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New extant and fossil Dominican Republic spider records, with two new synonymies and comments on taphonomic bias of amber preservation

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NEW EXTANT AND FOSSIL DOMINICAN REPUBLIC SPIDER RECORDS, WITH TWO NEW SYNONYMIES AND COMMENTS ON TAPHONOMIC BIAS OF AMBER PRESERVATION

David Penney

Abstract:

A collection of 23 identifiable extant spider species from the Dominican Republic revealed eight (= 35%) new species records for the country and five (= 22%) for the island of Hispaniola. The collection includes the first record of the family Prodidomidae from Hispaniola. *Phantyna guanica* (Gertsch, 1946) is identified as a junior synonym of *Emblyna altamira* (Gertsch & Davis, 1942) (Dictynidae) and *Ceraticelus solitarius* Bryant, 1948 is identified as a junior synonym of *C. paludigenus* Crosby & Bishop, 1925 (Linyphiidae). Such a large proportion of new records in such a small sample demonstrates that the extant spider fauna of the Dominican Republic is poorly known and is worthy of further investigation, particularly in light of its potential for quantifying bias associated with the amber-preserved fauna. New records of fossil spider species preserved in Miocene amber are provided. The taphonomic bias towards a significantly higher number of male compared to female spiders as inclusions in Dominican Republic amber is a genuine phenomenon.

Key words: Arachnida, Araneae, Dictynidae, Linyphiidae, Miocene, palaeontology, taphonomy, taxonomy, Hispaniola.

Taxonomy:

Emblyna altamira (Gertsch & Davis, 1942)
= *Phantyna guanica* (Gertsch, 1946) **new synonymy**
Ceraticelus paludigenus Crosby & Bishop, 1925
= *Ceraticelus solitarius* Bryant, 1948 **new synonymy**

Nuevos registros de arañas fósiles y vivientes de República Dominicana, con dos nueva sinonimias y comentarios sobre preferencias tafonómicas en la preservación del ámbar

Resumen:

Una colección de 23 especies identificables de arañas vivientes de la República Dominicana reveló ocho (=35%) nuevos registros de especies para el país y cinco (=22%) para la isla Hispaniola. La colección incluye el primer registro de la familia Prodidomidae para Hispaniola. *Phantyna guanica* (Gertsch, 1946) es propuesta como sinónimo de *Emblyna altamira* (Gertsch & Davis, 1942) (Dictynidae) y *Ceraticelus solitarius* Bryant, 1948 de *C. paludigenus* Crosby & Bishop, 1925 (Linyphiidae). La alta proporción de nuevos registros en una muestra tan pequeña demuestra que la fauna de arañas vivientes de la República Dominicana es pobremente conocida y merecedora de más investigación, particularmente en vista de su potencial relación con la fauna preservada en ámbar. Se proveen nuevos registros de especies de arañas fósiles. Desde el punto de vista tafonómico el número de arañas macho es significativamente alto comparado con hembras en las inclusiones en el ámbar dominicano, lo que constituye un fenómeno genuino.

Palabras clave: Arachnida, Araneae, Dictynidae, Linyphiidae, Mioceno, palaeontología, tafonomía, taxonomía, Hispaniola.

Taxonomía:

Emblyna altamira (Gertsch & Davis, 1942)
= *Phantyna guanica* (Gertsch, 1946) **nueva sinonimia**
Ceraticelus paludigenus Crosby & Bishop, 1925
= *Ceraticelus solitarius* Bryant, 1948 **nueva sinonimia**

Introduction

Penney & Pérez-Gelabert (2002) reviewed the current knowledge of Hispaniolan (=Dominican Republic and Haiti) araneology and provided a checklist of known Recent spiders (296 species in 40 families) and Miocene spiders preserved in Dominican Republic amber (145 species in 35 families). Here I present additional new spider records for the Dominican Republic and some amendments to the list of Penney & Pérez-Gelabert (2002). All extant spiders were collected by the author on a trip to the Dominican Republic in March and April 2003. The fossil spiders in Dominican Republic amber held in the collections of the Museo del Ámbar Dominicano, Puerto Plata were also studied. Taphonomic bias associated with preservation in amber is discussed.

Repository abbreviations: AMNH, American Museum of Natural History; AMPP; Museo del Ámbar Dominicano, Puerto Plata; MCZ, Museum of Comparative Zoology, Harvard; all other specimens are deposited in the Natural History Museum, London (NHM); † indicates a fossil species.

New records and amendments

Family DIPLURIDAE

†*Masteria sexoculata* (Wunderlich, 1988)
COMMENTS: This species was listed under the genus †*Microsteria* Wunderlich, 1988 by Penney& Pérez-Gelabert (2002). However, this genus was synonymized with *Masteria* by Raven (2000).

