

# LOWER EOCENE APHIDS (INSECTA) FROM DENMARK

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HEIE, O. E.: Lower Eocene aphids (Insecta) from Denmark. *Bull. geol. Soc. Denmark*, vol. 20, pp. 162-168. Copenhagen, November, 12 th, 1970.

Nine alate aphids have been found until now in the Danish diatomaceous earth from Lower Eocene, viz. *Siphonophoroides breineri* Heie (3 specimens), *S. magnalata* Heie (1 specimen), both belonging in Cal-laphididae, *Diatomyzus eocaenicus* n. gen. et n. sp. (3 specimens, two of them doubtful, however), belonging in Aphididae, and Aphidoidea spp. (2 unidentifiable specimens). Six of the finds are new and are described in the present paper. Additional notes to the description of the type specimen of *S. magnalata* are given on the basis of the recently discovered counterpart.

Few aphids have been found as fossils in the Danish Eocene diatomaceous earth at the Limfjord in North-Jutland until now. There may be climatic reasons for their small number. From the knowledge of the fossil fauna of other insect groups in the Danish diatomaceous earth it has been deduced that the climate was tropical or nearly tropical in Denmark during Lower Eocene (Henriksen 1922). The number of aphid species in the tropical regions of the present day is rather small. Most species occur in the temperate zone of the northern hemisphere today. Aphids, as a rule, are adapted to climates with considerable seasonal variations by having alternation between several parthenogenetic female-generations in the summer and an autumnal generation of males and females producing fertilised eggs, which survive the winter.

Consequently it could not be expected that a rich diversity of aphid species be found among the fossil insects of the diatomaceous earth. Add to this the small size and the fragile constitution of aphids, and their infrequency will seem quite comprehensible.

Previously three finds have been recorded (Heie 1967, pp. 197-200), viz. two specimens belonging in species within the genus *Siphonophoroides* Buckton (described from Oligocene deposits in North America), *S. breineri* Heie (M-1) and *S. magnalata* Heie (M-3), and one unidentifiable aphid (M-2), all of them alate.

Later on further six alate specimens, all of them occurring in cement stone (lime concretions), have been discovered in the collection of fossils in diato-

maceous earth belonging to the Mineralogical Museum of the University of Copenhagen, which recently have been gone through and classified by Dr. S. G. Larsson. These six specimens have been sent to me.

One specimen has been referred to a new species described below, *Diatomyzus eocaenicus* nov. gen. et nov. sp., and two others occurring in the same piece of cement stone are with some doubt identified with the same species. Two specimens are identified with *S. breineri*. The sixth fossil aphid is unidentifiable.

Finally the counterpart of the plate with the type of *S. magnalata* has now emerged from the collection of the Fur Museum making it possible to add some information on the morphology of this species.

### *Diatomyzus eocaenicus* n. gen. et n. sp.

Derivation of name: The name of the genus is compounded of diatom (from the diatomaceous earth) and *Myzus* (a recent aphid genus within Aphididae).

#### Diagnosis of genus

Radial sector of the fore wing rather long and straight, leaves the middle of the pterostigma. Media with two forks. Cubital branches separated, but rather close to each other. Antennae probably about as long as body. Siphunculi well developed, almost cylindrical, of medium length, with flange. Cauda tongue-shaped, a little constricted near base, the distal part almost globular. Abdomen with marginal sclerites.

Typus generis: *Diatomyzus eocaenicus* n. sp. (fossil).

#### Description of species

##### Alate morph

The holotype of this species is the specimen labelled »4« on the largest of the three pieces of cement stone labelled »M-4-5-6. Eocen. M b 570, str. cementsten (that is: »the striated cement stone«, ash layer ÷ 28 - ÷ 24), Knude Klint Ø. 9/7-52« (fig. 1). Knude Klint is located on the island of Fur in the Limfjord north of the Salling peninsula. The type specimen is kept in the Mineralogical Museum, Copenhagen, together with the other specimens dealt with in the present paper.

The body lies between other fossil insects in a peculiar position, the wings partly distorted, partly turned around and placed in front of the body. The head is missing. Close to this aphid (»4«) are two other aphids situated, »5« and »6«, on each side.

