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The fossil species *Merothrips dietrichi* (Schliephake) comb.n. redescribed and transferred from the genus *Heterothrips* (Thysanoptera)

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Identifying and describing fossil thrips (Thysanoptera) sometimes touches the limits of feasibility. Complications handling these tiny fossils are not only caused by their size, their position or fragmentary nature, but also by the state and condition of the matrices surrounding them. Due to poor preservation in some matrices (such as lime, potash and lignite) their identification often remains uncertain (Ulitzka 2015a). Amber, however, considered as a window on times past (Gröhn *et al.* 2015), presents a wide range of insect inclusions in excellent condition. Nevertheless, many problems can impede our visibility through this ‘window’. Fissures, opacity or clouding in the fossil resin, as well as inclusions or bubbles of air, can cover specific characteristics of an included specimen. Curvature of the amber surface results in optical distortions that can impede a reliable assessment of certain features, and the deeper an inclusion is in the amber the greater are the problems. For these reasons cutting or grinding the amber as close as possible to a specimen is essential. In the future, synchrotron X-ray microtomography may be an alternative (Henderickx *et al.* 2012; van de Kamp *et al.* 2014), but at present is too complex and expensive.

Many fossil thrips species have been described with crucial characteristics hardly assessable. Such problem species include *Anaphothrips fuscicaudus* Schliephake, *Heliothrips scudderi* Bagnall, *Phlaeothrips pohligi* von Schlechtendahl, *Physothrips succineus* Bagnall, among many others. Some species have been named according to their hidden condition, e.g. *Rhipidothripoides involvus* Schliephake “Derivation of the name: The specimen is coated with a white substance. Preservation: The inclusion is completely coated with a milky resin” ... “thus there is little possibility of taking exact measurements and comparing it with the type species” (Schliephake 2001). Problems also arise with collectors requesting that inclusions be described, and thus enhance the commercial value of their piece of amber, but refusing to permit the appropriate grinding and polishing. There are thus many problems in relating many named fossil thrips with a suitable biological taxon.

The holotype of *Heterothrips dietrichi* Schliephake, an inclusion in Baltic amber, was concealed dorsally by various particles hiding parts of the wings, and ventrally by an opacity and parts of an insect larva covering much of the abdomen, especially all distal abdominal sternites. Furthermore, the un-evenness of the amber impeded a clear assessment of antennal structure, resulting in the merothripoid characters remaining hidden. The amber piece has now been re-worked, and the specimen now presents all necessary requirements for taxonomic study, and permits its recognition as a species of *Merothrips*. Three other Merothripidae are known from Baltic Eocene amber: *Praemerothrips hoodi* Priesner, *M. fritschi* Priesner and *M. balticus* Ulitzka (ThripsWiki 2016). Each of these was based on a unique, and although the holotype of *balticus*, and the neotype of *hoodi* are available, the holotype of *fritschi* was lost during the turmoil of the Second World War. The objective of this paper is to redescribe *dietrichi* and to compare the four Merothripidae known from Eocene Amber (40–50 million years old).

The present study deals with an amber inclusion fossil that was collected by Burkhard Dietrich (formerly Collection Dietrich No. 28. 00332. 02), but was acquired by the first author in 2014, together with all thrips inclusions from Sarstedt in the Dietrich Collection. Syninclusions in the amber piece included a mite and some stellate hairs presumably from oak trees. The larva mentioned by Schliephake (2003) was present in fragments only. It was covering parts of the thrips, and was therefore removed by grinding the amber. To reach the necessary optical conditions, and to prevent decomposition or oxidation, the amber was conserved by embedding it in XOR-Crystal-Resin (cf. Ulitzka 2015a). Examination was carried out using 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 with transmission light

