Indies”. Both names are also synonyms of *Sphendononema guildingii*. Peck (1992) reported *Scutigera* sp. from eight caves in Jamaica, suggesting that it could represent the synanthropic species *Scutigera coleoptrata* (Linnaeus, 1758). Muchmore (1993) recorded *Scutigera lincei* for St. John in the Virgin Islands. Lazell (2005) recorded the presence of scutigermorphs in Guana Island, British Virgin Islands, with the suspicion that these records could represent the same species reported from St. John. Chamberlin (1918) also described the species *Gonethella nesiotis* from the Cayman Islands and *Gonethina grenadensis* from Grenada. However, these two monotypic genera are both based on single immature specimens and are of little taxonomic utility.

Obviously the Caribbean fauna of scutigermorph centipedes has only been subject to sporadic investigation, usually as part of larger efforts to characterize the chilopod fauna of the area. In this paper the fauna of scutigermorph centipedes of the Dominican Republic, island of Hispaniola is studied for the first time.

OBJECTIVE

- To characterize the fauna of scutigermorph centipedes of the Dominican Republic.

MATERIAL AND METHODS

A faunistic survey was carried out between 2002 and 2004 by the first author and collaborators sampling over 280 localities dispersed throughout the varied geography of the Dominican Republic. Although the primary target of this survey were orthopteroid insects, a total of 23 scutigermorph specimens were also collected during these expeditions and 5 others were added from the collections of the Museo Nacional de Historia Natural, Santo Domingo (MNHNSD) and the Instituto de Investigaciones Botánicas y Zoológicas (IIBZ) of the Universidad Autónoma de Santo Domingo (UASD). Overall 21 localities from 12 different provinces are represented, located mostly in the central and northern mountains. Nearly all individuals were encountered at night while they were on the vegetation. Scutigermorphs were captured using an entomological net, immediately preserved in 75% ethanol and eventually examined under a Leica MZ16A stereoscope. Specimens are deposited in the United States National Museum of Natural History, Smithsonian Institution, Washington, DC (USNM), the MNHNSD and the IIBZ.

RESULTS

As all previous reports of scutigermorph centipedes in Hispaniola were based on specimens taken in Haiti, those presented here appear to be the first records of scutigermorphs specifically from the Dominican Republic. The two species collected have been identified as

Sphendononema guildingii (Newport, 1844) and *Dendrothereua linceci* (Wood, 1867). The taxonomic hierarchy for the Hispaniolan specimens and their collection data are as follows:

Phylum Arthropoda
Subphylum Myriapoda
Class Chilopoda Latreille, 1817
Subclass Notostigmophora Verhoeff, 1901
Order Scutigermorpha Pocock, 1895
Family Pselliodidae Kraus, 1955
Genus *Sphendononema* Verhoeff, 1904

Sphendononema guildingii (Newport, 1844)
Figure 1, A and B

Recognition. Body length up to 35 mm. Antennal articles longer than wide. Tergites having most bristles associated with a strong spine, spines mostly half length of bristle; spinulae/spiculae elongate triangular. Lightly pigmented (pale yellow) band on medial part of tergites wide; lateral bands mottled brown. Stoma-saddles strongly vaulted. Female gonopods elongate, with relatively short proarthron and long mesarthron. Male gonopods on first genital segment short, lamelliform; gonopods on second genital segment style-like.

