On the biology of *Blepharomyia piliceps* (Zetterstedt) (Diptera: Tachinidae)

Figure 1. *Blepharomyia piliceps*, live female (Karmøy, Norway).

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Introduction

Blepharomyia (Brauer & Bergenstamm) (Dexiinae, Voriini) is a Holarctic genus comprising six known species, four from the Palearctic Region and two from the Nearctic Region (Tschorsnig & Richter 1998, O'Hara & Wood 2004).

Blepharomyia piliceps (Zetterstedt) (Fig. 1) is a boreo-montane species found mainly in northern and central Europe but also known from high altitudes in Bulgaria and Spain (Tschorsnig *et al*. 2004).

The known hosts, usually based only on one or two records each, are: Lepidoptera, Geometridae: *Ematurga atomaria* (L.), *Entephria caesiata* (Denis & Schiffermüller), *Epirrita autumnata* (Borkhausen), *Eulithis populata* (L.), *Macaria brunneata* (Thunberg), *Mesotype didymata* (L.) and Noctuidae: *Xylena solidaginis* (Hübner) (Herting 1960, Belshaw 1993). More records exist for *Eulithis populata* which seem to be the preferred host of *B. piliceps* (IOBC lists 9 and 10, Ziegler 1983, Ford *et al*. 2000, Robertson & Shaw 2012).

Presented below are the results of field observations and experiments on oviposition of *B. piliceps*. The egg, first instar larva and puparium are described. The cephaloskeleton of the second instar larva is illustrated. Observations on oviposition and descriptions of early stages were not known before for this species. A description and figures of the first instar exist for the closely related *B. pagana* (Meigen) [= *amplicornis* Zetterstedt] (Farinets 1976), as well as some observations on its development (Herting 1965) and some descriptive notes on the puparium (Herting 1960).

Material and methods

Field observations and collection of specimens for experiments were done in Ferkingstadskogen, Karmøy, Norway.

Two specimens of *Eulithis populata* were used as hosts in the oviposition experiments. To reduce the chance of tachinid or hymenopteran preinfection both were collected at a very early stage, and reared to maturity before being exposed to the fly. Experiments were done as described in Haraldseide & Tschorsnig (2014). Specimens of immature stages described and illustrated are the results of captive rearings, except the first instar larva which was dissected from a collected female.

Field observations

In Norway *B. piliceps* has been collected from the beginning of May to beginning of June, and seems to be rare but locally common. In Ferkingstadskogen the species is frequent and appears to be one of the most abundant spring tachinids. The location is a damp and thin forest consisting mainly of *Pinus* and various deciduous trees and shrubs with patches of marshland. Open areas and undergrowth are dominated by *Vaccinium myrtillus* and *Calluna vulgaris*, on which the hosts *Eulithis populata* and *Ematurga atomaria* are abundant. Adults of *B. piliceps* are most often observed in more or less shaded areas on *V. myrtillus* where they are very active. Males are sometimes also found on tree trunks.

