Geologica Acta, Vol.3, Nº1, 2005, 59-64
Available online at www.geologica-acta.com

geologica acta

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

D. PENNEY

Earth, Atmospheric and Environmental Sciences, The University of Manchester
Manchester, M13 9PL, UK. E-mail: david.penney@manchester.ac.uk

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 *Floriomus* 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 (Itturalde-Vinent and MacPhee, 1996). The amber containing the fossil spider 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.

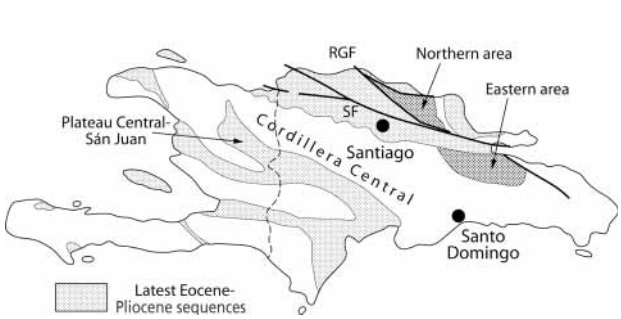

FIGURE 1 | **Latest Eocene-Pliocene sequences in Hispaniola is indicated by the darker pattern (after Iturralde-Vinent and MacPhee, 1996). Location of the main amber mining districts (northern and eastern areas).**

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 PALAEONTOLOGY

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

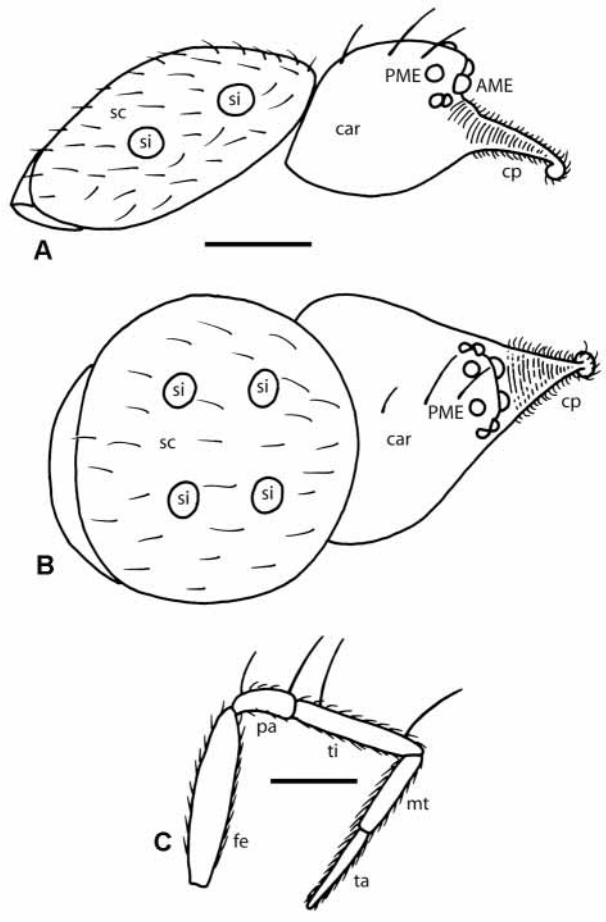

FIGURE 2| ***Floricomus fossilis*** **n. sp., camera lucida drawing of male holotype in Miocene Dominican amber (LL. 11629). A) Lateral view of body. B) Dorsal view of body. C) Retrolateral view of right leg 1. For explanation of abbreviations see Material and Methods. Scale bars = 0.2 mm.**

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.**

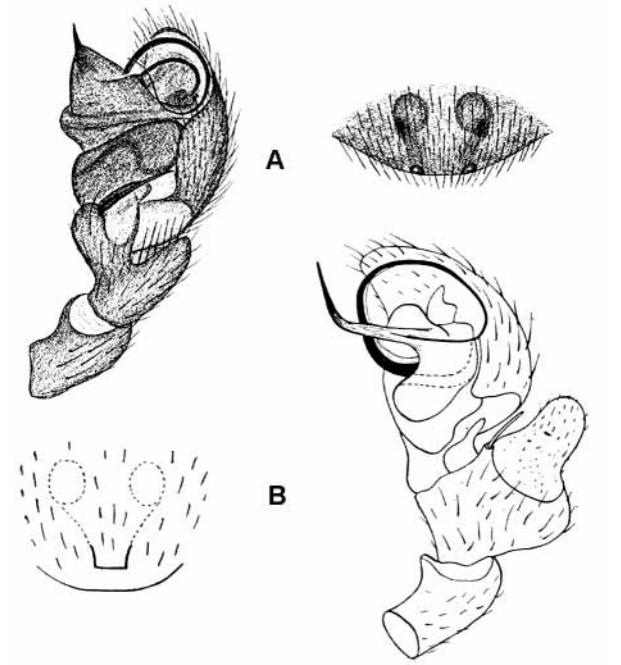

FIGURE 4 | **Genitalia of *Floricomus littoralis* and *Floricomus ornatulus*. A) Male pedipalp and female epigyne of *F. littoralis* (from Chamberlin and Ivie, 1935). B) Male pedipalp and female epigyne of *F. ornatulus* (from Gertsch and Ivie, 1936).**

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 protruberence; *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.