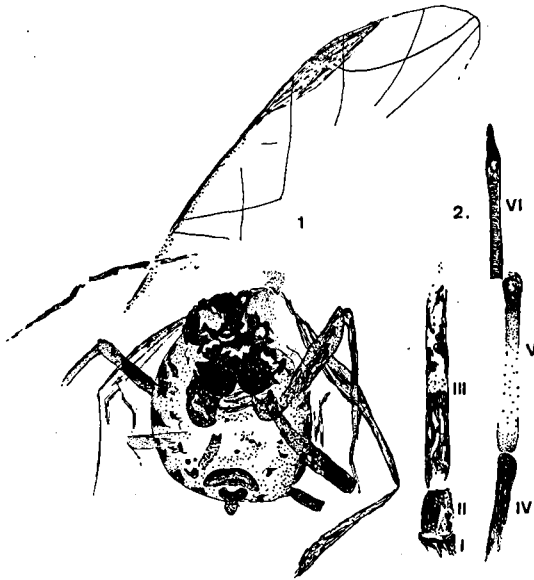


Fig. 1. *Diatomyzus eoacaenicus* n. gen. et n. sp. Body and wings of the holotype specimen ( $\times 4$  in  $\blacktriangleright$ M-4-5-6 $\blacktriangleleft$ ). One fore wing is turned around and placed in a wrong position in front of the body. Length of fore wing about 3 mm.

Fig. 2. Antenna of alate aphid identified with *Diatomyzus eoacaenicus* with some doubt ( $\times 5$  in  $\blacktriangleright$ M-4-5-6 $\blacktriangleleft$ ). The magnification bigger than in fig. 1, the length of the VIth antennal segment being 0.37 mm. The distal part of III and the basal part of IV are probably missing.

The preserved part of the body (thorax and abdomen) 1.45 mm long, the total body length probably close to 2 mm. Abdomen 1.07 mm wide. Part of one antenna, about 1.3 mm, is visible; the IIIrd segment is about 0.50 mm long, diameter 0.05 mm in the middle; rhinaria not visible. Eyes and rostrum cannot be seen. Thorax dark brown. Fore wing about 3 mm long, cannot be seen in its entirety because it is folded (fig. 3 shows a reconstruction). Media with two forks. Radial sector goes from the middle of pterostigma; it is rather long, but not as long as in *Siphonophoroides*. Little of the legs preserved; they have been rather long; hind femur about 0.85 mm long, 0.10 mm thick in the middle, tarsi not visible. Abdomen pale, with dark marginal sclerites and a couple of dark transverse bands on the posterior part (see fig. 1), possibly anal plate and genital plate on the ventral body wall. Marginal spots, roundish, pale, diameter about 0.03 mm, are visible on some segments, e.g. VI and VII (fig. 6 A), may be spiracles. The possibility cannot be excluded that marginal tubercles are present. Siphunculus (fig. 5 A) visible in both sides, 0.23 mm long, dark, almost cylindrical, with weakly developed

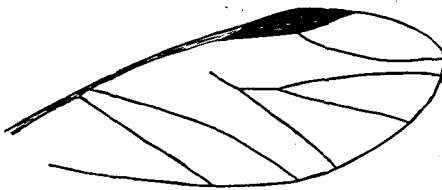


Fig. 3. Reconstruction of fore wing of *Diatomyzus eoacaenicus* n. gen. et n. sp. ( $\times 4$  in  $\blacktriangleright$ M-4-5-6 $\blacktriangleleft$ ).

flange; diameter of aperture 0.06 mm, of siphunculus in the middle 0.08, at base 0.06, consequently a little constricted at base and faintly swollen. The siphunculus in the left side of the fossil is rather difficult to see, probably because the aphid is viewed from the underside, so that the body covers this (actually the right) siphunculus, which has been turned around, now pointing forward. Cauda (fig. 4 A) tongue-shaped, paler, 0.10 mm long, 0.08 mm wide, a little constricted at base, the distal part being nearly globular.

