First record of gall midge larvae (Diptera, Cecidomyiidae) feeding on springtails (Collembola)

ARNE FJELLBERG

Fjellberg, A. 2024. First record of gall midge larvae (Diptera, Cecidomyiidae) feeding on springtails (Collembola). *Norwegian Journal of Entomology* 71, 235–237.

Two specimens of soil living predaceous gall midge larvae (tribus Lestodiplosini, species unidentified) from Finnmark, North Norway, were barcoded and gave full match with two Collembola species, *Lepidocyrtus lignorum* and *Tomocerina minuta*. Blue granular matrix in the larval intestine is interpreted as pigments from the prey. A prolonged snout-like mouth with mandibles formed as long stylets probably reflects the hunting mode of the larva, although no direct observation of the latter is made.

Key words: Gall midges, *Lestodiplosis*, predation, soil, Collembola.

Arne Fjellberg, Mågerøveien 168, N-3145 Tjøme, Norway. E-mail: arnecoll@gmail.com

Introduction

Gall midges of the family Cecidomyiidae are mostly gall makers on plants. Members of the tribus Lestodiplosini are generally active predators on other gall midge larvae, aphids and other Homptera, gall mites, and even as endoparasitoids on psyllids. Within the large genus *Lestodiplosis*, still in a systematically unsatisfactory condition, there is even a speies living as ectoparasitoid on the myriapod *Polyxenus lagurus* (Linnaeus, 1758) (Mamaev & Krivosheina 1993). Larvae of the *Lestodiplosis*-type are reglarly found in soil samples, although in low numbers. Hardly anything is known abouth their function in the terrestrial ecosystem.

Material and methods

During the years 2021–2024 soil samples were collected from various vegetation types in eastern Finnmark for the purpose of increasing the knowlede of soil fauna in subarctic North Norway. Samples were extracted with modifed Tullgren funnels, using 80% ethanol as a preservative. Although gall midges were not a target group of the project, our attention was drawn to a particular larval type of general *Lestodiplosis* habitus, but with exceptionally prolonged mouth parts. Specimens were made transparent in lactoglycerol and studied in microscopic slides, revealing a bluish gray matrix in the intestine which must have come from ingested food (Figure 1). The colour of the gut content resembled the type of pigment often seen in springtails. Two larvae of the same morphotype (gut content not checked) were sequenced in order to demonstrate a possible systematic relationship to other groups of *Lestodiplosis* s. lat.

Origin of the specimens: FØ, Sør-Varanger, Gjøkåsen, 69.15780°N, 29.20745°E, 5 October 2023, pine forest litter, 77 m asl., leg. J.M.Vuolteenaho.

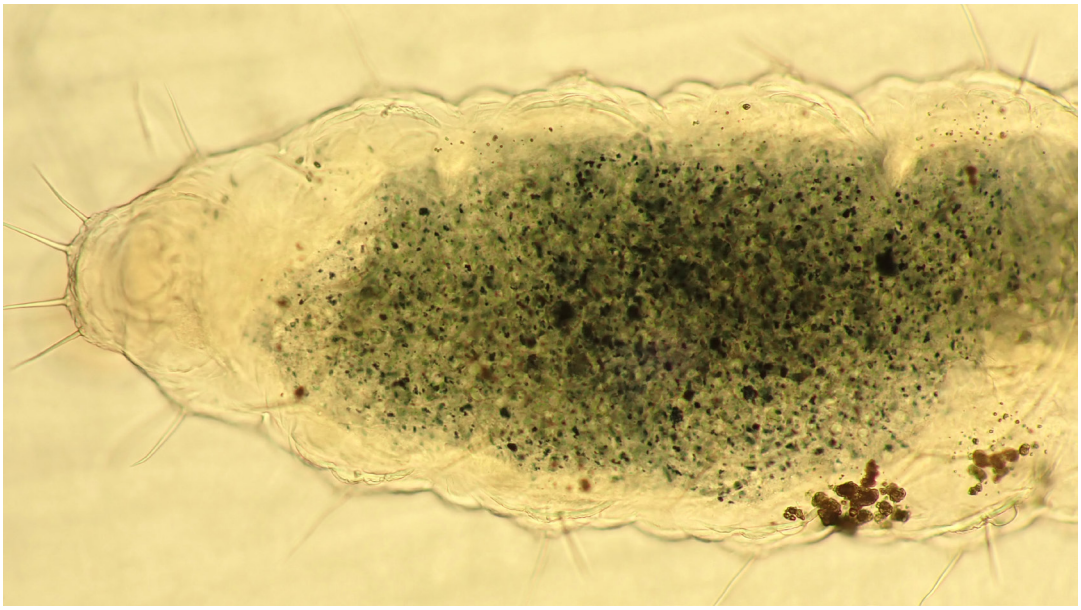

FIGURE 1. Posterior end of gall midge larva (cleared in lactoglycerol) showing bluish-grey gut content from ingested prey, probably a springtail.

