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# First Caribbean *Floricomus* (Araneae: Linyphiidae), a new fossil species in Miocene Dominican Republic amber. A new synonymy for the extant North American fauna

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## ABSTRACT

The new species *Floricomus fossilis* (Araneae: Linyphiidae) is described from Miocene Dominican Republic amber. This is the first fossil record of *Floricomus*, extending its known geological range by 15–20 Ma, and is the first record of the genus outside North America and Canada. Extant species may exist on Hispaniola, given the similarities between the known fossil and extant faunas. Most extant *Floricomus* species were described during the first half of the twentieth century and have received little, or no further taxonomic attention. The extant *F. ornatulus* GERTSCH and IVIE, 1936 is a junior synonym of *F. littoralis* CHAMBERLIN and IVIE, 1935 n.syn. The high degree of variation in somatic and genitalic characters observed in species currently assigned to *Floricomus* indicate the genus requires revision.

**KEYWORDS** | Biogeography. Hispaniola. Spider. Palaeontology. Taxonomy.

## INTRODUCTION

Hispaniola island (Caribbean Sea) is unique in terms of its known spider fauna, in that more families are recorded from fossils in Miocene Dominican Republic amber, than are recorded from extant species (Penney and Pérez-Gelabert, 2002). During the period of amber-forming resin secretion (15–20 million years ago; Iturralde-Vinent and MacPhee, 1996) Hispaniola was a distinct island; for a discussion of alternative ages for this amber deposit see Poinar and Poinar (1999). There may have been a connection to Puerto Rico via a narrow neck of land, however this is not certain (Iturralde-Vinent and MacPhee, 1999). The amber was formed in a tropical climate similar to that in the region today (Poinar and Poinar,

1999), therefore the fossil and Recent faunas are directly comparable ecologically. The high frequency with which spiders occur as Dominican Republic amber inclusions and their similarity to the Recent fauna makes this a potentially valuable data set for qualitative (Penney, 1999) and quantitative (Penney, 2002a) palaeoecological investigations.

It is only two decades since Ono (1981) described the first spider preserved in Miocene amber from the Dominican Republic. Subsequently, Dominican Republic amber spiders have been described by Schawaller (1981, 1982, 1984), Wunderlich (1981, 1982, 1986, 1987, 1988, 2004), Reiskind (1989), Wolff (1990) and Penney (2000a, b, 2001, 2005). The spiders described as *Mysmena dominicana* WUNDERLICH, 1998 (Mysmenidae) and *Grammonota deformans*

WUNDERLICH, 1998 (Linyphiidae) by Wunderlich (1998) and the specimen reported as Archaeidae (Wunderlich, 1999) from Dominican Republic amber are all actually subfossils preserved in Madagascan copal (Wunderlich, 2004). Penney and Pérez-Gelabert (2002) provided a checklist of the known fossil and Recent Hispaniolan spider faunas, which was updated and emended by Penney (2004).

The spider family Linyphiidae is very species-rich, with 4,247 recognized extant species in 560 genera (Platnick, 2004). However, many of these genera are monotypic and would probably not withstand phylogenetic scrutiny (Hormiga, 2000). The family consists mainly of tiny spiders that build sheet-webs, but some are active hunters. It has a global distribution, but linyphiids are most diverse in northern temperate regions (Coddington and Levi, 1991). Fossil Linyphiidae have been described from Tertiary Dominican Republic (Wunderlich, 1988), Baltic (Petrunkevitch, 1942) and Mexican (an exuvium; Petrunkevitch, 1971) ambers, and Cretaceous Lebanese (Penney and Selden, 2002) and New Jersey (Penney, 2002b) ambers. The family was reported as present in Tertiary Bitterfeld amber (Schumann and Wendt, 1989) and Cretaceous ambers from Canada (McAlpine and Martin, 1969) and Myanmar (Grimaldi et al., 2002), but these specimens have yet to be formally described. A non-amber fossil spider was described as a linyphiid by Berland (1939), but this specimen is poorly preserved and its correct placement in this family is dubious.