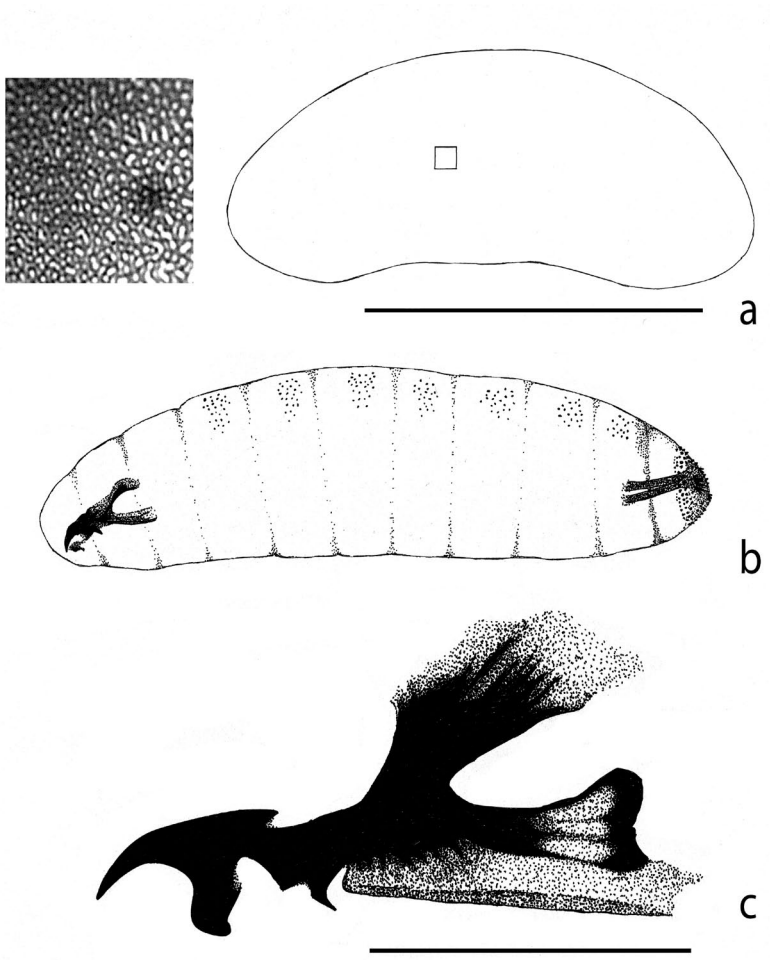

Figure 2. *Blepharomyia piliceps*. **a**. Egg. Scale bar 0.5mm (insert: surface structure). **b**. First instar larva. **c**. Cephaloskeleton of second instar larva. Scale bar 0.2mm.

Immature stages

Blepharomyia piliceps is ovolarviparous. The egg is macrotype, approximately 0.8 mm long, oval in dorsal view and in lateral view planoconvex to weakly reniform when mature (Fig. 2a). Its dorsal surface is whitish with a reticulated structure (see insert to Fig. 2a), and the ventral surface is thin and smooth, covered with an adhesive material which sticks to the host. The egg is indehiscent; i.e., there is no line of weakness present. Probably the tachinid larva penetrates the host directly through the ventral surface of the egg. About 60–70 eggs of varying maturity were counted by dissection of two females.

The first instar larva (Fig. 2b) is fully developed within the egg at the time of oviposition and hatches soon after it is deposited on a host. Its thoracic segments are devoid of spines. The abdominal segments 1–7 bear broad bands of short robust spines or scales dorso-posteromedially on the segments, these bands are broadly interrupted along the dorsal midline, leaving 20–25 spines on each side. Posteriorly on segment 7 a complete encircling band of minute spines is present. Segment 8 posteriorly has short robust spines and groups of longer spines which almost encircle the posterior spiracles, these spines are especially strong lateral to the spiracles and dorsally between them.

The second and third instar larvae are not described here except by illustration of the cephaloskeleton of the second instar (Fig. 2c).

The puparium (three puparia examined) is 5.3–5.4 mm long and 2.4 mm wide, reddish-brown, cylindrical, slightly widening posteromedially and tapering towards posterior spiracles (Fig. 3). Its surface texture is dull with fine transverse striations, these especially prominent on the posterior fifth where they may become rugose. The intersegmental divisions are differentiated only by deeper and closer striae. Bands of spines completely absent. Lateral muscle scars visible. Anterior spiracles protruding, parallel and apically blunt and cerebriform. Posterior spiracles situated on or just above longitudinal axis,