ACKNOWLEDGEMENTS

I thank John Nudds (former Keeper of Geology at Manchester Museum; present collection curator Phil Manning) for the loan of the specimen, the British Arachnological Society reprint library and Jason Dunlop (Museum für Naturkunde, Humboldt-Universität zu Berlin) for providing literature. I thank Richard Hartley (University of Manchester) for generating figure 1. Jason Dunlop and an anonymous reviewer are thanked for reviews. I acknowledge a Leverhulme Trust grant.

REFERENCES

Banks, N., 1906. Descriptions of new American spiders. Proceedings of the Entomological Society of Washington, 7, 94-100.

Berland, L., 1939. Description de quelques araignées fossiles. Revue Français d'Entomologie, 4, 1-9.

Bishop, S.C., Crosby, C.R., 1935. American Erigoneae: the spider genera *Pelecopsidis* and *Floricomus*. Journal of the New York Entomological Society, 43, 31-45.

Blackwall, J., 1859. Descriptions of newly discovered spiders captured by James Yate Johnson Esq., in the island of Madeira. Annals and Magazine of Natural History (series 3), 4, 255-267.

Chamberlin, R.V., Ivie, W., 1935. Miscellaneous new American spiders. Bulletin of the University of Utah, 26, 1-79.

Chamberlin, R.V., Ivie, W., 1944. Spiders of the Georgia region of North America. Bulletin of the University of Utah, 35, 1-267.

Clerck, C., 1757. Aranei suecici, descriptionibus et figuris oeneis illustrati, ad genera subalterna redacti speciebus ultra 60 determinati. Svenska Spindlar, uti sina hufvud-slagter indelte samt. Stockholm, L. Salvii, 154 pp., 6 pls.

Coddington, J.A., Levi, H.W., 1991. Systematics and evolution of spiders. Annual Review of Ecology and Systematics, 22, 565-592.

Crosby, C.R., 1905. A catalogue of the Erigoneae of North America, with notes and descriptions of new species. Proceedings of the Philadelphia National Academy of Sciences, 57, 301-343.

Crosby, C.R., Bishop, S.C., 1925. A new genus and two new species of spiders collected by *Bufo quercicus* (Holbrook). Florida Entomologist, 9, 33-36.

Emmerton, J.H., 1882. New England spiders of the family Theridiidae. Transactions of the Connecticut Academy of Arts and Sciences, 6, 1-86.

Emmerton, J.H., 1911. New spiders from New England. Trans-

actions of the Connecticut Academy of Arts and Sciences, 16, 383-407.

Gertsch, W.J., Davis, L.I., 1936. New spiders from Texas. American Museum Novitates, 881, 1-21.

Gertsch, W.J., Ivie, W., 1936. Descriptions of new American spiders. American Museum Novitates, 858, 1-25.

Grimaldi, D., Engel, M.S., Nascimbene, P.C., 2002. Fossiliferous Cretaceous amber from Myanmar (Burma): its rediscovery, biotic diversity, and paleontological significance. American Museum Novitates, 3361, 1-71.

Hormiga, G., 2000. Higher level phylogenetics of Erigonine spiders (Araneae, Linyphiidae, Erigoninae). Smithsonian Contributions to Zoology, 609, 1-160.

Iturralde-Vinent, M.A., Macphee, R.D.E., 1996. Age and palaeogeographical origin of Dominican amber. Science, 273, 1850-1852.

Iturralde-Vinent, M.A., Macphee, R.D.E., 1999. Paleogeography of the Caribbean region: implications for Cenozoic biogeography. Bulletin of the American Museum of Natural History, 238, 1-95.

Ivie, W., Barrows, W.M., 1935. Some new spiders from Florida. Bulletin of the University of Utah, 26, 1-24.

McAlpine, J.F., Martin, J.E.H., 1969. Canadian amber -a paleontological treasure chest. Canadian Entomologist, 101, 819-838.

Ono, H., 1981. First record of a crab spider (Thomisidae) from Dominican amber (Amber Collection Stuttgart: Arachnida, Araneae). Stuttgarter Beiträger zur Naturkunde Serie B (Geologie und Paläontologie), 73, 1-13.

Paquin, P., Dupérré, N., 2003. Guide d'identification des Araignées (Araneae) du Québec. Fabreries, Supplément 11, 1-251.

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., 2000a. Miocene spiders in Dominican amber (Oonopidae, Mysmenidae). Palaeontology, 43, 343-357.

Penney, D., 2000b. Anyphaenidae in Miocene Dominican Republic amber (Arthropoda: Araneae). Journal of Arachnology, 28, 223-226.

Penney, D., 2001. Advances in the taxonomy of spiders in Miocene amber from the Dominican Republic (Arthropoda, Araneae). Palaeontology, 44, 987-1009.

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

Penney, D., 2002b. Spiders in Upper Cretaceous amber from New Jersey (Arthropoda: Araneae). Palaeontology, 45, 709-724.