#### Additional specimens

The other two alate specimens (»5« and »6«) in the same piece of cement stone are with some doubt identified with *D. eocaenicus*, but not included in the type material. The specimen »6« does not show morphological details sufficient for certain identification. On »5« are seen several characters similar to characters in »4«: Body length only a little longer, 2.3 mm; length of hind femur about 0.85 mm; length of the preserved part of IIIrd antennal segment 0.44 mm, diameter in the middle 0.055 mm; abdomen pale with dark marginal sclerites. The body lies in a distorted position, and some characters upon which the identification with *D. eocaenicus* ought to be based are not visible, viz. the siphunculi, the cauda, and the venation of the fore wing. On the other hand it is possible to see details not visible in »4«, especially morphological details of head and antennae: Frons a little convex, almost straight; 1.76 mm of one antenna preserved, but there is a disconnection between the 0.71 mm long basal part (fig. 2 left) and the 1.05 mm long distal part (fig. 2 right), so the antenna has perhaps been 2 mm long or a little longer; lengths of segments in mm: I about 0.14, II 0.13, III at least 0.44, IV at least 0.27, V 0.41, VIa 0.30, VIb 0.07; VIa continues gradually into VIb; VIth segment with fine transverse lines; indications of primary rhinaria on V and VI, but secondary rhinaria not visible.

#### Taxonomic notes

The venation of the fore wing and especially the shape of the siphunculus and the cauda make the belonging of *Diatomyzus* in Aphididae s. str. (sensu Börner) probable. On account of the bad condition of the type specimen it is difficult to decide to what group within this family *Diatomyzus* is more closely related, especially because the shape of the frons and the morphology of the antenna cannot be seen. Resemblance to the genera *Paducia* Hottes & Frison, *Pterocomma* Buckton, and *Rhopalosiphum* Koch, which are so distinct from each other, may be superficial (figs 4–6).

The long radial sector and the combination of characters make probable that it belongs in an extinct, previously unknown tribe. If specimen »5« is conspecific with the type specimen »4«, and this is somewhat doubtful, then

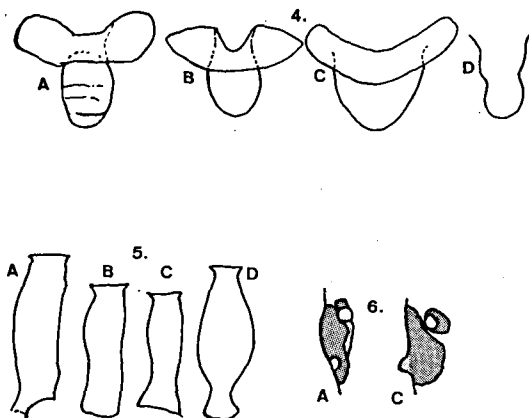


Fig. 4-5. Cauda (with anal plate) (4.) and siphunculus (5.) of A: *Diatomyzus*, B: *Rhopalosiphum* (*insertum* and *maidis*), C: *Pterocomma* (*konoii*), and D: *Paducia* (*antennata*). Setae and other details not visible in the fossil *Diatomyzus* are omitted in the drawings of the recent genera. (*Paducia* drawn on the basis of Hottes & Frison, 1931; anal plate not drawn).

Fig. 6. Marginal abdominal sclerite in outline of A: *Diatomyzus* and C: *Pterocomma*.

the shape of the Vth antennal segment, such as it appears in »5«, in combination with the siphunculus and the cauda, such as they appear in »4«, makes it still more difficult to place the genus close to any known genus within Aphididae, for the antenna in »5« is more like antennae in some Callaphididae and obviously primitive in relation to modern representatives of Aphididae (with the subfamilies Pterocommatinae and Aphidinae).

The family Aphididae, which today is richer in species than any other family within Aphidoidea, has never been established in deposits older than the Pliocene (Heie, 1968).

#### Additional finds of *Siphonophoroides breineri* Heie

1) One alate aphid in cement stone labelled »M-7. 1954. 49-50. Ertebølle. I. P. Andersen. Niveau 15-16. 19/5 1934«. Ertebølle is located in Himmerland at the Limfjord.

