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A new species of *Chiridurothrips* Okajima from Miocene amber of the Dominican Republic (Thysanoptera: Phlaeothripidae)

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The thysanopteran genus *Chiridurothrips* Okajima is known from a single extant species, *C. hisakoae* Okajima, collected in Japan (ThripsWiki 2019). Occurring on dead leaves and branches of evergreen trees in the subtropical Ryukyu Islands, this species remains known from only five females (Okajima 1981, 2006; also pers. comm. 2018). Within Phlaeothripidae, *Chiridurothrips* is associated with the tribe Plectrothripini. Species of this sub-group feed on fungal hyphae or the break-down products of fungal attack on decaying plant material (Mound & Ng 2018). They are found mainly under the bark of trees or on dead branches, and they do not seem to inhabit leaf-litter (Okajima 1981). At present, Plectrothripini comprises 60 extant species in 13 genera, with no fossils recorded. Of these species 32 are placed in the genus *Plectrothrips* Hood, ten in *Streptothrips* Priesner, and six in *Chirothripoides* Bagnall, whereas both *Menothrips* Hood and *Mastigothrips* Priesner each include only two species. The remaining eight species are all placed in separate monobasic genera (ThripsWiki 2019). Concerning this strongly asymmetric classification, Mound and Ng (2018) suggest that Plectrothripini might be particularly old, with the large number of monobasic genera each representing a relict lineage. An alternative possibility, however, might be an unusual instability in the genes controlling morphogenetic processes, and thus resulting in striking autapomorphies on which each one of these genera is diagnosed (Mound & Ng 2018). Species associated with Plectrothripini share the following character states (Okajima 1981; Mound & Tree 2017): antennae 8-segmented, segment II with the campaniform sensillum situated in the basal half, III–IV with stout sense cones, VIII slender with narrow base; head with posterior ocelli close to compound eyes; pronotum commonly with sclerotized plate eroded or reduced, prosternal basantra week or absent; legs with fore tarsal tooth large; mid and hind tibiae commonly with apical spur-like setae; macropterae with fore wings parallel-sided, usually with duplicated cilia; pelta broad at base, abdominal tergite II eroded laterally; abdominal sternites often with reticulate glandular areas. Regarding the fore wings, it seems worth mentioning that in some members of Plectrothripini the subbasal wing vein is reduced and thus the three subbasal wing setae are lacking (see *Plectrothrips tenuis* Okajima, *Chiridurothrips* [c.f. fig. 2], *Chirothripoides*, *Lonchothrips* Hood; Bhatti 1998; Okajima 1981). This short vein that is present in (almost all) other macropterous Phlaeothripidae has been interpreted as a plesiomorphic feature that resulted from the reduction of a former well-developed longitudinal first vein of ancestral Tubulifera, the Rohrthripidae (Ulitzka 2018, 2019).

The thrips specimen described below is a fossil inclusion in a small piece of Dominican amber. The age of this kind of amber is controversial, with earlier age estimates of 30 or even 45 million years (Lambert *et al.* 1985; Schlee 1990). Currently it is considered to have been formed 15 to 20 million years ago, during the late Lower Miocene through early Middle Miocene (Grimaldi 1996; Iturralde-Vincent & MacPhee 1996). During this period the resin was produced by an extinct, leguminous tree, described as *Hymenaea protera* (Poinar 1991). Dominican amber from different mines contains fossil inclusions, often in exquisite preservation (c.f. The Blue Amber Blog 2006). In some cases, these fossils even provide the opportunity to study distribution and behaviour of the former biota, and they allow conclusions to be drawn about the ecology of the former amber forest of Hispaniola (Poinar 2013). Insects have been found in particularly large variety (Arillo & Ortuño 2005; Pérez-Gelabert 1999). The occurrence of thrips in Dominican amber is known (e.g. Poinar 2013: 28, fig. 6) but no species has been described so far. The study presented here strives to extend our knowledge of ancestral Phlaeothripidae, and tries to give advice on the evolutionary age of the tribe Plectrothripini.

The present study deals with an amber inclusion fossil that came from the La Bucara mine located in the North of the Dominican Republic. It was acquired by the author in 2018 from Vincent T. Calabrese (Big Run, Jefferson County, Pennsylvania, USA) who sells amber on eBay. To reach the necessary optical conditions and to prevent decomposition or oxidation the amber was ground to a thin slice and embedded in XOR-Polyester-Resin (S-Kresin 2410, manufacturer:

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S u. K Hock GmbH, Regen, Germany) (cf. Ulitzka 2015). Examination was carried out using a Zeiss Stemi SV11 Apo Stereomicroscope and a Zeiss Standard Microscope with the following objectives: Zeiss Plan 10/0,22 160/-, Nikon M Plan 20 x ELWD 210 mm and Nikon M Plan 40 x ELWD 0.5NA 210 mm. Illumination involved merging transmission light with two or three white-light-LED incident illuminators. White paper was used as a diffusor for incident illumination to prevent reflections in the amber; different coloured paper sheets were inserted under the sample to get the inclusion in better contrast to the yellowish translucent amber. Images were taken with a digital camera attached to the microscopes (Canon EOS 70d), and these were produced using Helicon Focus software. Nik Sharpener Pro and Adobe Photoshop were used for final colour adjustment and sharpening.