The linyphiid spider genus *Floricomus* CROSBY and BISHOP, 1925 was first described from two extant species extracted from the gut contents of American toads (Crosby and Bishop, 1925). According to Platnick (2004), the genus includes 13 extant species, all of which are restricted to North America; species also occur in Canada (Paquin and Dupérré, 2003). *Floricomus*, as currently delimited, are tiny (1.2–1.7 mm body length) spiders, but they are easily recognized by their dorsal abdominal scutum, absence of cephalic pits in males, distinct clypeal protrusion clothed with hairs, and the male palpal tibia with a thin projection that overlies the base of the paracymbium (Bishop and Crosby, 1935). In this paper I describe the first fossil *Floricomus*, a new species from Dominican Republic amber and discuss the taxonomy of the extant species.

## MATERIAL AND METHODS

The exact provenance of this amber specimen is unknown. However, the two major amber producing areas in the Dominican Republic (Fig. 1) derive from the same sedimentary depositional basin (Iturralde-Vinent and MacPhee, 1996). The amber containing the fossil spider

First Caribbean *Floricomus* from Miocene Dominican amber

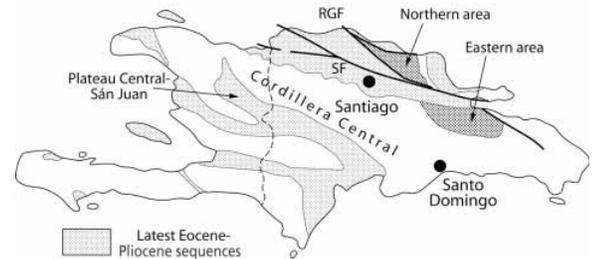


FIGURE 1 | Latest Eocene-Pliocene sequences in Hispaniola is indicated by the darker pattern (after Iturralde-Vinent and MacPhee, 1996). Location of the main amber mining districts (northern and eastern areas).

was embedded in clear plastic, which was cut and polished to reveal the inclusion. The spider-bearing amber piece was removed from the plastic and is a wedge-shape of 6 × 3 mm. Two other cut-off pieces remain in plastic, the smaller of which contains one insect syninclusion. Drawings were made with the aid of a camera lucida.

## Abbreviations used in the text and figures

AME, anterior median eye; car, carapace; cp, clypeal projection; fe, femur; mt, metatarsus; p, leg segment present but not measurable; pa, patella; PME, posterior median eye; sc, scutum; si, sigilla; ta, tarsus; ti, tibia; 1–4, legs 1–4. In the leg formula (e.g., 1=2,4,3), the legs are ranked in order of length (longest first).

## SYSTEMATIC PALAEOLOGY

**Order:** Araneae CLERCK, 1757

**Suborder:** Opisthothelae POCOCK, 1892

**Infraorder:** Araneomorphae SMITH, 1902

**Family:** Linyphiidae BLACKWALL, 1859

GENUS *Floricomus* CROSBY and BISHOP, 1925

*Type species:* *Pholcomma rostratum* EMERTON, 1882.

*Other species:* see discussion

*Floricomus fossilis* n. sp.

Figures 2 and 3

*Diagnosis:* The cone-shaped clypeal projection originating from the base of the clypeus, and with a downward-pointing, swollen tip, distinguishes the fossil species from all extant species.

*Description:* Adult male. Body length (measured from the tip of the clypeal projection) 1.1 mm; prosoma 0.6 mm long, 0.5 mm wide, 0.2 mm high anteriorly with a very distinctive conical clypeal projection extending from