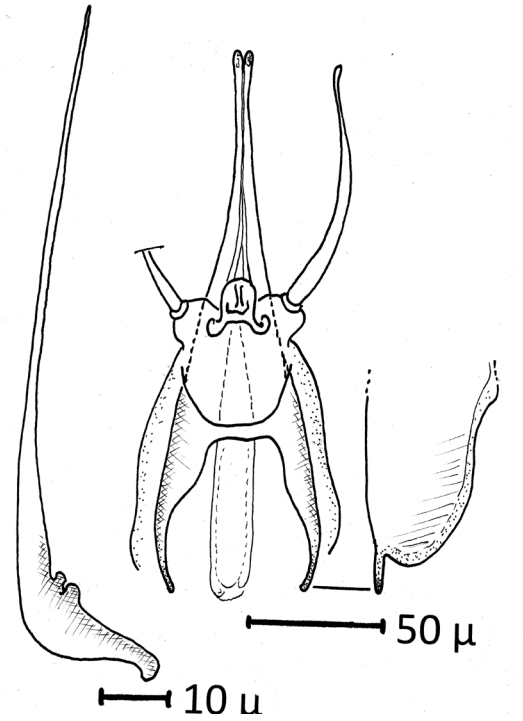

FIGURE 2. Skeletal elements of head capsule of gall midge larva. Prolonged posterior tentorial arm in sideview to the right, enlarged left mandible to the left.

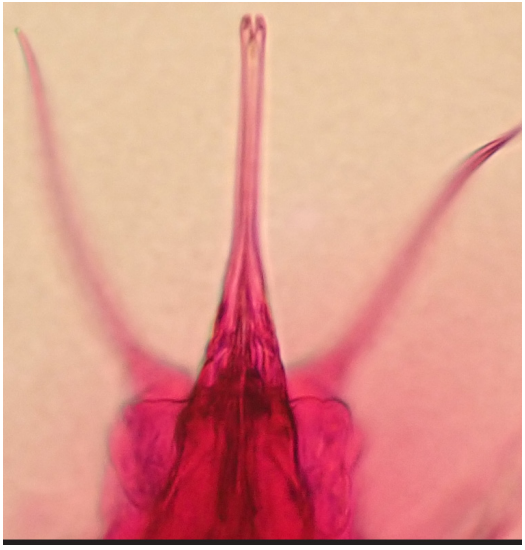

FIGURE 3. Head capsule of larva with prolonged mouthparts (slide specimen in lactoglycerol, stained with fuchsin).

Results and discussion

The barcodes from the sequencing (BOLD refs.: NOCEC347-24, NOCEC348-24) provided no matches from Cecidomyiidae, probably due to mixed genetic material from ingested prey. However, the one specimen gave a full match on the springtail *Lepidocyrtus lignorum* (Fabricius, 1793), the other on *Tomocerina minuta* (Tullberg, 1876), both being common in the locality. A literature search gave no indications that springtails have ever been recorded as part of the gall midge diet. The observations from Finnmark thus give new insight into the role and function of gall midges and springtails in the soil ecosystem.

The actual gall midge larvae possess an exceptionally prolonged mouth cone with stylet-like mandibles inside tubular sheets probably representing the labial part of he cephalic folds (Figures 2, 3). The antennae are curved downwards, the snout-like mouthparts upwards. The springtails that had been preyed upon are highly mobile forms. How the gall midge larvae approach and get hold on the springtails still has to be demonstrated in situ – which we hope to do once live larvae have been collected. Wehrmeister (1924, figure 22) has figured a *Lestodiplosis* larva collected in moss from wet meadows at Greifswald, Germany, with a head very similar to our larvae. He suggested it was feeding on aphids, without providing evidence for this. Also Baylac (1987) has figured the head of a gall midge larva (from a slide in the collections of British Museum of Natural History, London) with similarly prolonged mouthparts, suggesting it was feeding on mites (without evidence).

Acknowledgements. The material was collected in field by Juho M. Vuolteenaho as part of the project Soil Organisms in the Subarctic (2021–2024), hosted at NIBIO, Svanhovd. I am indepted to the project managers for permission to use the samples for this publication. The project "Phytophagous gall midges, a megadiverse but overlooked group of flies" (The Norwegian Biodiversity Information Centre), led by Hallvard Elven, Oslo, provided access to barcoding facilities for which I am most grateful.

References

Baylac, M. 1987. Morphologie comparée de quelques larves du genre *Lestodiplosis* Kieffer (Diptera, Cecidomyiidae). Nouvelle revue d'Entomologie (N.S.), T4 (2), 195–209.

Mamaev, B.M. & Krivosheina, N.P. 1993. *The larvae of the gall midges (Diptera, Cecidomyiidae).* Revised and updated English edition (Edit. H. Roskam). 293 pp. A.A. Balkema, Rotterdam.

Wehrmeister, H. 1924. Beiträge zur Kenntniss der Cecidomyiidenlarven mit besonderer Berücksichigung des darmes. *Zoologische Jahrbücher der Abteilung für Systematik* 49, 299–344.

Received: 15 November 2024
Accepted: 3 December 2024