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An Aphid Identified with *Aphis transparens* Germar et Berendt, 1856, and Some Other Baltic Amber Aphids in German Collections

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With 1 Figure

At the kind request of Professor Dr. W. Hennig some pieces of Baltic amber with aphids have been handed over to me for examination and identification. The forwarded material consists of twelve aphids distributed over eleven pieces of amber. The aphids have been labelled C–1 to C–12, whereas A- and B-numbers refer to previously described amber aphid material from the Copenhagen Collection (Heie 1967) and the Berendt Collection in Berlin (Heie in press), respectively. Ten pieces with eleven aphids belong in the „Königsberger Bernstein-Sammlung", and one piece with one aphid (C–10) belongs in „Sammlung des Staatlichen Museum für Naturkunde in Stuttgart"[1]). Both collections are at present in the last-mentioned museum at Zweigstelle Ludwigsburg.

The material consists of six species, all of them previously described, viz. two species of *Mindarus* Koch and four species of *Germaraphis* Heie. These species are known from Baltic amber, only. The genus *Mindarus* have representatives in the Oligocene of North America (Florissant) and in present time, too.

This paper gives a list of these six species with descriptions of some of the specimens, especially of those belonging to the least known species, in order to illustrate the intraspecific variation. In particular one species, *Mindarus transparens*, is described in detail because no material has been identified with this species since it was originally described by Germar and Berendt in 1856. Previously the possibility could not be quite excluded that *Aphis transparens* Germar et Berendt and *Mindarus magnus* Baker actually one day might prove to be synonyms. In the present paper the reason for the conclusion that *transparens* and *magnus* are two separate, though closely allied species, is given on the basis of the finding in the Königsberg Collection of a specimen fitting the original description and drawing of *transparens*. This specimen is designated to serve as neotype of *transparens*, as the holotype most probably has gone lost; it has not been possible to find it among the amber aphids in the Berendt Collection in Berlin.

Acknowledgements

The writer wants to thank Professor Dr. W. Hennig very much for giving me opportunity of examining the present material, and lecturer cand. mag. H. J. Balle Hansen for criticism of the English translation.

[1] The specimens of the Königsberger Bernstein-Sammlung will be returned to the „Geologisch-Palaeontologisches Institut der Universität Göttingen" (Göttingen, Berliner Straße 28).

Mindarus magnus Baker, 1922

Lit.: Baker 1922, p. 353–358; Heie 1967, p. 35–38; Heie, in press.

The present material: Two alate individuals in two amber pieces:

C–1 (11 a): Well preserved specimen with wings covering the abdomen; occurring together with an apterous specimen of *Germaraphis dryoides* (C–11).

C–2 (9): Well preserved specimen at the very edge of a polished amber piece, with wings stretched out. Apex of one wing in a little piece of amber which is broken off.

Notes: With regard to appearance both specimens agree with the three specimens kept in the Copenhagen and Berendt collections, consequently with Baker's material,