Family FILISTATIDAE

†*Misionella didicostae* Penney, 2004
COMMENTS: The holotype and only known specimen is a mature male (AMPP 220) preserved in Miocene Dominican Republic amber. This is the only described fossil from this family and is the only known record of the Miocene–Recent genus *Misionella* from Hispaniola.

Family PHOLCIDAE

Micropholcus fauroti (Simon, 1887)
COMMENTS: This is a new species record for Hispaniola. Two females were collected from the ceiling inside Hotel Maison Gautreaux, C/Félix Mariano Luberes, Santo Domingo on 9 April 2003, and one male and two females were collected inside a house in Puerto Plata on 11 April 2003.

Family OECOBIIDAE

Oecobius concinnus Simon, 1893a
COMMENTS: A new record for the Dominican Republic, previously recorded from Haiti. This spider is very common on walls of buildings and is also found on tree trunks.

Family THERIDIIDAE

†*Dipoenata yolandae* Wunderlich, 1988
COMMENTS: Listed as *D. yolande* [a *lapsus calami*] by Penney & Pérez-Gelabert (2002).

Theridion melanostictum O. P.-Cambridge, 1876
COMMENTS: This is a new species record for Hispaniola. The specimen is a mature female and was collected on 26 March 2003 by hand, from a wall of a building along the main coastal road in Puerto Plata.

Family LINYPHIIDAE

Ceraticelus paludigenus Crosby & Bishop, 1925
Ceraticelus solitarius Bryant, 1948 **new synonymy**
Figures 1–2

DESCRIPTION OF NEWLY COLLECTED FEMALE: Total length 1.57mm. Habitus and colouration typical for the genus (Fig. 1A–B). Carapace orange-yellow with a blackish area surrounding the eyes (Fig. 1B). Sternum same colour as carapace but with a darker margin (Fig. 1A), legs pale yellowish. Abdomen a creamy off-white colour without a dorsal scutum, but with four slightly sclerotized and clearly visible orange sigillae (Fig. 1B), ventrally with a pale sclerite close to the spinnerets which are a dark colour (Fig. 1A–B), and also with a small orange sclerite just posterior to the epigyne (Fig. 1A–B). Structure of epigyne as in Figs 1–2.

COMMENTS: This is a new species record for Hispaniola. One female was collected on 11 April 2003 using a sweep-net on low vegetation in marshland at Boca Nueva Village, approximately 14 km east of Puerto Plata, along the main road from Puerto Plata to the airport. The specimen is described and figured here as the original figure of the epigyne by Crosby & Bishop, 1925 is unsatisfactory by modern standards.

The correct identification of this specimen to this species was confirmed by the collection of an additional, identical female with a mature male, from vegetation in Puerto Plata (Feb 2004; specimens also in NHM). The male of this species is distinct in having an anterior cephalic lobe extending far in front of the posterior lobe, and as high as the latter, and in having a semi-transparent scoop-like structure on the tibial apophysis (Crosby & Bishop, 1925: figs 88–90). Bryant (1948) described *C. solitarius* from a single female collected from Valle Nuevo, Cordillera Central, Dominican Republic; no further records of this species have been reported and there are no other specimens with the holotype or elsewhere in the MCZ collections (L. Leibensperg, pers. comm. 2004). Bryant (1948: fig. 68) only figured the epigyne, but her figure bears very little resemblance to the true structure, as observed in the holotype (Fig. 1C–D), which resembles very closely the epigyne of *C. paludigenus* (e.g., Crosby & Bishop, 1925: fig. 91). The ducts observed in the new female specimens collected by the author vary slightly from those of Bryant's holotype in that they are not so acutely bent. However, given the conformation of the male pedipalp in the newly collected specimen to that of *C. paludigenus*, it can be assumed that the slight difference in the epigyne structure represents natural variation. Thus, *C. solitarius* Bryant, 1948 is a junior synonym of *C. paludigenus* Crosby & Bishop, 1925.

Family TETRAGNATHIDAE

Leucauge venusta (Walckenaer, 1842)
COMMENTS: A new record for the Dominican Republic, previously recorded from Haiti. A male and female were collected on 31 March, 2003 from Isabella de Torres, Puerto Plata, in low vegetation.

Tetragnatha pallescens F. O. P.-Cambridge, 1903
COMMENTS: A new record for the Dominican Republic, previously recorded from Haiti. A male and female were collected on 11 April, 2003 from Boca Nueva Village, on low vegetation in marshland, close to sugar cane fields, approximately 14 km east of Puerto Plata.