This specimen, with body length 3.31 mm, shows some characters not being visible in the holotype, viz. the shape of the head, the length of the hind wing, and the shape of the siphunculus. Width of head 0.63 mm; frons straight; large compound eyes visible in outline, longitudinal diameter about 0.17 mm; lengths of antennal segments in mm: I 0.15, II 0.13, part of III 0.73, which is rugged and apparently with 10 transverse oval secondary rhinaria; fore wing 5.9 × about 2.0 mm, hind wing about 2.4 mm long; siphunculus short, truncate, about 0.21 mm long, diameter 0.29 at base, 0.21 in the middle, and 0.13 at apex.

2) One alate specimen in two counterparts labelled »M-8. Skarrethage. Coll. Walter Kühne. 1938. 63«. Skarrethage is located on the island of Mors in the Limfjord.

This specimen is smaller than the holotype (fore wing only 4.6 mm long), but it resembles the type as well as M-7 mentioned above.

## Aphidoidea gen. sp.

One alate aphid in cement stone labelled »M-9. 397 c. 1954. Junget N.«. Junget is located on the Salling peninsula north of Skive.

It is badly preserved and unidentifiable. Body length almost 3 mm. May be *Siphonophoroides breineri*, but too few details are visible.

Additions to the description of *Siphonophoroides magnalata* Heie

Recently Dr. S. G. Larsson discovered in Fur Museum an alate aphid in a piece of cement stone labelled »891 – Knudeklint Vest »E« 18/9 1960«. Dr. Larsson and Mr. M. Breiner Jensen, Fur Museum, most kindly handed the fossil over to me for identification and description. It is now kept in the Mineralogical Museum, Copenhagen.

This is the counterpart of the fossil described as *S. magnalata* Heie, 1967 (M-3, p. 199). The number »M-3a« has been added to the label. It shows several details not visible on the plate described in 1967 (fig. 7). The total body length is about 5 mm, when the missing head is included, and the abdomen is not shrivelled as in the fossil state. Fore wing about 7 × about 2.6 mm; hind wing relatively short, about 2.7 × about 0.9 mm, with two oblique veins. Siphunculus truncate, apparently with flange (visible in the right side), 0.21 mm long, diameter 0.31–0.33 at base, 0.12–0.14 of aperture.



Fig. 7. *Siphonophoroides magnalata* Heie. The counterpart (M-3a) of the fossil (M-3) described in Heie, 1967, p. 199, the holotype. Length of fore wing 7 mm. A = antenna, F = fore leg, H = the oblique veins of the hind wing, S = siphunculus.

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## Dansk sammendrag

Der gøres rede for seks nye fund af bladlus-fossiler fra Nedre Eocæn i cementsten fra det danske molér. En af disse bladlus beskrives som *Diatomyzus eocaenicus* n. gen. et n. sp. og henføres til familien Aphididae, der hidtil kun er kendt tilbage til Pliocæn, men i nutiden er den artsrigeste af bladlusfamilierne. To andre eksemplarer henføres med nogen tvivl til samme art. To af bladlusene er bestemt til *Siphonophoroides breineri* Heie, hvoraf hidtil kun et eksemplar har været kendt, ligeledes fra moléret. Denne art hører til familien Callaphididae. Det sjette fossilfund er ubestemmeligt.

Modpladen til den forstening, der tidligere er beskrevet som *Siphonophoroides magnalata* Heie, er for nylig blevet fundet og beskrives i det foreliggende arbejde, fordi der på den kan ses adskillige morfologiske detaljer, som ikke er synlige på den først fundne plade.

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## References

- Heie, O. E. 1967: Studies on fossil aphids (Homoptera: Aphidoidea), especially in the Copenhagen Collection of fossils in Baltic amber. *Spolia Zool. Musei Hauniensis* 26, 1-274. Copenhagen.
- Heie, O. E. 1968: Pliocene aphids from Willershausen (Homoptera: Aphidoidea). *Beih. Ber. Naturhist. Ges.* 6, 25-40 Hannover.
- Henriksen, K. L. 1922: Eocene insects from Denmark. *Danmarks geologiske Undersøgelse, Række 2*, 37, 36 pp. Copenhagen.
- Hottes, F. C. & Frison, T. H. 1931: *The plant lice, or Aphidae, of Illinois*, 447 pp. Urbana, Ill.