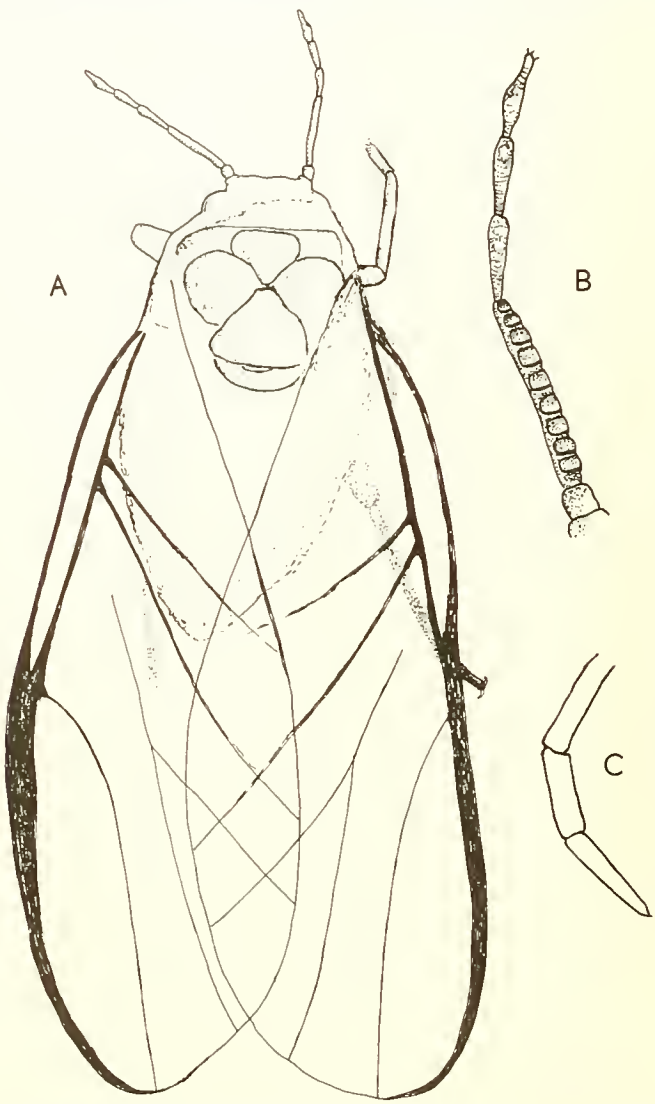

Fig. 1. *Mindarus transparens* (Germar et Berendt) (C-3, neotype). Alate specimen. A. Outline of body in a dorsal view. Length of fore wing 4 mm. B. Antenna. Length 1 mm. C. Ultimate part of rostrum. Same scale as B.

too. This consisted of two alate specimens, so a total of 7 alate specimens of this species have been found.

Mindarus transparens (Germar et Berendt, 1856)

Lit.: Germar et Berendt 1856, p. 7 *(Aphis tr.);* Heie 1967, p. 37–38.

The present material:

C–3 (10): One alate specimen, probably viviparous female, well preserved, wings covering body. Amber with many rupture lines. Body partly covered with milky substance. Neotype. Kept in the Königsberg Collection, at present in „Staatliches Museum für Naturkunde in Stuttgart" at Zweigstelle Ludwigsburg.

Description of the present material

Alate morph (fig. 1)

Body measuring 2,4 mm, but probably it has been longer, as abdomen seems to have shrivelled. Width of body at the anterior end of abdomen about 1,4 mm. Width of head across eyes 0,61 mm.

Frons nearly straight, with median furrow. Eyes large, protruding, globular, longitudinal diameter 0,16 mm. Antenna 1,06 mm long, accordingly shorter than half of the body length, 6-segmented; lengths of segments in mm: left antenna: I+II 0,16, III 0,39, IV 0,15, V 0,16, VIa 0,15, VIb 0,05; right antenna: III 0,37, IV 0,15, V 0,15, VIa 0,13, VIb 0,04 (fig. 1 B); IIIrd segment with about 10 transverse oval secondary rhinaria. Rostrum reaches a little past IIIrd coxae; milky substance conceals the basal parts, and as rostrum apparently lies in a curved position it may be longer than the 1,2 mm, found by measuring the visible apical part and the straight continuation through the milky substance to the base of the head; IIIrd segment 0,17 mm; apical segment 0,21 mm long, slender, pointed, basal width 0,04 mm (fig. 1 C). Fore wing 4,0 mm long, 1,5 mm wide; venation as usual in *Mindarus,* one media-fork (fig. 1 A). Hind wing not visible. The main vein and pterostigma of fore wings almost black. Measurements of legs in mm: middle tibia about 0,75, hind tibia about 1,05, fore tarsus 0,16, middle tarsus 0,18, hind tarsus 0,21, second segment of hind tarsus 0,19. Details on abdomen not visible.

Notes: The material has been identified with *Aphis transparens* on the basis of the original description and drawing in Germar et Berendt (1856). The size of the present specimen agrees with measurements calculated on the basis of the scale which accompanies the original illustration: body length about 2,2 mm, antenna about 0,9 mm, length and width of fore wing 4,0 and 1,5 mm. So it is larger than *M. magnus.* Regarding size of body and wing it even surpasses *M. scudderi* Buckton from Florissant.