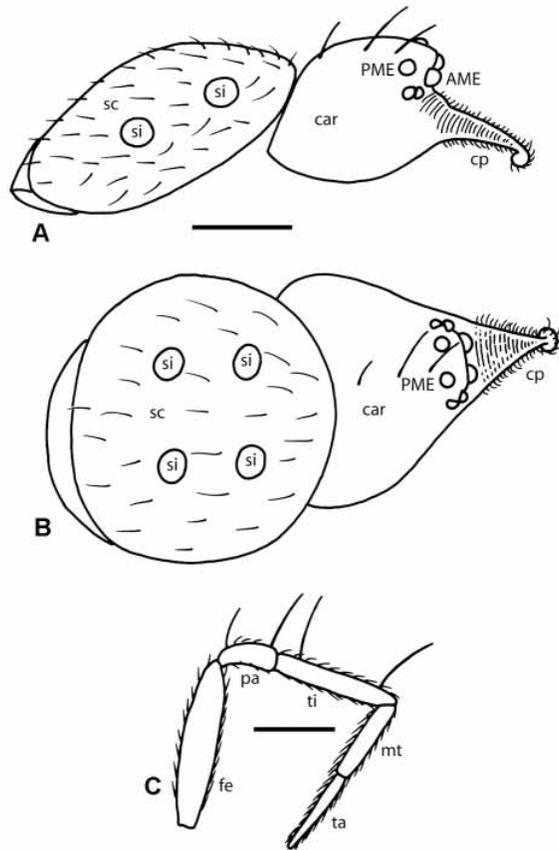


FIGURE 2| *Floricomus fossilis* n. sp., camera lucida drawing of male holotype in Miocene Dominican amber (LL. 11629). A) Lateral view of body. B) Dorsal view of body. C) Retrolateral view of right leg 1. For explanation of abbreviations see Material and Methods. Scale bars = 0.2 mm.

the lateral margins of the prosoma and the base of the clypeus, fringed with setae, and curved downwards and swollen at the anterior tip (Figs. 2A and 2B), sides rounded, ocular area raised. Eight eyes in two rows, anterior row recurved, posterior row straight when viewed from above; laterals slightly smaller than medians, AME slightly closer together than PME (Figs. 2A and 2B). Clypeus five and one half times the diameter of an AME. Several long, erect setae present in the cephalic region. Sternum, chelicerae and mouthparts not clear. Opisthosoma 0.6 mm long, 0.6 mm wide, 0.2 mm high, almost circular when viewed from above, a dorsal scutum with four large, distinct sigillae and scattered setae covering all but the distal part of the abdomen (Figs. 2A and 2B). There also appears to be a ventral scutum covering the proximal three quarters of the opisthosoma, although this is not certain; the ventrodistal tip of the opisthosoma is missing.

Leg formula 1=2,4,3; leg 1 fe 0.4 mm, pa 0.1 mm, ti 0.3 mm, mt 0.2 mm, ta 0.2 mm, total 1.2 mm; leg 2 fe 0.4 mm, pa 0.1 mm, ti 0.3 mm, mt 0.2 mm, ta 0.2 mm, total

1.2 mm; leg 3 fe 0.2 mm, pa 0.1 mm, ti 0.2 mm, mt p, ta p; leg 4 fe 0.3 mm, pa 0.1 mm, ti 0.2 mm, mt p, ta p; all tibiae with one long, thin proximal dorsal spine, in addition, tibiae 1 and 2 with a distal dorsal spine (Fig. 2C). Patellae with thin proximal and distal spines, remaining segments without spines. A clear view of the pedipalp sclerite morphology is not possible, but the distal edge of the tibia forms a broad, thin apophysis over the base of the cymbium, as seen in extant species.

*Type specimen*: LL. 11629; holotype male in Miocene Dominican Republic amber (Fig. 3), deposited in the Geology Department of the Manchester Museum, University of Manchester, UK. The only known specimen.

*Etymology*: Specific epithet “fossilis” based on the palaeontological nature of the specimen.