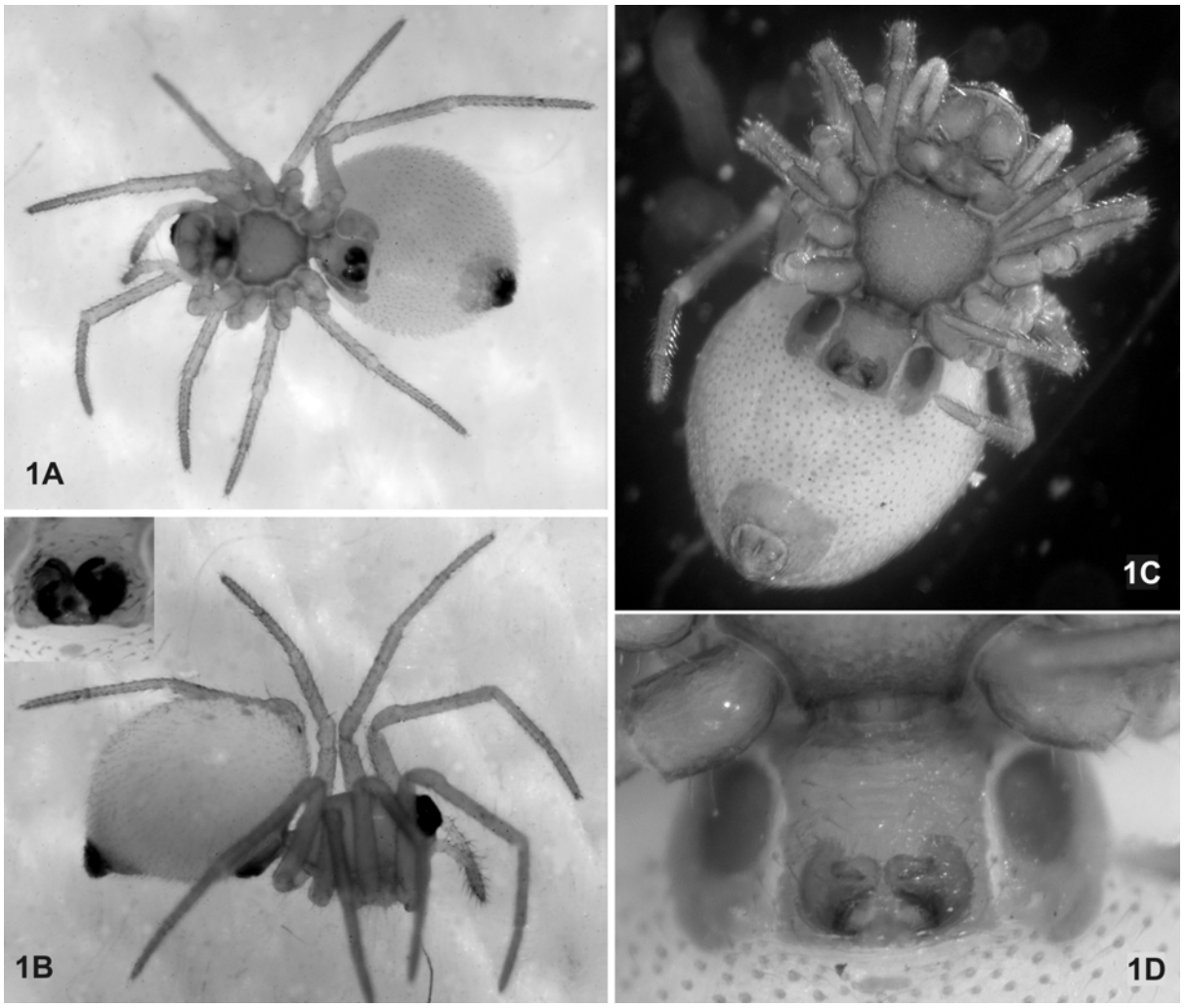

Fig. 1. *Ceraticelus paludigenus* Crosby & Bishop, 1925. **A.** whole animal, ventral; **B.** whole animal lateral, with epigyne inset; **C.** *C. solitarius* Bryant (holotype, MCZ), whole animal, ventral; **D.** *C. solitarius* Bryant (holotype, MCZ), epigyne.

Family ARANEIDAE

Metepeira compsa (Chamberlin, 1916)
COMMENTS: Accidentally omitted by Penney & Pérez-Gelabert (2002), this species was recorded from Hispaniola by Piel (2001).

Family DICTYNIDAE

Emblyna altamira (Gertsch & Davis, 1942)
Phantyna guanica (Gertsch, 1946) **new synonymy**
Figure 3

COMMENTS: Gertsch & Davis (1942) described *Dictyna altamira* from a single female specimen. They considered it to be closely related to *Dictyna annexa* Gertsch & Mulaik, 1936, but Chamberlin & Gertsch (1958) considered *D. altamira* closer to *D. cambridgei* Gertsch & Ivie, 1936 (incorrectly cited as Gertsch & Davis by these authors) and *D. annexa* closest to *D. abundans* Chamberlin & Ivie, 1941. Gertsch & Davis (1942) differentiated *D. altamira* from *D. annexa* because the