Material examined. 1♀ DOMINICAN REPUBLIC RD-170 km 8 Cabo Rojo-Aceitillar Rd., Pedernales Prov., 17°59.378'N 71°39.001'W, 27 m, 30.vii.2003, D. Perez, R. Bastardo, B. Hierro. (night); 1♀ DOMINICAN REPUBLIC RD-173 Las Yayitas, Azua Prov., by river, 104 m, 21.xi.2003, 18°29.632'N 70°44.253'W, D. Perez, R. Bastardo, A. Francisco. (night); 1♂ DOMINICAN REPUBLIC RD-174 Las Yayitas, Azua Prov., under forest cover, 21.xi.2003, D. Perez, R., Bastardo, A. Francisco. (night); 1♀ DOMINICAN REPUBLIC RD-220 El Callejón de la Loma, Parque Nacional El Choco, Puerto Plata prov., 110 m, 19°44.428'N 70°25.459'W, 13.iv.2004, D. Perez, B. Hierro, R. Bastardo. (day/night); 1♀ DOMINICAN REPUBLIC RD-234 Cerro San Francisco, Bánica, Elías Piña prov., 366 m, 19°05.284'N 71°41.096'W, 21.iv.2004, D. Perez, B. Hierro, R. Bastardo. (night); 1♂ DOMINICAN REPUBLIC San Cristóbal Prov., ~3 km N La Colonia, Mano Matuey, 7.ix.2008, D. Perez, B. Hierro, R. Bastardo, S. Medrano; 1♀ DOMINICAN REPUBLIC RD-051 Loma Guaconejo, Prov. M. T. Sánchez (IIBZ), 1 prob. ♀ Loma Isabel de Torres, Pto. Pta., 29/10/97 (MNHNSD); 1 prob. ♂ República Dominicana, Prov. Independencia, La Descubierta, Isla Cabritos, UTM 19Q 0212559mE 2047156 mN, 9m, 08-I-2010, G. de los Santos (MNHNSD).

Ecological notes. *S. guildingii* were collected at night usually while on shrubs of various dry to wet forests in low montane conditions. It appeared that individuals were carrying out most of their hunting on the vegetation.

Previously known distribution. St. Vincent (Chamberlin, 1918), Cuba, Hispaniola, Mexico, Central America and Bolivia, Brazil, Colombia, French Guyana, Guyana, Paraguay, Peru and Venezuela. There is also a doubtful record from California (Stoev & Geoffroy, 2004).