The width of the head is shorter than shown in the original illustration, where it has probably been exaggerated (0,94 mm). The original description says that rostrum is only a little shorter than the body, but the abdomen may have shrivelled more in the type than in C–3, and it should also be remembered that rostrum in C–3 possibly lies in a curved position and, therefore, seems too short. The IIIrd antennal segment and processus terminalis are relatively longer in the original illustration than in C–3, but the drawing need not be relied upon in every detail. The description only tells that IV + V are shorter than III, which is also the case in C–3, and it is said that „VII" (= processus terminalis) is indistinct. As the type seems to have gone lost I designate the present specimen to serve as neotype.

The species deviates from *magnus* with regard to the following characters: 1) the considerable size; the length of the fore wing is 3 mm in *magnus* and 4 mm in *transparens;* 2) the short apical segment of rostrum; it is only as long as hind tarsus in *transparens,* but 1,3 times longer than hind tarsus in *magnus;* 3) the darker colour,

especially of the main vein and pterostigma. However, the resemblance to *magnus* is so great that they must be closely related. Presumably they are distinct species, may be successional species from different periods of the millions of years of the history of the amber forest. It is not improbable that they are subspecies, but as alatae in the recent *M. abietinus* Koch all belong to one generation it is improbable that the known specimens of *transparens* and *magnus* belong with the very same population judging from a comparison between the length of the fore wing in *transparens* and the average length of wing in the known specimens of *magnus*.

We know the wing length in six specimens of *magnus:* one specimen of Baker's 2,9 mm, A–1 and A–2 3 mm (cannot be given exactly, but equalized with 3,0 in the following calculation), B–7 3,1 mm, C–1 3,1 mm, C–2 2,8 mm. Though the sample is very small, N = 6, an estimate concerning the probability that C–3 belongs in the same population may be made, if the method for comparison of single specimens with the mean of small samples in Simpson et Roe (1939, p. 203–209) is followed.

The arithmetic mean, M, is 3,0, the standard deviation is 0,12. The difference between the wing length of *transparens* (4,0 mm) and M is 1,0 mm, so this difference divided by the standard deviation is 8,3, which according to table VI in Simpson et Roe (l. c., p. 206) is significant, as then the probability is much below 0,01.

Germaraphis baltica Heie, 1967

Lit.: Heie 1967, p. 70–73.

The present material:

C–4 (33032, 3): Apterous aphid, probably immature, in little piece of amber mounted on glass slide.

Notes: The specimen closely fits in with the original decription based on seven specimens in the Copenhagen Collection.

Germaraphis defuncta Heie, 1967

Lit.: Heie 1967, p. 67–68.

The present material: Two apterous specimens, probably immature, in two pieces of amber mounted in balsam on glass slides.

C–5 (33017, 2): Easy to examine.

C–6 (7): The frontal part of the head is lacking. Stellate hairs present.

Notes: The specimens are of about the same size as the type in the Copenhagen Collection (A–61). They only differ from the type with regard to one character, viz. the length of the apical rostral segment. It is 0,19 mm long in the type, apparently only 0,13 and 0,12 mm long in C–5 and C–6, respectively, but the measurements may be incorrect as it has not been possible to place them in a position quite parallel to the microscope table.

As only one specimen of this species has been known previously, short descriptions with some measurements in mm are given below.

C–5: Body 0,57 long, 0,26 wide. Width of head about 0,18. Margin (carina) developed like in emaciated aphids. Dorsum with six rows of faceted wax gland plates. Small eyes. Antenna 0,29 mm long, 4–segmented; lengths of segments: I about 0,02, II 0,04, III 0,13, IV 0,10. Rostrum about 0,6 long, protruding about 0,2 behind the rear end of abdomen; apical segment oblong, pointed, 0,02 wide at base, and apparently only 0,13 mm long, probably a little longer; IIIrd rostral segment about 0,07; 1st rostral segment does not reach IIIrd coxae. Fore femur 0,14, fore tibia 0,12, hind tibia 0,17, tarsi 0,07. Legs very shorthaired.

C–6: Body about 0,57 long, 0,29 wide. Antenna about 0,29 long; 4 segments in the left antenna (III 0,12, IV 0,10), 5 in the right one (III 0,06, IV 0,07, V 0,10). Rostrum protrudes about 0,2 at the rear end; apical segment apparently only 0,12 long, slender and pointed; IIIrd rostral segment 0,08. Hind femur about 0,15, hind tibia 0,19, hind tarsus 0,08.