Chiridurothrips dominicus sp. n. (Figs 1–4)

Female macroptera. Body slightly contracted; fore legs angled, mid and hind legs extended; wings fully spread. Colour (Figs 1, 2) dark brown including antennae and legs; major body setae and wing fringes dark; wing membrane shaded brownish, extreme tip of forewing and clavus somewhat darker.

Head retracted basally under pronotum (Fig. 2); longer than wide, projecting in front of the compound eyes, with cheeks slightly rounded behind eyes and converging straight towards base; dorsally with reticulate sculpture. Ocelli large; posterior pair close to compound eyes. One pair of short ocellar setae visible just behind posterior ocelli. Postocular setae broken off, their points of insertion visible far behind the eyes. Antennae (Fig. 3) 8-segmented; segment I barrel-shaped; segment II basally with a cone-shaped pedicle, apically polygonal and bluntly prolonged at the inner edge, sensilla situated between base and middle; III–VII basally with a slender pedicel, then inverse conically shaped and tapering distally from level of sense cones; VIII spindle-shaped, at base much narrower than segment VIII distally; III and V each with two sense cones (1+1), IV with two or three sense cones (1+1 or 1+2) – difficult to assess, VI with one sense cone (1+0), VII with one sense cone (0+1). Mouth cone short, rounded.

Prothorax not clearly assessable, deformed (Fig. 2); pronotum small, laterally eroded; without prominent setae. Mesothorax and metathorax deformed by lateral distortion; both ventrolaterally with a pair of long fine, hair-like setae bent inwards to the front. Fore wings (Fig. 1) parallel-sided; with 6–7 duplicated cilia; subbasal wing setae as well as subbasal wing vein lacking. Fore legs (Fig. 4) with femora slightly enlarged, each with a long hair-like seta; fore tarsi with a large tarsal tooth and a hamus consisting of three discrete teeth („*dentate pseudungius*“ c.f. Bhatti 1998: 258). Mid and hind tibiae each dorsally and laterally with a fine long seta, their ventral tips each with one spur-like apical seta; mid and hind tarsi two-segmented, each with a recurved hamus.

Pelta not assessable. Tergites without sigmoid wing retaining setae; lateral setae short, pointed. Sternites with short discal setae (only some visible). Segment IX tapering dome-shaped, with setae pointed, s1 short, s2 long, but not protruding tube. X (tube) long and slender, concavely extended at base and sharply constricted distally; anal setae weak but longer than tube.

Measurements. Holotype in microns: Body length 1188. Head, length 202; width 124. Eyes, length 60; width 31. Ocelli diameter 16; distance between hind ocelli about 40. Prothorax, length about 202; width not measurable (deformed). Pterothorax, not measurable (deformed); ventrolateral hair-like setae on mesothorax about 155, on metathorax about 190. Abdomen, length 542; largest width 217 (segments V); segment X (tube), length 90; basal width 47. Setae on tergite IX, s1 34, s2 74; longest anal setae 155. Antennae, length 296; length (largest width) of segment I 28 (28), II 31 (37), III 40 (31), IV 47 (28), V 37 (22), VI 39 (19), VII 37 (12), VIII 37 (6). Fore wings, length 706; width in the middle 65.