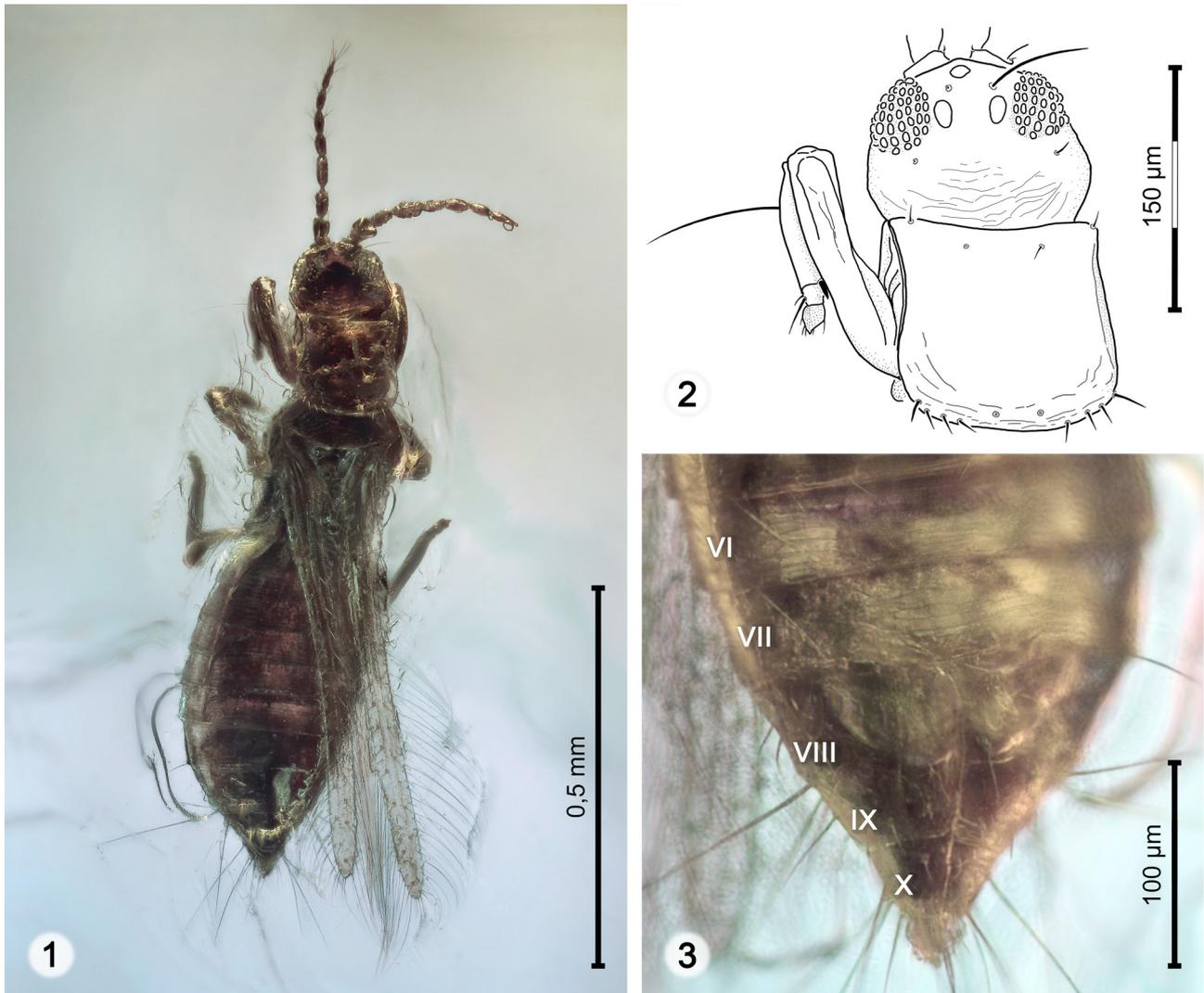
to get the inclusion in better contrast to the yellowish translucent amber. Images were taken with a digital camera attached to the microscope (Canon EOS 70d), and these were produced using Helicon Focus software. Nik Sharpener Pro and Adobe Photoshop CS3 were used for final colour adjustment and sharpening. Subsequently, details of the thrips inclusion were drawn using a Zeiss drawing tube attached to the microscope.

***Merothrips dietrichi* (Schliephake) comb.n.**

Heterothrips dietrichi Schliephake, 2003: 179.

Holotype female, inclusion in Baltic Eocene amber, found in a gravel pit near Sarstedt (Lower Saxony, Germany). Collection Ulitzka No. MU-Fos-44/1.

Description. Colour of body, head, legs and antennae uniformly light brown (Fig. 1).



FIGURES 1–3. *Merothrips dietrichi*, female. (1) dorsal view; (2) head, prothorax and left fore leg; (3) abdominal sternites VI–X.

Measurements (holotype female, in microns). Body length 832 (slightly contracted). Head, length 104; width 127. Eyes, length 44. Intercellar setae 64; postocular setae 16. Pronotum, length 120; basal width 135; anteroangular setae 20; anteromarginal setae 13; posteroangular setae 23; posteromarginal setae 14. Mesonotum, length 45; width 122. Metanotum not measurable due to the position of the wings. Mesothorax, largest width measured over the spiracles 173. Abdomen, length 430 (measured ventrally); largest width (segment V) 237; setae on tergite IX S1 134, S2 192, S3 96; axial setae of the trichobothria on tergite X 143, diameter of their sensoria 4. Antennae, length 256; length (width) of antennomeres I 20 (26), II 29 (23), III 39 (16), IV 42 (16), V 29 (14), VI 29 (13) VII 29 (13), VIII 39 (10). Fore wings, length 576; width in the middle 38. Fore tibiae (difficult to measure) about 78; dorsal seta 75. Middle tibiae 78; dorsal seta measurable only at the left, tip broken off at a length of 48. Hind tibiae 105; dorsal seta (hardly visible) about 70.