Germaraphis dryoides (Germar et Berendt, 1856)

Lit. GERMAR et BERENDT 1856, p. 4–5 *(Lachnus dr.);* HEIE 1967, p. 51–63; HEIE, in press.

The present material: Five apterous specimens in five pieces of amber, probably immature.

C–7 (33001, 1): Easy to examine. Mounted on glass slide.

C–8 (8): A little difficult to examine, because the amber has many fissures.

C–9 (33057, 5): Part of the dorsal skin is lacking. Stellate hairs present. The amber piece mounted on glass slide.

C–10: The amber contains three other insects and many impurities.

C–11 (11): Presumably younger instar than the others. It lies in the same piece of amber as C–1, an alate *Mindarus magnus*, behind it and under its wings. Can only be studied from above. The rear end directed against the rear end of C–1.

Notes: The present specimens agree with previous descriptions of *dryoides*. Body length ranges from 0,7 to 1,2 mm.

The youngest specimen, C–11, through its occurrence together with *M. magnus* and its morphology gives doubtful evidence that *G. dryoides* and *M. magnus* are synonyms, so it ought to be described more closely: Body 0,75 mm long, body width 0,33 mm, width of head across eyes 0,23 mm. Head and prothorax fused. Dorsum with 6 rows of faceted wax gland plates. Eye apparently with three ommatidia only. Antenna 0,3 mm long, 5–segmented; lengths of segments in mm: I 0,02, II 0,04, III 0,06, IV 0,05, Va 0,08, Vb 0,04. Rostrum protrudes 0,50 mm behind the abdomen; IIIrd segment 0,12 mm, apical segment 0,20 mm long (lies in a somewhat oblique position) and slender. Tibiae with rather few, but long, pointed, thin bristles; tarsus with two long, pointed claws; some measurements in mm: fore tibia 0,15, middle tibia 0,19, hind tibia 0,23, middle tarsus 0,08, hind tarsus 0,08; bristles that are supposed to be empodial setae are as long as or a little longer than the claws and faintly capitate.

From this description it appears that C–11 belongs to the species *G. dryoides*, especially the age group „Old larvae with 5–segmented antennae". It resembles for instance very much specimen no. A–35 in the Copenhagen Collection regarding measurements of body, head, antennae, and rostrum.

A certain probability also exists that C–11 belongs to the species *Mindarus magnus*, partly because it occurs in the same piece of amber as an alate *magnus*, and partly because of similarity regarding the shape and the size of the apical rostral segment.

Germaraphis has been placed in the family Thelaxidae, subfamily Thelaxinae, tribe Phloeomyzini, which stands close to tribe Mindarini. It has been described as a heterogeneous genus some species of which may be more closely allied with *Stegophylla* Oestl. or with *Mindarus* Koch than with *Phloeomyzus* Horv. (HEIE 1967, p. 50). BAKER (1922) proposed the supposition that *dryoides* belongs with the genus *Mindarus*. Another evidence for *dryoides* and *magnus* being conspecific is the lack of findings of alate *dryoides* and apterous *magnus* though 67 apterous specimens of *dryoides* and 7 alate specimens of *magnus* have been found until now. No other amber aphid species with more apterous and alate specimens, respectively, occur.

Maybe more kinds of evidence will appear in the future so that we shall be forced to consider these two names as synonyms, but until further notice the writer prefers to maintain them as names of two species distributed over two genera. No. C–11 lies close to the abdomen of no. C–1, but it is impossible to take it for being a newborn larva of C–1. Neither does it lie in the natural position at birth, nor is it small enough. Smaller specimens of *dryoides* are known from the Copenhagen Collection, e. g. A–45, who is only 0,37 mm long and has 3 or 4 antennal segments, only. Furthermore, only few similarities can be seen between large apterous specimens of *dryoides* and alate specimens of *magnus*. The considerable length of the rostrum so characteristic to the genus *Germaraphis*, especially the prolongation of the basal segment, cannot be stated in *Mindarus*. About 1,5 mm long specimens of *dryoides* have a 1,8 mm long rostrum, whereas about 2 mm long specimens of *magnus* have an only 1,3 mm long rostrum. It may be guessed that they represent two generations of one species, the apterae of which are especially adapted for living on tree trunks and thick branches, but a corresponding difference is not known in extant species of *Mindarus*.

Germaraphis henningseni Heie, 1967

Lit.: Heie 1967, p. 73–75.