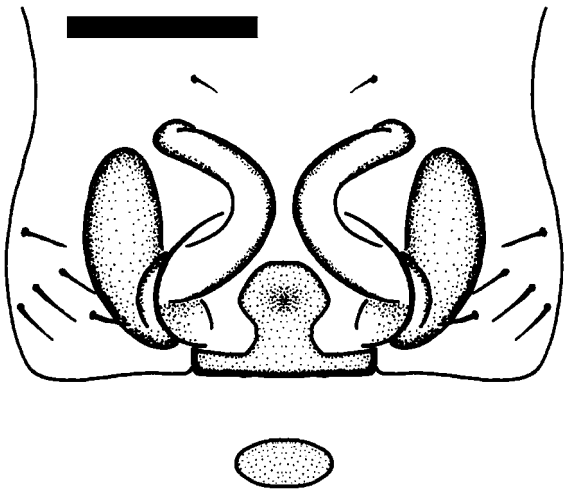

Fig. 2. *Ceraticelus paludigenus* Crosby & Bishop, 1925, camera lucida drawing of epigyne. Scale bar = 0.1 mm.

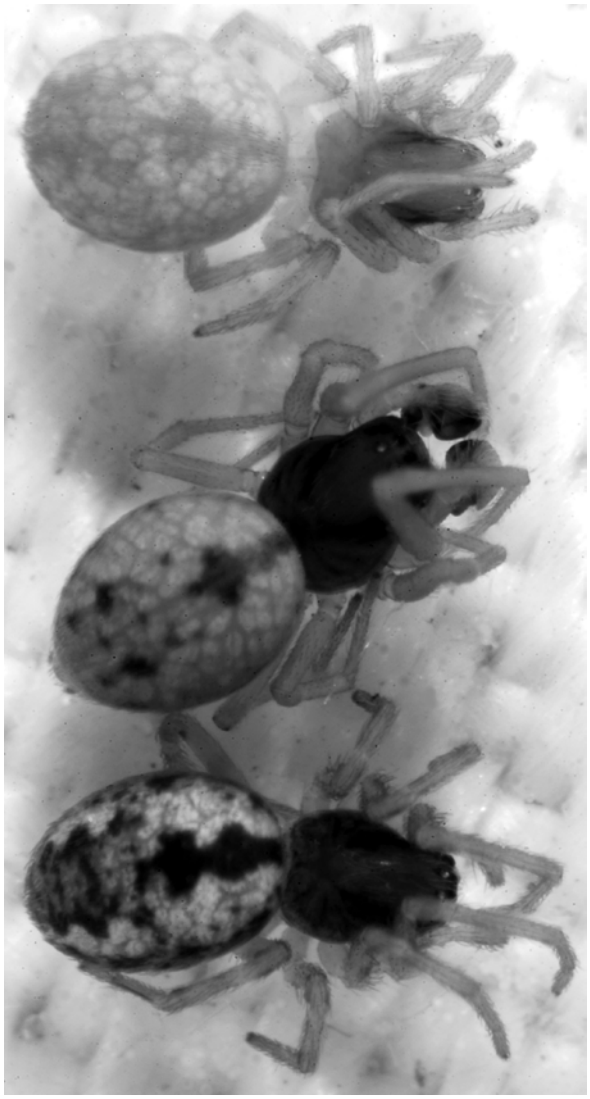

Fig. 3. *Emblyna altamira* (Gertsch & Davis, 1942), colour and pattern variation in specimens from the Dominican Republic.

former lacked a ventral abdominal median dark band, and the width of the triangular space separating the openings of the epigyne was broader. However, Gertsch & Mulaik (1936) only described the male of *D. annexa*, so it is unclear how Gertsch & Davis made their comparison. Chamberlin & Gertsch (1958) described the female of *D. annexa* for the first time and the epigyne is clearly different. Chamberlin & Ivie (1944) described *D. savanna* and provided excellent figures of many aspects of its morphology, including the venter of the abdomen with a dark band. This species was synonymized with *D. altamira* by Chamberlin & Gertsch (1958), who noted considerable variation in the degree of abdominal patterning in this species, from completely unmarked to having a distinct blackish pattern. This variation is evident in specimens from the Dominican Republic (Fig. 3).

Petrunkevitch (1930) described and figured a female of *D. parietalis* O. P.-Cambridge, 1896 (=*Phantyna* sp.) from Puerto Rico, this species was synonymized with *D. mandibularis* Taczanowski, 1874 (=*Phantyna*). Petrunkevitch's record from Puerto Rico was a misidentification (Gertsch, 1946). *D. mandibularis* ranges from Mexico to Brazil and so was not included in the revision of Chamberlin & Gertsch (1958) who covered the Dictynidae in America north of Mexico. However, Gertsch (1946) established the new name *D. guanica* for the single female specimen described from Puerto Rico by Petrunkevitch (1930), which he considered to differ from *D. parietalis* (=*P. mandibularis*) by lacking leg annulations and by having the epigynal openings separated to a greater degree. Bryant (1948) identified and figured one female of *D. guanica* from Haiti, which clearly belongs to the same species identified from Puerto Rico by Petrunkevitch (1930). According to the literature, the male of this species has never been described (e.g. Platnick, 2003).