Family Scutigeridae Leach, 1814
Genus *Dendrothereua* Verhoeff, 1944

Dendrothereua linceci (Wood, 1867)
Figure 1, C and D

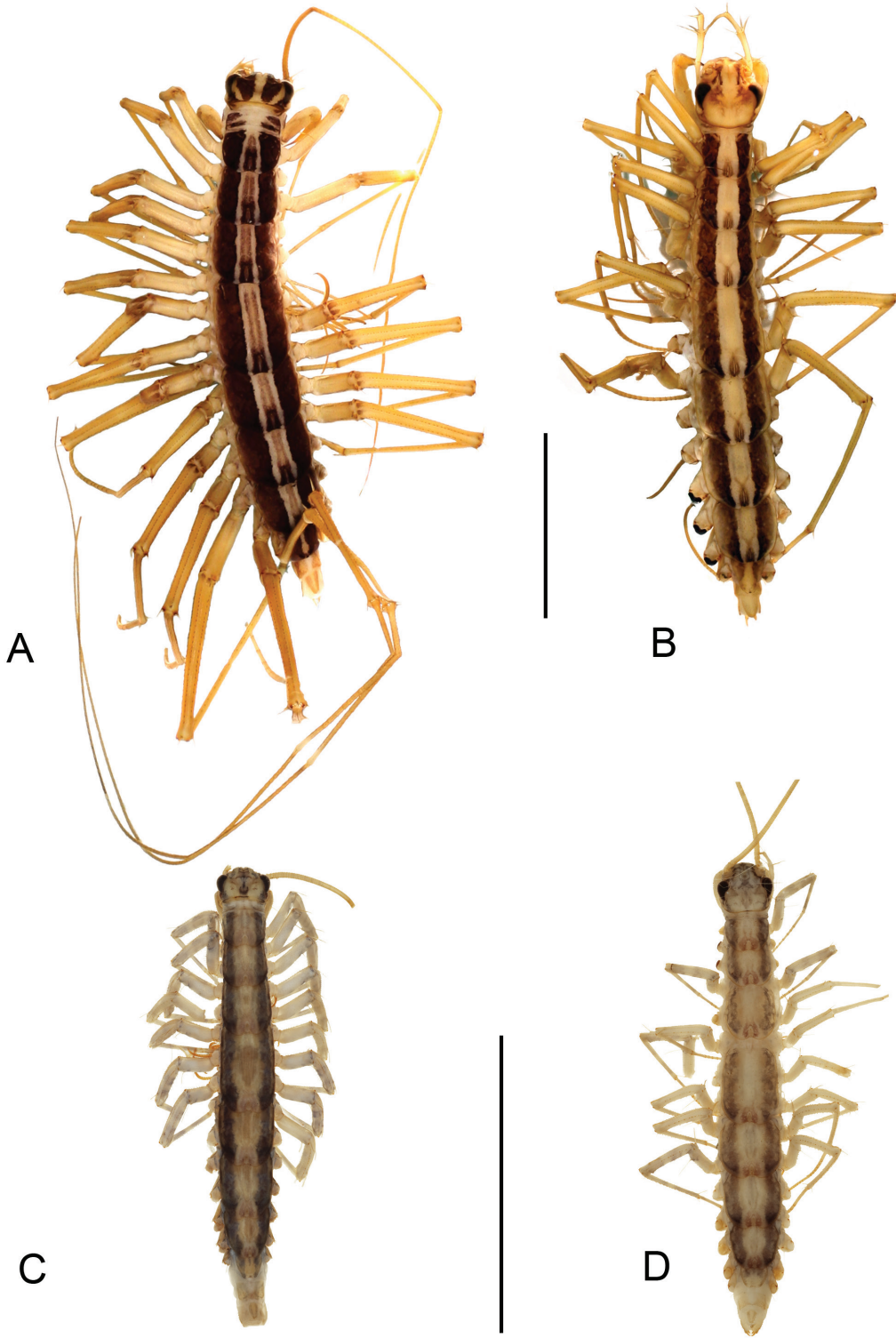


Fig. 1. Photographs of Hispaniolan scutigermorphs showing variation in body colors. A & B, *Sphendononema guildingii*. C & D, *Dendrothereua linceci*. Scale approximately 10 mm.

Recognition. Body length up to 23 mm. Dark bands on lateral parts of tergal plates blue in Dominican material. Spines lacking on tergites; elongate, slender hairs (spiculae) about half length of bristles. Sternites and coxae of posterior trunk segments with dense hairs. Pair of spine-bristles at distal end of tarsus 1 on legs 6-14. Female gonopods 1.9-2.8 times longer than wide; metarthron short, 0.25-0.3 times length of proarthron + mesarthron, claw-like.