The present material:

C–12 (33049, 4): Apterous aphid in small piece of amber mounted on glass slide. Fine lines in the hyaline amber show how it bent and stretched out fore and middle legs while in death struggle.

Notes: The specimen is a little smaller than the type in the Copenhagen Collection (A–74), and as the type is the only previously known specimen, and as C–12 is a little different, e. g. by having four, not five antennal segments, a short description of C–12 is given below.

Body 0,42 mm long, 0,19 mm wide. Width of head 0,14 mm. Eyes apparently with 3 ommatidia. Antenna 0,21 mm long, 4–segmented, about equally thick from base to apex, shorthaired; lengths of segments in mm: I 0,02, II 0,02, III 0,10, IV 0,07; processus terminalis short and thick. Rostrum about 0,23 mm long, reaching to the middle of abdomen; apical segment triangular, about 0,03 mm long; IIIrd segment thicker than IInd and IVth segments, about 0,04 mm long; IInd segment very thin. Legs shorthaired. Middle tibia 0,09 mm long, hind tibia 0,11, hind tarsus 0,04.

Summary

A material consisting of 12 fossil aphids in 11 pieces of Baltic amber from the „Königsberger Bernstein-Sammlung“ and „Sammlung des Staatlichen Museum für Naturkunde in Stuttgart“, kept in the last-mentioned museum at Zweigstelle Ludwigsburg, has been identified with 6 previously described amber aphids: *Mindarus magnus* (2 alate specimens), *M. transparens* (1 alate specimen), *Germaraphis baltica* (1 apterous specimen), *G. defuncta* (2 apterous specimens), *G. dryoides* (5 apterous specimens), and *G. henningseni* (1 apterous specimen).

Mindarus transparens has not been refound since the original description appeared in 1856, and the present specimen has been designated to serve as neotype. It deviates from *magnus* in being considerably larger (length of fore wing 3 mm in *magnus* and 4 mm in *transparens)* and in having a shorter apical rostral segment.

The material of *Germaraphis defuncta* and *G. henningseni* gives information about the individual variation and variation due to different age with regard to certain characters in these two species previously only known through single individuals.

One specimen of *G. dryoides* occurs together with an alate *M. magnus* in one piece of amber, and as certain morphological similarities exist between them the possibility is discussed if *dryoides* and *magnus* are synonyms which is denied on the basis of our present experience.

Zusammenfassung

Ein Material, das aus 12 fossilen Blattläusen in 11 Stücken von Baltischem Bernstein aus der „Königsberger Bernstein-Sammlung" und der „Sammlung des Staatlichen Museum für Naturkunde in Stuttgart" besteht und in dem letztgenannten Museum in Zweigstelle Ludwigsburg aufbewahrt ist, ist mit 6 früher beschriebenen Bernstein-Blattläusen identifiziert worden: *Mindarus magnus* (2 geflügelte Exemplare), *M. transparens* (1 gefl. Ex.), *Germaraphis baltica* (1 ungefl. Ex.), *G. defuncta* (2 ungefl. Ex.), *G. dryoides* (5 ungefl. Ex.) und *G. henningseni* (1 ungefl. Ex.).

Mindarus transparens ist nicht wieder gefunden worden seit der Publikation der Originalbeschreibung 1856, und das gefundene Exemplar ist als Neotypus erwählt. Es weicht von *magnus*, was seine bedeutende Größe anbelangt, ab. Die Länge des Vorderflügels ist bei *magnus* 3 mm, bei *transparens* 4 mm. Ferner ist das Endglied des Rostrums kürzer als bei *magnus*.

Die Funde von *G. defuncta* und *G. henningseni* geben Information über die individuelle Variation und die Variation zwischen verschiedenen Altersstufen bei diesen Arten, von denen bisher nur Einzelexemplare bekannt gewesen sind.

Das eine Exemplar von *G. dryoides* kommt in demselben Bernstein-Stück wie ein geflügelter *M. magnus* vor, und da sich gewisse morphologische Ähnlichkeiten zwischen ihnen erkennen lassen, wird die Möglichkeit, daß *dryoides* und *magnus* vielleicht Synonyme sein können, diskutiert. Diese Möglichkeit muß mit unserem gegenwärtigen Wissen verworfen werden.

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