Seventeen dictynid specimens, including mature males and females all belonging to the same species, were collected on 11 April, 2003 by the author using a sweepnet at a single locality in the Dominican Republic (Boca Nueva Village, on low vegetation in marshland, close to sugar cane fields, approximately 14 km east of Puerto Plata along the main road to the airport). These specimens key out as *D. altamira* using Chamberlin & Gertsch (1958) based on the structure of the terminal portion of the embolus. The females also conform to the diagnostic characters given in their revision. The females also match perfectly the descriptions and figures for *Phantyna guanica*. The Caribbean species were not included in the revision of Chamberlin & Gertsch (1958) but had they been so, they would surely have identified the synonymy established here. The fact that these two species are synonymous and were placed in different genera according to Platnick (2003) as a result of the genus revalidations by Lehtinen (1967), based mainly on the species groups of Chamberlin & Gertsch (1958), suggests this classification scheme requires reassessment. However, it should be noted that the male of *P. guanica* was unknown until the establishment of the new synonymy here.

Family PRODIDOMIDAE

Zimiris doriai Simon, 1882

COMMENTS: The specimen (AMNH), collected by the author from inside a hotel room in Puerto Plata, was described and figured by Platnick & Penney (2004) and is the first record of the family from Hispaniola, and the first record of this species from the New World.

Family ZORIDAE

Odo abudi Alayón-García 2002

COMMENTS: Authorship of this species was mistakenly attributed to Alayón-García, 1992 by Penney & Pérez-Gelabert (2002).

Fig. 4. *Misumenops californicus* (Banks, 1896) from the Dominican Republic, with epigyne inset.

Family THOMISIDAE

Misumenops californicus (Banks, 1896)
Figure 4

COMMENTS: The specimen is a mature female (Fig. 4) and was collected on 11 April 2003 by sweep-netting low vegetation around sugar cane plantations at Boca Nueva Village, approximately 14 km east of Puerto Plata; this is a new species record for Hispaniola. Several *Misumenops* species are morphologically indistinguishable other than in details of their genitalia (the following terminology follows Schick [1965]). In *M. celer* (known from Hispaniola) the width of the medium septum is approximately equal to the interdistance between the outlines of the spermathecal apophyses (Gertsch, 1939: fig. 68; Kaston, 1981: fig. 1487. In *M. californicus* it is only one sixth the width of the interdistance (Gertsch, 1939: fig. 67). In addition, in *M. celer* the outlines of the spermathecal apophyses are circular and 1.0 × their diameter apart, whereas in *M. californicus* they are oval and separated by approximately 1.5 × their diameter. The epigyne structure of *M. asperatus* (also recorded from Hispaniola) appears intermediate between *M. celer* and *M. californicus*. In the new specimen from the Dominican Republic identified as *M. californicus*, the intromittent orifice is wider than long, whereas in the figure of Gertsch (1939) it is longer than wide. However, this variation is known to occur in *M. californicus* (Schick, 1965: figs. 72, 73).

Previously recorded extant taxa

The following spider species previously recorded from the Dominican Republic were also collected: SCYTODIDAE: *Scytodes fusca* Walckenaer, 1837; PHOLCIDAE: *Modisimus glaucus* Simon, 1893b, *Physocyclus globosus* (Taczanowski, 1874); ULOBORIDAE: *Zosis geniculata* (Oliver, 1789); THERIDIIDAE: *Nesticodes rufipes* Lucas, 1846, *Theridula gonygaster* (Simon, 1873); TETRAGNATHIDAE: *Leucauge argyra* (Walckenaer, 1842), *Nephila clavipes* (Linnaeus, 1767); ARANEIDAE: *Argiope trifasciata* (Forskål, 1775), *Cyclosa walckenaeri* (O. P.-Cambridge, 1889), *Eustala fuscovittata* (Keyserling, 1864), *Neoscona nautica* (L. Koch, 1875); SALTICIDAE: *Hentzia antillana* Bryant, 1940, *Menemerus bivittatus* (Dufour, 1831).