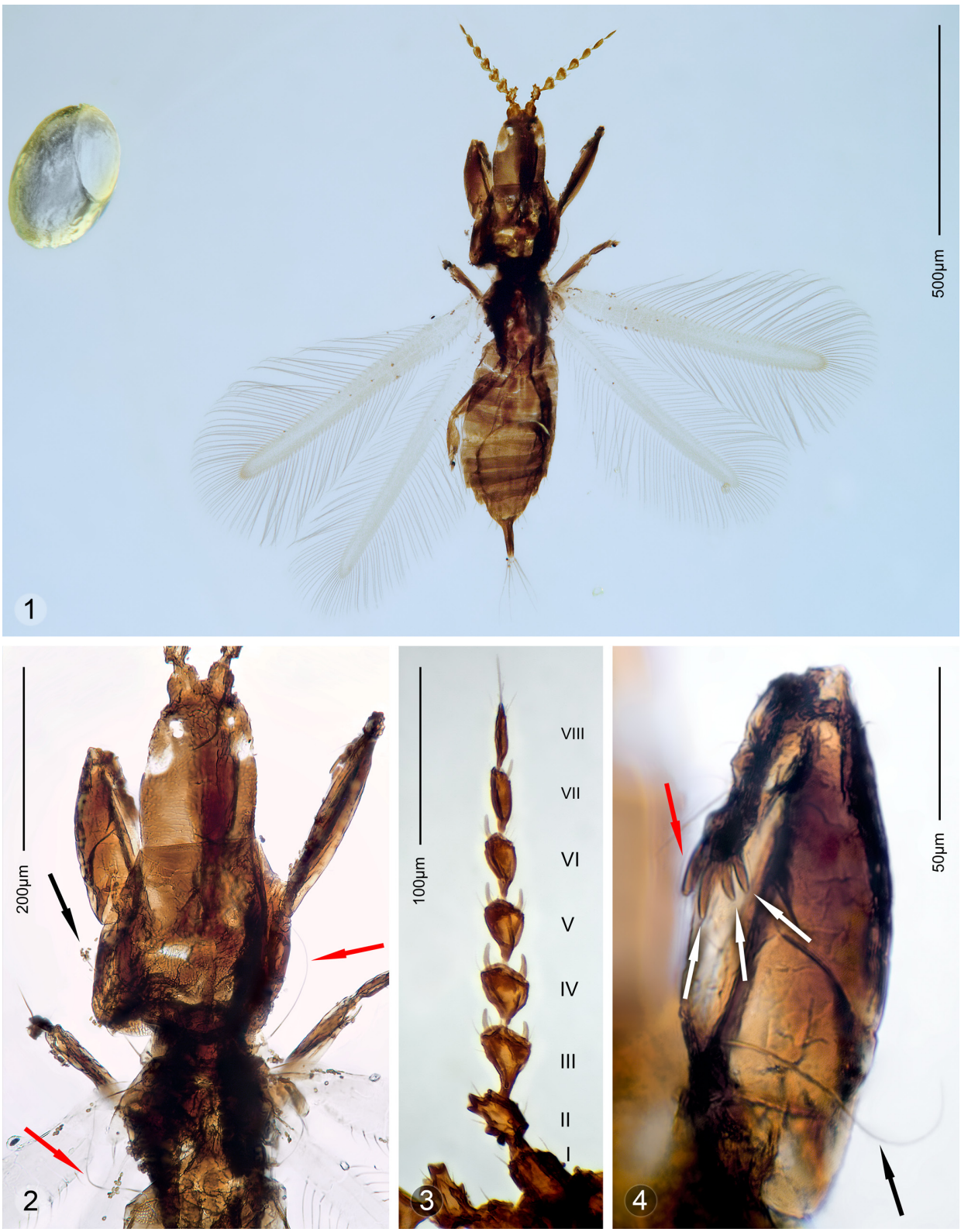
Specimen studied. Holotype female, inclusion in Dominican Miocene amber from the La Burca mine in the North of the Dominican Republic. Collection Ulitzka No. MU-Fos-83/1.

Syninclusions: One mite and parts of a fly (both not identified); small particles of plant detritus; numerous fungal spores attached to the thrips at its body, legs, and particularly at the base of the wings (Fig. 2).

Etymology. The species epithet *dominicus* refers to the country in which the amber deposit is located, the Dominican Republic.

Comparisons. The combination of the following character states makes the new species clearly associable with *Chiridurothrips*: (1) head elongate and projecting in front of the eyes, (2) tube long, (3) antennal segment II asymmetrically prolonged at inner apex, (4) fore wing without subbasal wing vein and subbasal wing setae, (5) fore tarsi with a large tarsal tooth and a hamus consisting of three discrete teeth. *Chiridurothrips dominicus* sp. n. differs from the type species *C. hisakoae* first of all in the distinctly smaller body size. Furthermore, setae s2 on tergite IX are much longer than s1 in the new species, whereas their length is subequal in *C. hisakoae*. In *C. dominicus* sp. n. the anal setae are much longer than

the tube, in *C. hisakoae* shorter. Regarding the fore wings, the number of duplicated cilia is much higher in *C. hisakoae* (30) than in the new species (6–7). Due to these features, *C. dominicus* sp. n. is clearly distinguishable from *C. hisakoae.* Moreover, according to zur Strassen (1973) fossils found in amber are generally not attributable to extant species. Species vary in the course of time and therefore each of them has only a limited period of existence.



FIGURES 1–4. *Chiridurothrips dominicus* **sp. n.** holotype female. **(1)** dorsal view; **(2)** head and thorax, indicated red: thoracic ventrolateral setae, black: clusters of fungal spores (others are visible at the legs and the wing base); **(3)** right antenna; **(4)** left fore leg, indicated black: femoral hair-like seta, red: tarsal tooth, white: *dentate pseudungius* **(**hamus consisting of three discrete teeth).

Conclusion.

The fossil *Chiridurothrips* from Dominican amber is an important find showing that members of this genus had retained their distinctive character states for at least 15 to 20 million years. This fact, as well as the occurrence of this genus in locations far away from each others –the Old World and the New World– indicate that its roots go back a long way. This result seem transferable to other Plectrothripini and reveals the monobasic extant genera of this tribe as relict lineages; it rejects the presumption that the striking autapomorphies of these thrips might be a result of an instability in the genes controlling morphogenetic processes (Mound & Ng 2018; see above). The presence of numerous fungal spores attached to the body, legs and wings of *C. dominicus* sp. n. (Fig. 2) allows the conclusion that this species was feeding on fungi, similar to extant members of Plectrothripini, and it probably also had lived in similar habitats.

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