Material examined. 1 juvenile sex unknown, DOMINICAN REPUBLIC RD-074 Nizaito, Valle Nuevo, La Vega Prov., (Antiguo Proyecto papas J. D. Guzmán), 2,205 m, 18°44.401'N 70°37.588'W, 27.xi.2002, D. Perez, B. Hierro, R. Bastardo. (sunset-night); 1♀ / 1 juvenile sex unknown, DOMINICAN REPUBLIC RD-076 Way down from Cueva, Valle Nuevo, La Vega Prov., 2,096 m, 18°46.326'N 70°40.438'W, 28.xi.2002, D. Perez, B. Hierro, R. Bastardo. (night); 1♂ DOMINICAN REPUBLIC RD-086 Hilltop on way to Palos Grandes, NE of S. J. de Ocoa, 1,437 m, Ocoa Prov., 18°37.871'N 70°30.777'W, 8.xii.2002, D. Perez, R. Bastardo. (day/night); 2♀♀ DOMINICAN REPUBLIC RD-087 Way down from Palos Grandes, NE of S. J. de Ocoa, Ocoa Prov., 1,440 m, 18°37.283'N 70°31.481'W, 8.xii.2002, D. Perez, R. Bastardo. (night); 1♀ juvenile, DOMINICAN REPUBLIC RD-117 Down from Cueva, Valle Nuevo, La Vega Prov., 2,280 m, 18°46.258'N 70°40.564'W, 2.iv.2003, D. Perez, R. Bastardo, B. Hierro. (night); 1♀ DOMINICAN REPUBLIC RD-121 La Jarda (monte arriba), Padre Las Casas, Azua Prov., 18°44.167'N 70°52.010'W, 5.iv.2003, D. Perez, B. Hierro, S. Medrano, D. Veloz (day); 1♂ DOMINICAN REPUBLIC RD-139 Caseta no. 3, Parque Nacional Sierra de Bahoruco, Independencia Prov., 18°13.720'N 71°35.243'W, 1,941 m, 3.vii.2003, D. Perez, R. Bastardo, B. Hierro. (night); 2♀♀ juveniles, DOMINICAN REPUBLIC RD-181 Loma Quita Espuela, halfway to peak, 616 m, [Duarte Prov.], 19°20.912'N 70°08.941'W, 3.xii.2003, D. Perez, R. Bastardo, A. Marmolejos. (day/night); 3♀♀ DOMINICAN REPUBLIC RD-184 Trail to peak and Centro SOECI, Pico Diego de Ocampo, Santiago Prov., 918 m, 5.xii.2003, D. Perez, R. Bastardo, A. Marmolejos. (day/night); 2♀♀ 1♂ DOMINICAN REPUBLIC RD-201 Bejucalito García, 19 km W of Higüey, [La Altagracia Prov.], 18°41.182'N 68°53.961'W, 19.xii.2003, D. Perez, B. Hierro, R. Bastardo. (night). 1 specimen, Palo de Agua, P. N. Sierra de Bahoruco, 231996 2015021, 1806 msnm, 11:50 am, C. Marte, R. Ortíz (MNHNSD); 1 specimen, M. A. Pinar Parejo, Estación #VIII, [Valle Nuevo, Prov. La Vega], 10/07/98, col. D. Veloz, S. Navarro (T.A.) (MNHNSD).

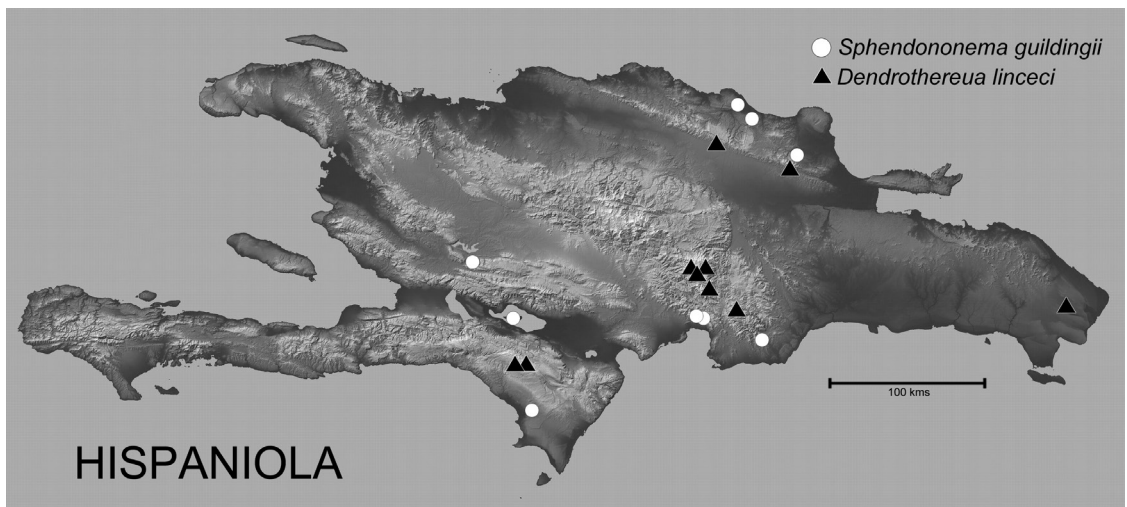


Fig. 2. Distribution of collection localities in the Dominican Republic. White circles, *Sphendononema guildingii*. Black triangles, *Dendrothereua lincei*.