Previously recorded fossil taxa

The following taxa were newly identified in the amber collections of the Museo del Ámbar Dominicano, Puerto Plata: SCTYODIDAE: *Scytodes* sp. indet., one juvenile (AMPP 234); MIMETIDAE: Gen. et sp. indet., one juvenile (AMPP 231), with a partial amblypygid syninclusion; HERSILIIDAE: Gen. et sp. indet., one juvenile (AMPP 235); THERIDIIDAE: †*Argyrodes crassipatellaris* Wunderlich, 1988, one beautifully preserved male (AMPP 244), †*Dipoenata globulus* Wunderlich, 1988, two males (AMPP 232 and 245), *Episinus* sp. indet., one juvenile (AMPP 226), †*Theri-*

dion variosoma Wunderlich, 1988, one male (AMPP 227), †*Theridion wunderlichi* Penney, 2001, one male (AMPP 246); TETRAGNATHIDAE: †*Nephila dommeli* Wunderlich, 1982, two males (AMPP 210 and 236), the former has a large feather syninclusion; ARANEIDAE: †*Araneometa spirembolus* Wunderlich, 1988, one male (AMPP 237); DICTYNIDAE: †*Hispaniolyna c.f. magna* Wunderlich, 1988, one male (AMPP 247), †*Palaeolathys spinosa* Wunderlich, 1986, one male (AMPP 241)—this may possibly be a specimen of †*P. similis* Wunderlich, 1988, but it is impossible to tell because the specimen is broken in two, with the fracture running through the spider; ANYPHAENIDAE: Gen. et sp. indet., one juvenile (AMPP 240); CORINNIDAE: †*Veterator ascutum* Wunderlich, 1988, one male (AMPP 239); SALTICIDAE: †*Corythalia ocululiter* Wunderlich, 1988, one male (AMPP 233), †*Corythalia pilosa* Wunderlich, 1982, one male (AMPP 229), †*Lyssomanes pristinus* Wunderlich, 1986, one male (AMPP 228), †*Pensacolatus coxalis* Wunderlich, 1988, one male (AMPP 238).

Discussion

The small collection of extant spiders upon which this paper is based contained adults of 23 different species, 15 (= 65%) of which had previously been recorded from the Dominican Republic. Thus, eight species (= 35%) are new records for the country and five (= 22%) of these are new records for the island of Hispaniola. The collection includes one new family record (Prodidomidae) for the island, and has also identified one new synonymy in the family Dictynidae and one in the family Linyphiidae, as proposed here, and also resulted in a number of synonymies in the family Prodidomidae proposed by Platnick & Penney (2004). This suggests that the spider fauna of the Dominican Republic is relatively poorly known and is worthy of further investigation.

In total 84 fossil amber spiders in AMPP were studied. Of these 33 were adult (30 males and three females = 1:0.10 males:females) and the remainder were juvenile. Penney (2002) demonstrated quantitatively a bias of amber preservation towards active trunk-dwelling faunas. This reasoning was based in part upon ratios of male:female inclusions found in two major collections of Dominican Republic amber. These collections did not differ significantly in their ratios (1:0.16, n=308 and 1:0.25, n=120), but a statement was included to the effect that there may have been a bias of collection, i.e. that there may have been an entomological filter, in terms of selection of the best specimens for scientific purposes by the scientists who acquired the specimens. As the most reliable taxonomy of spiders is based on the structure of the male genitalia this did not seem an unreasonable suggestion. However, the material studied in AMPP had undergone no such filter. All the material had come straight from the mines, or via maybe only one dealer, who would not have had such an entomological knowledge. The specimens were then purchased by the AMPP owners who also had no such knowledge. (they told me this directly when I asked them about it). A Chi-squared test for association demonstrated no significant difference in the ratio of male:female inclusions in the collections of AMPP and those ratios used by Penney (2002) ($\chi^2 = 3.2505$, d.f. = 2, $p>0.1$). Therefore, the taphonomic bias towards an excessively high number of male compared to female spiders (of the mature component of the fauna), as inclusions observed in museum collections of Dominican Republic amber, is a genuine phenomenon rather than an artefact of specimen selection.

The extant spider fauna of Hispaniola now numbers 301 described species in 41 families and the fossil spider fauna is known from 146 described species in 36 families. However, when fossils that have been described but not named as distinct species are included the family value rises to 45. In this respect the spider fauna of Hispaniola is unique, in that more families are recorded from fossils than from the Recent fauna. In total, 51 extant families are now known from Hispaniola with 35 shared between the fossil and Recent faunas.

Hispaniola is also unique in being the only locality on the planet where the fossil and Recent faunas are particularly similar at genus and family level (e.g. Penney, 1999; Penney & Pérez-Gelabert, 2002). This is because this relatively young (15–20 Myr, Itturalde-Vinent & MacPhee, 1996) amber formed in a tropical environment similar to that observed in the region at present. Therefore, these two faunas can be considered directly comparable ecologically. The high frequency of amber spiders in Dominican Republic amber makes this a potentially valuable data set for qualitative and quantitative palaeoecological investigations. However, amber, as with other fossil Lagerstätten, only preserves a fraction of the biota that existed at the time. Because of the similarity of the two faunas, given a more complete knowledge of the Recent fauna it should be possible to elucidate some of the biases within the amber fauna, such that reliable estimates of spider palaeodiversity in the Miocene can be made. With due diligence, this information on bias of preservation in Dominican Republic amber could be extended to other fossil resins. Hence, the value of an increased knowledge of the extant fauna of the Dominican Republic should not be underestimated.