Penney, D., 2004. New extant and fossil Dominican Republic spider records, with one new synonymy and comments on taphonomic bias of amber preservation. Revista Ibérica de Aracnología, 9, 183-190.

Penney, D., 2005. First Filistatidae in the fossil record: A new species of *Misionella* in Miocene amber from the Dominican Republic. Journal of Arachnology., 33.

Penney, D., Pérez-Gelabert, D.E., 2002. Comparison of the Recent and Miocene Hispaniolan spider faunas. Revista Ibérica de Aracnología, 6, 203-223.

Penney, D., Selden, P.A., 2002. The oldest linyphiid spider, in Lower Cretaceous Lebanese amber (Araneae, Linyphiidae, Linyphiinae). Journal of Arachnology, 30, 487-493.

Petrunkevitch, A., 1942. A study of amber spiders. Transactions of the Connecticut Academy of Arts and Sciences, 34, 119-464.

Petrunkevitch, A., 1971. Chiapas amber spiders, 2. University of California Publications in Entomology, 63, 1-44.

Platnick, N.I., 2004. The world spider catalog, version 4.5. American Museum of Natural History, online at http://research.amnh.org/entomology/spiders/catalog81-87/index.html.

Pocock, R.I., 1892. *Liphistius* and its bearing upon the classification of spiders. Annals and Magazine of Natural History (Series 6), 10, 306-314.

Poinar, Jr., G.O., Poinar, R., 1999. The amber forest: a reconstruction of a vanished world. New Jersey, ed. Princeton University Press, 239 pp.

Reiskind, J., 1989. The potential of amber fossils in the study of the biogeography of spiders in the Caribbean with the description of a new species of *Lyssomanes* from Dominican amber (Araneae: Salticidae). In: Woods, C.A. (ed.). Biogeography of the West Indies, Past, Present and Future. Gainesville, Florida, ed. Sandhill Crane Press, 217-227.

Schawaller, W., 1981. The spider family Hersiliidae in Dominican amber (Amber Collection Stuttgart: Arachnida, Araneae). Stuttgarter Beiträger zur Naturkunde Serie B (Geologie und Paläontologie), 79, 1-10.

Schawaller, W., 1982. Spinnen der familien Tetragnathidae, Uloboridae und Dipluridae in Dominikanischem Bernstein und allgemeine Gesichtspunkte (Arachnida, Araneae). Stuttgarter Beiträger zur Naturkunde Serie B (Geologie und Paläontologie), 89, 1-19.

Schawaller, W., 1984. The family Selenopidae in Dominican amber (Arachnida: Araneae). Stuttgarter Beiträger zur Naturkunde Serie B (Geologie und Paläontologie), 103, 1-8.

Schumann, H., Wendt, H., 1989. Zur Kenntnis der tierischen Inklusen des Sächsischen Bernsteins. Deutsche Entomologische Zeitschrift, 36, 33-34.

Smith, F.P., 1902. The spiders of Epping Forest. Essex Naturalist, 12, 181-201.

Wolff, R.J., 1990. A new species of *Thiodina* (Araneae: Salticidae) from Dominican amber. Acta Zoologica Fennica, 190, 405-408.

Wunderlich, J., 1981. Fossile Zwergsechsaugenpinnen (Oonopidae) der Gattung *Orchestina* Simon, 1882 in Bernstein mit Ammerkungen zur Sexual–biologie (Arachnidae: Araneae). Mitteilungen aus dem Geologisch–Paläontologischen Institut der Universität Hamburg, 51, 83-113.

Wunderlich, J., 1982. Die häufigsten Spinnen (Araneae) des Dominikanischen Bernsteins. Neue Entomologische Nachrichten, 1, 26-45.

Wunderlich, J., 1986. Spinnenfauna Gestern und Heute, 1. Fos-

sile Spinnen in Bernstein und Ihre Heute Lebenden Verwandten. Wiesbaden, ed. Erich Bauer Verlag bei Quelle und Meyer, 283 pp.

Wunderlich, J., 1987. *Tama minor*, n. sp., eine fossile Spinnerart der Familie Hersiliidae in Dominikanischem Bernstein (Arachnida: Araneae). Entomologische Zeitschrift, 97, 93-96.

Wunderlich, J., 1988. Die Fossilen Spinnen im Dominikanischem Bernstein. Beiträge zur Araneologie, 2, 1-378.

Wunderlich, J., 1998. Beschreibung der ersten fossilen Spinnen der Unterfamilien Mysmeninae (Anapidae) und Erigoninae (Linyphiidae) im Dominikanischen bernstein (Arachnida, Araneae). Entomologische Zeitschrift, 108, 363-367.

Wunderlich, J., 1999. Two subfamilies of spiders (Araneae, Linyphiidae: Erigoninae and Anapidae: Mysmeninae) new to Dominican amber – or falsificated amber? Estudios del Museo Ciencias Naturales de Álava, 14 (Numero Especial 2), 167–172.

Wunderlich, J., 2004. Fossil spiders in amber and copal. Beiträge zur Araneologie, 3ab, 1-1908.

Manuscript received May 2004;
revision accepted September 2004.