Head (Figs 1, 2). Wider than long, weakly sculptured on posterior half, produced in front of the compound eyes; with one pair of long ocellar setae arising outside the ocellar triangle (missing on the left) and one pair of major postocular setae lying well behind the eyes. Eyes not distended ventrally. Antennae with eight antennomeres (not nine, as mentioned in Schliephake [2003]); all segments clearly distinct from each other and bearing long setae; segments III and IV each with a transverse oval sensorium on apex (cf. Schliephake 2003, fig. 1).

Thorax. Prothorax (Figs 1, 2) longer than wide, slightly trapezoidal, with a pair of conspicuously curved longitudinal sutures laterally. Pronotum smooth, without any lines of sculpture; bearing one pair of anteroangular setae, one pair of anteromarginal setae arising well behind the anterior margin, one pair of posteroangular setae and three pairs of posteromarginal setae. Mesothorax much wider than prothorax, weakly sculptured. Fore wings narrow, with two longitudinal veins lying close together; first vein with a row of about 19, second vein with 16 setae (median setae are difficult to count due to reflections in the amber); wing surface without microtrichia; fringes straight; wing scale with a single seta distally. All tibiae bearing dorsally one long median seta; fore tibiae with a slender tubercle at inner apex (due to position of the legs difficult to assess). Tarsi with two tarsomeres; basal tarsomere of fore tarsi bearing one long apical seta on outer margin.

Abdomen. Tergites with transverse lines of sculpture; tergites IX and X with long setae; tergite X additionally with a pair of trichobothria, each bearing a conspicuously long axial seta. Sternites with faint lines of transverse sculpture, without discal setae; sternite VIII reduced to a pair of lobes on posterior margin of seventh sternite (Fig. 3), each lobe bearing two setae. Ovipositor reduced; hidden in the body, visible only at extreme tip.

Comments. This is the fourth species of Merothripidae found in Baltic Amber, and the third species of fossil *Merothrips* from the Tertiary Eocene. The original specimen of *M. fritschi* was lost during the Second World War, but the description by Priesner (1924) provides sufficient detail to distinguish it from *dietrichi*. The body of *M. fritschi* is longer and more slender but with conspicuously shorter antennae. The length and width of the head of *fritschi* are almost equal, but in *dietrichi* the head is much wider than long. Like most extant *Merothrips* species, the hind margin of the pronotum of *fritschi* and *dietrichi* bears only one pair of posteroangular setae, but these setae differ in length. The head of *balticus* is also longer than wide, but the body is similar in shape to that of *dietrichi*, although *balticus* bears two pairs of pronotal posteroangular setae, similar to the extant species *M. mirus* (Mound & O'Neill 1974).

Key to the species of Merothripidae from Baltic Eocene amber

1. Antennae 9-segmented; pronotum without any longer setae; apterous..... *Praemerothrips hoodi*
- Antennae 8-segmented, pronotum with 1 or 2 pairs of posteroangular setae; slender wings present with two longitudinal veins but without microtrichia (*Merothrips*) 2
2. Pronotum with 2 pairs of posteroangular setae; interior pair arising from minute cone shaped tubercles *M. balticus*
- Pronotum with one pair of posteroangular setae 3
3. Posteroangular setae length 43–52 microns; antennae 200 microns..... *M. fritschi*
- Posteroangular setae length 23 microns; antennae 256 microns..... *M. dietrichi*

Remarks. The original allocation of *dietrichi* to the genus *Heterothrips* appeared doubtful, even without studying the specimen. The antennal sensoria did not correspond, and all species of Heterothripidae have the antennae clearly 9-segmented. Moreover, it is probably relevant that all extant Heterothripidae are from the New World. Currently there remain four fossil Heterothripidae listed in ThripsWiki (2016), but the systematic position of each of these is equivocal. (1) *Electrothrips hystrix* Bagnall: “most of the specimen is obscured by fractures in the amber”, its antennae are not clearly visible (Mound 1968); (2) *Eocephalothrips capito* (Schlechtendahl): “the genus is based on an illustration of a fossil” (ThripsWiki 2016), “the text states that the median antennal segments are not clearly visible” (Mound 1968); (3) *Heterothrips nani* Schliephake: according to the author both sides of the specimen are covered with bubbles of air hiding its main characteristics, furthermore, the typical heterothripoid apical sensorial areas around antennal segments III and IV are not visible (Schliephake 2001); (4) *Protothrips speratus* Priesner: the author did not specify the holotype male necessarily as a Heterothripidae, but considered it as a representative of a new family within the superfamily Thripoidae. He proposed its taxonomic position as close to the heterothripids (Priesner 1924). The type specimen of *P. speratus* once was part of the Klebs and Fritsch Collections, which were associated with the former immense amber collection of the Albertus University of Königsberg, Prussia. Unfortunately, this collection was lost during the Second World War (Ulitzka 2015b), thus further studies on that species are not possible.

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