Ecological notes. In general *D. lincei* was collected at higher elevations, being particularly abundant in Valle Nuevo, an elevated mesa generally situated at over 2,000 m, but it was also collected at a low locality (Bejucalito García, near Higüey) in the eastern plains of the island.

Previously known distribution. Costa Rica, Cuba, El Salvador, USA, Granada, Guatemala, Honduras, Mexico, Nicaragua, Panama (Edgecombe & Cupul-Magaña, 2008).

DISCUSSION

The scutigermorph fauna of the Dominican Republic is composed of the species *Sphendononema guildingii* and *Dendrothereua lincei* with populations that appear to be widely but sparsely distributed from low to high elevations (above 2,000 meters) (Fig. 2). From Haiti only *S. guildingii* is known so far. Two *D. lincei* are reported from the highlands of Sierra de Bahoruco in the ‘southern paleoisland’ of Hispaniola, which was an independent island with its own biota until docking with the ‘northern paleoisland’ around the late Miocene ca 10 million years ago (Iturralde Vinent and MacPhee, 1999).

These are the same two species found in Cuba, while a species in Jamaican caves has only been identified as *Scutigera* sp. No literature records of scutigermorphs in Puerto Rico have been found, though a photograph of a correctly determined specimen of *S. guildingii* taken at the Maricao State Forest, western Puerto Rico appears on the website on West Indian natural history <http://www.kingsnake.com/westindian/> of Alejandro Sánchez. Scutigermorph centipedes most likely colonized the Caribbean islands from Central and South America early in the archipelago’s evolution. Given that there are records from low and small islands like some of the Bahamas, Guana, St. Vincent and Grenada, it would appear that large islands with complex ecosystems are not a requirement for scutigermorph populations. Therefore scutigermorphs probably occur in many of the West Indian islands.

Fossil scutigermorphs in Dominican amber. Amber from the Dominican Republic is famous for the high diversity and exceptional preservation of its fossilized inclusions. The age of the Dominican amber has been the subject of some debate, with earlier studies based on the analysis of associated Foraminifera and nuclear magnetic resonance spectroscopy suggesting a range of up to 40 million years for amber from different mines (reviewed in Poinar, 1992). More recent studies based on paleogeographic and biostratigraphic evidence (Iturralde Vinent and MacPhee, 1996), propose that the Dominican amber was entombed in a single depositional basin during the late Early Miocene through early Middle Miocene (15-20 million years ago) and were never subject to extensive redeposition from older age sediments. Further study allowed the dating to be constrained to around 16 million years old (Burdigalian stage of the Miocene) (Iturralde Vinent, 2001; Penney, 2010).

Several scutigermorph specimens have been reported as fossilized inclusions in the Miocene amber from the Dominican Republic. Judging from the number of pictures easily encountered of specimens for sale or in the hands of collectors, it appears that scutigermorphs are not uncommon in the Dominican amber. Their close association with vegetation and tree trunks probably made them likely candidates for entrapment in the liquid resin. One specimen of “house” centipede fossilized in Dominican amber was depicted by Poinar (1992). Photographs of four other specimens appeared in a book by Wu (1997), where one of the pictures is identified as the widespread ‘house centipede’ *Scutigera coleoptrata* (Linnaeus, 1758), while the same identification appears intended for the others. However, because *S. coleoptrata* originates in the Mediterranean region, having spread to many parts of the world by anthropogenic introduction in rather recent times, it is very unlikely to be the species fossilized in the Dominican amber. So far, extant specimens of *S. coleoptrata* have never been found in Hispaniola.

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