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References

ALAYÓN-GARCÍA, G. 2002. Nueva especie de *Odo* Keyserling (Araneae: Zoridae) de República Dominicana. *Revista Ibérica de Aracnología*, **5:** 29–32.

BANKS, N. 1896. New Californian spiders. *Journal of the New York Entomological Society*, **4:** 88–91.

BRYANT, E. B. 1940. Cuban spiders in the Museum of Comparative Zoology. *Bulletin of the Museum of Comparative Zoology, Harvard*, **86:** 247–554.

BRYANT, E. B. 1948. The spiders of Hispaniola. *Bulletin of the Museum of Comparative Zoology, Harvard*, **100:** 331–459.

CAMBRIDGE, F. O. P. 1903. Arachnida. Araneida and Opiliones. *Biologia Centrali-Americana, Zoology,* **2:** 425–464.

CAMBRIDGE, O. P. 1876. Catalogue of a collection of spiders made in Egypt, with descriptions of new species and characters of a new genus. *Proceedings of the Zoological Society of London*, **1876:** 541–630.

CAMBRIDGE, O. P. 1889. Arachnida. Araneida. *Biologia Centrali-Americana, Zoology*, **1:** 1–56.

CAMBRIDGE, O. P. 1896. Arachnida. Araneida. *Biologia Centrali-Americana, Zoology*, **1:** 161–224.

CHAMBERLIN, R. V. 1916. Results of the Yale Peruvian Expedition of 1911. The Arachnida. *Bulletin of the Museum of Comparative Zoology, Harvard,* **60:** 177–299.

CHAMBERLIN, R. V. & W. J. GERTSCH 1958. The spider family Dictynidae in America north of Mexico. *Bulletin of the American Museum of Natural History,* **116:** 1–152.

CHAMBERLIN, R. V. & W. IVIE 1941. Spiders collected by L. W. Saylor and others, mostly in California. *Bulletin of the University of Utah,* **31:** 1–49.

CHAMBERLIN, R. V. & W. IVIE 1944. Spiders of the Georgia region of North America. *Bulletin of the University of Utah*, **35:** 1–267.

CROSBY, C. R. & S. C. BISHOP 1925. Studies in New York spiders, genera: *Ceratinella* and *Ceraticelus*. *New York State Museum Bulletin,* **264:** 5–71.

DUFOUR, L. 1831. Descriptions et figures de quelques Arachnides nouvelles ou mal connues et procédé pour conserver à sec ces Invertébrés dans les collections. *Annales des Sciences Naturelles* (*Zoologie*)**, 22:** 355–371.

FORSKÅL, P. 1775. *Descriptiones animalium avium, amphibiorum, piscium, insectorum, vermium; quae in itinere orientali observavit Petrus Forskål.* Hauniae, pp. 85–86.

GERTSCH, W. J. 1939. A revision of the typical crab spiders (Misumeninae) of America north of Mexico. *Bulletin of the American Museum of Natural History*, **76:** 277–442.

GERTSCH, W. J. 1946. Notes on American spiders of the family Dictynidae. *American Museum Novitates*, **1319:** 1–21.

GERTSCH, W. J. & L. I. DAVIS 1942. Report on a collection of spiders from Mexico. IV. *American Museum Novitates*, **1158:** 1–19.

GERTSCH, W. J. & W. IVIE 1936. Descriptions of new American spiders. *American Museum Novitates*, **858:** 1–25.

GERTSCH, W. J. & S. MULAIK 1936. Diagnoses of new southern Spiders. *American Museum Novitates*, **851:** 1–21.

ITTURALDE-VINENT, M. A. & R. D. E. MACPHEE 1996. Age and palaeogeographical origin of Dominican amber. *Science,* **273:** 1850–1852.

KASTON, B. J. 1981. Spiders of Connecticut (revised edition). *Bulletin of the State Geological and Natural History Survey of Connecticut*, **70:** 1–1020.

KEYSERLING, E. 1864. Beschreibungen neuer und wenig bekannter Arten aus der Familie Orbitelae Latr. oder Epeiridae Sund. *Sitzungsberichte und Abhandlungen der Naturwissenschaftlichen Gesellschaft Isis in Dresden*, **1863:** 63–98, 119–154.

KOCH, L. 1875. *Aegyptische und abyssinische Arachniden gesammelt von Herrn C. Jickeli*. Nürnberg.

LEHTINEN, P. T. 1967. Classification of the cribellate spiders and some allied families, with notes on the evolution of the suborder Araneomorpha. *Annales Zoologici Fennici*, **4:** 199–468.

LINNAEUS, C. 1767. *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus differentiis, synonymis, locis. Editio duodecima, reformata*. Holmiae, **1(2):** 533–1327 (Araneae, pp. 1030–1037).