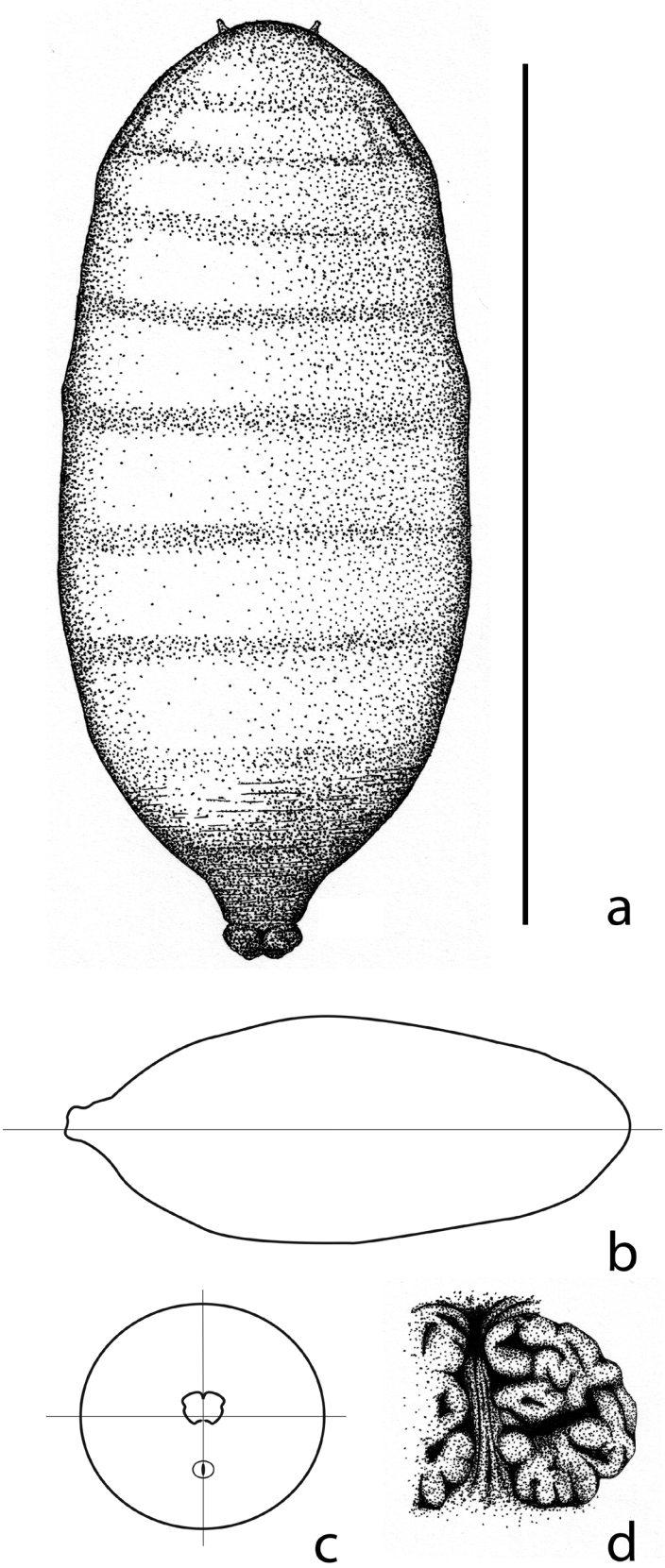

Figure 3. *Blepharomyia piliceps*, puparium. **a**. Dorsal view. Scale bar 5.0 mm. **b**. Lateral view. **c**. Posterior view. **d**. Right posterior spiracle.

protruding and asymmetrically cerebriform in structure. Anal plate circular, opening slit-like.

Oviposition

A single female (collected 4 May 2014) was used in both experiments. In the first experiment the fly was allowed to oviposit once. The attack happened five minutes after introduction of the fly into the experimental box. One egg was laid dorso-laterally on a posterior abdominal segment of the host (the caterpillar was inactive due to ecdysis which was completed the next day).

In the second experiment the fly was allowed to attack several times. The first attack happened after one and a half minutes and the experiment was stopped after two and a half minutes. A total of four eggs were laid, one on a thoracic segment, one on an anterior abdominal segment, and two on the posterior abdominal segments, all in dorsolateral position.

Attacks were direct and did not seem very calculated, the fly landed on the resting, motionless host and held fast during oviposition while the host twitched violently. The average contact during an oviposition attack lasted approximately one second.

No cleaning efforts were attempted by the hosts. This might explain the lack of care taken by the fly to oviposit on the anterior segments to avoid loss of eggs by the host's mandibles.

The mature tachinid larvae emerged from the caterpillars after 11 days and crawled a short distance before pupariation. Both hosts produced one mature larva each (of equal size), however, upon dissection a dead second instar larva was found in the second host.

The tachinid adults had not yet emerged at the time of submission of this article because the species has a single generation in spring and overwinters in the puparium.

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