## DISCUSSION

The new species fits well in *Floricomus* as currently delimited. However, most species were described during the first half of the twentieth century and have received little, or no further taxonomic attention. For example, Chamberlin and Ivie (1935) described the new species *F. littoralis*, and Gertsch and Ivie (1936) described *F. ornatulus* as new, but made no mention of the species described the previous year. Both species conform closely to the type species *F. rostratus* (EMERTON, 1882) and upon close inspection of the pedipalp and epigyne figures provided by these authors (Figs. 4A and 4B) it is clear that *F. littoralis* and *F. ornatulus* are synonymous. It is surprising that Wilton Ivie did not notice this, as he was second author on both papers. Thus, *F. ornatulus* GERTSCH and IVIE, 1936 is identified as a junior synonym of *F. littoralis* CHAMBERLIN and IVIE, 1935 n. syn.



FIGURE 3| *Floricomus fossilis* n. sp., holotype in Miocene Dominican amber (LL. 11629). Scale bar = 0.2 mm.

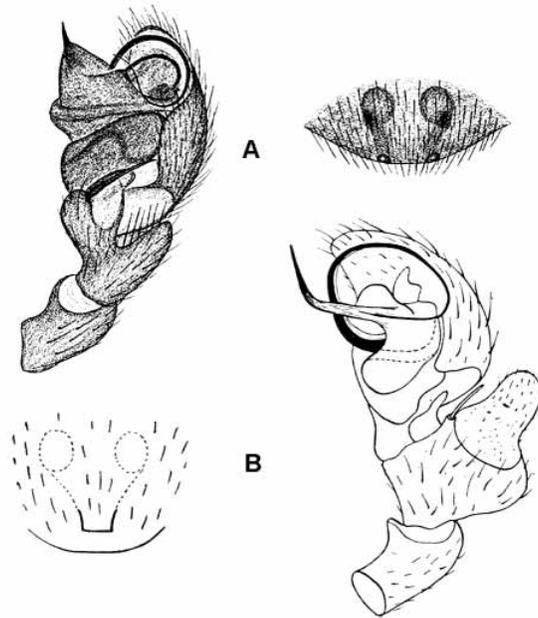


FIGURE 4 | Genitalia of *Floricomus littoralis* and *Floricomus ornatulus*. A) Male pedipalp and female epigyne of *F. littoralis* (from Chamberlin and Ivie, 1935). B) Male pedipalp and female epigyne of *F. ornatulus* (from Gertsch and Ivie, 1936).

Based on carapace clypeal structure, the 13 species (including the new fossil species) included in the genus fall into five distinct groups: *F. setosus* CHAMBERLIN and IVIE, 1944 has no clypeal projection; *F. littoralis* and *F. rostratus* possess a clypeal ‘horn’ with numerous captiate hairs which increase in length towards the tip of the ‘horn’; *F. crosbyi* IVIE and BARROWS, 1935 has a raised, upwardly directed cephalic protruberance; *F. praedesignatus* BISHOP and CROSBY, 1935 has a distinct transverse fissure between the clypeal and cephalic lobes; and *F. bishopi* IVIE and BARROWS, 1935, *F. mulaiki* GERTSCH and DAVIS, 1936, *F. nasutus* (EMERTON, 1911), *F. nigriceps* (BANKS, 1906), *F. plumalis* (CROSBY, 1905), *F. pythonicus* CROSBY and BISHOP, 1925, *F. tallulae* CHAMBERLIN and IVIE, 1944 and the new fossil species *F. fossilis* n. sp. all have an anteriorly directed, swollen clypeal protruberance. All species have a dorsal abdominal scutum but the size and degree of sclerotization is variable between the species. The palpal morphology is also too variable to suggest that all the above species belong in the same genus.

This is the first fossil record of *Floricomus*, extending its known geological range by 15–20 Ma. It is also interesting from a biogeographic viewpoint, because extant species are unknown outside of North America and Canada, making this the first record for the Caribbean. The presence of this genus in amber from the Dominican Republic, means that it is not unreasonable to expect that

extant species may exist on Hispaniola, particularly given the similarities between the fossil and extant spider faunas (Penney and Pérez-Gelabert, 2002). In addition, the extant spider fauna of Hispaniola remains poorly known (Penney and Pérez-Gelabert, 2002; Penney, 2004) and these spiders are extremely small and rarely encountered.

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