LUCAS, H. 1846. Histoire naturelle des animaux articules. In: Exploration scientifique de l'Algerie pendant les annees 1840, 1841, 1842 publiee par ordre du Gouvernement et avec le concours d'une commission academique. *Paris, Sciences physiques, Zoologie*, **1:** 89–271.

OLIVIER, G. A. 1789. Araignée, Aranea. *Encyclopédie méthodique Histoire Naturelle. Insects. Paris*, **4:** 173–240.

PENNEY, D. 1999. Hypotheses for the Recent Hispaniolan spider fauna based on the Dominican Republic amber spider fauna. *Journal of Arachnology*, **27:** 64–70.

PENNEY, D. 2001. Advances in the taxonomy of spiders in Miocene amber from the Dominican Republic (Arthropoda, Araneae). *Palaeontology*, **44:** 987–1009.

PENNEY, D. 2002. Paleoecology of Dominican amber preservation—spider (Araneae) inclusions demonstrate a bias for active, trunk–dwelling faunas. *Paleobiology,* **28:** 389–398.

PENNEY, D. 2004. First Filistatidae in the fossil record: a new species of *Misionella* in Miocene amber from the Dominican Republic. *Journal of Arachnology*. In press.

PENNEY, D. & D. E. PÉREZ-GELABERT 2002. Comparison of the Recent and Miocene Hispaniolan spider faunas. *Revista Ibérica de Aracnología,* **6:** 203–223.

PETRUNKEVITCH, A. 1930. The spiders of Porto Rico. Part two. *Transactions of the Connecticut Academy of Arts and Sciences*, **30:** 159–356.

PIEL, W. H. 2001. The systematics of Neotropical orb-weaving spiders in the genus *Metepeira* (Araneae: Araneidae). *Bulletin of the Museum of Comparative Zoology, Harvard*, **157:** 1–92.

PLATNICK, N. I. 2003. *The world spider catalog, version 4.0.* American Museum of Natural History, online at http://research.amnh.org/entomology/spiders/catalog81-87/index.html.

PLATNICK, N. I. & D. PENNEY 2004. A revision of the widespread spider genus *Zimiris* (Araneae, Prodidomidae). *American Museum Novitates*. In press.

RAVEN, R. J. 2000. Taxonomica Araneae I: Barychelidae, Theraphosidae, Nemesiidae and Dipluridae (Araneae). *Memoirs of the Queensland Museum*, **45:** 569– 575.

SCHICK, R. X. 1965. The crab spiders of California (Araneae, Thomisidae). *Bulletin of the American Museum of Natural History*, **129:** 1–180.

SIMON, E. 1873. Aranéides nouveaux ou peu connus du midi de l'Europe. (2me mémoir). *Mémoires de la Société royale des Sciences de Liège*, **5:** 187–351.

SIMON, E. 1882. II. Etude sur les Arachnides du Yemen méridional. In: Viaggio ad Assab nel Mar Rosso dei signori C. Doria ed O. Beccari con il r. Aviso explorate-ro del 16 nov. 1879 ad 26 feb. 1881. *Annali del Museo Civico di Storia Naturale di Genova*, **18:** 207–260.

SIMON, E. 1887. Arachnides recuellis à Obock en 1886, par M. le Dr L. Faurot. *Bulletin de la Société zoologique de France*, **12:** 452–455.

SIMON, E. 1893a. Arachnides. In: Voyage de M. E. Simon au Venezuela (décembre 1887–avril 1888). 21e Mémoire. *Annales de la Société entomologique de France*, **61:** 423–462.

SIMON, E. 1893b. Etudes arachnologiques. 25e Mémoire. XL. Descriptiones d'espèces et de genres nouveaux de l'ordre des Araneae. *Annales de la Société entomologique de France*, **62:** 299–330.

TACZANOWSKI, L. 1874. Les aranéides de la Guyane française. *Horæ Societatis Entomologicæ Rossicæ*, **10:** 56–115.

WALCKENAER, C. A. 1837. *Histoire naturelle des Insectes. Aptères*. Paris, 1: 1–682.

WALCKENAER, C. A. 1842. *Histoire naturelle des Insects. Aptères*. Paris, 2: 1–549.

WUNDERLICH, J. 1982. Die häufigsten Spinnen (Araneae) des Dominikanischen Bernsteins. *Neue Entomologische Nachrichten*, **1:** 26–45.

WUNDERLICH, J. 1986. *Spinnenfauna Gestern und Heute, 1. Fossile Spinnen in Bernstein und Ihre Heute Lebenden Verwandten*. Erich Bauer Verlag bei Quelle & Meyer, Wiesbaden.

WUNDERLICH, J. 1988. Die Fossilen Spinnen im Dominikanis-hen Bernstein. *Beiträge zur Araneologie,* **2:** 1–378.