

# Description of *Macrolabis mali* sp. nov. (Diptera Cecidomyiidae), a new inquiline gall midge species from galls of *Dasineura mali* on apple in Italy

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## Abstract

*Macrolabis mali* Anfora sp. nov. (Diptera Cecidomyiidae) is described and its taxonomically important structures are illustrated. Larvae live as inquilines in leaf galls of *Dasineura mali* (Kieffer) on *Malus domestica* Borkhausen. The new species was found in orchards of Trento Province (Italy) during summer 2003. The basic biology of the new species is reported.

**Key words:** Cecidomyiidae, Diptera, *Macrolabis mali*, *Dasineura mali*, gall midges, *Malus domestica*, apple, Rosaceae, inquiline, insect taxonomy.

## Introduction

The Apple Leaf Curling Midge, *Dasineura mali* (Kieffer) (Diptera Cecidomyiidae), damages cultivated apple trees in Europe, Asia, North America, and New Zealand; the larvae feed on fluids of tissue of young developing leaves and cause the edges to roll tightly inwards along the central nervure, to swell (reddish galls), and to drop prematurely. *D. mali* control requires pesticide applications, especially in nurseries and young plantations (Antonin and Baggiolini, 1972). In 2003 and 2004, during studies on *D. mali*, another midge species emerged from apple leaf galls collected in Trento Province (Italy). This new species is placed in the Palaearctic genus *Macrolabis* Kieffer, 1892, comprising 52 species; *Macrolabis* species are both gall-making and inquilines, and usually monophagous on host plants belonging to 21 families (Skuhravá, 1986; Fedotova, 2000). The presence of a *Macrolabis* species in apple orchards has been previously signalled only in South Tyrol to SW Germany, and it was considered a gall-maker (Carl, 1980). The new species is not included in the last review of the genus (Fedotova, 2000) and in the checklists of the gall midge fauna in Italy (Skuhravá and Skuhravý, 1994; Dahl *et al.*, 1995), Switzerland (Skuhravá and Skuhravý, 1997), Austria (Skuhravá and Skuhravý, 1995), and Southern Tyrol (Skuhravá *et al.*, 2001). It is also not mentioned among the midges infesting plants of the family Rosaceae (Fedotova 2002a; 2002b). Given the shape of the galls, which differs from that of the galls of other gall-making *Macrolabis* species (Fedotova, 2000), the preliminary studies on its biology (Anfora *et al.*, 2005) and other still unpublished data, we suggest that the new species is not a gall-maker, but an inquiline, normally dwelling in *D. mali* galls. In England, another *Macrolabis* species was reported as an inquiline in galls of *Dasineura pyri* (Bouché) (Barnes, 1948), but it has not been found in north alpine area (Carl, 1982) and in pear orchards of northern Italy (personal observations, 2004).

Below we provide a description of the species, called *Macrolabis mali* sp. nov., collected from apple leaf galls in Trento Province. Studies were carried out by the entitled authors, while this description by G. Anfora.

## Materials and methods

Leaf galls infested with midge larvae were collected from organic *Malus domestica* Borkhausen (Rosaceae, cv. Golden, Stark, Fuji) orchards in Trento Province (Northern Italy) in spring and summer 2003 and 2004. Some leaves were dissected, the mature larvae were divided by species, and preserved in 70% ethanol. To rear adult midges, some galls were placed in cubic plastic cages (length 45 cm) with a 3-cm layer of horticultural soil, where the larvae of both species could pupate. Cages were housed in a climatic chamber (26 ± 2 °C, 60 ± 5% R.H., L16:D8 photoperiod). The emerged adults were preserved in 70% ethanol. The insect morphology was studied using bright field and phase contrast microscopy. Permanent microscope slides were obtained for the type series; the specimens were prepared according to the technique proposed by Gisin (1960) for Collembola, emptying the larval body after the clearing treatment. Some adults were also mounted on pinned paper labels using the Fauré liquid.

## Results

### Type material

The holotype and part of the paratypes, mounted in Canada balsam on permanent microscope slides, are deposited at the Tridentino Natural Sciences Museum (TNSM) (Trento, Italy). The other paratypes, preserved in 70% ethanol and mounted, and the slides are deposited at the Research Center of Agricultural Institute of S. Michele all'Adige (Trento, Italy).



**Figures 1-7.** *Macrolabis mali* sp. nov. male. (1) Adult. (2) Flagellar segments. (3) Palpus. (4) Tarsal claw and empodium. (5) Wing. (6) Genitalia in dorsal view (cerci, hypoproct, and mediobasal lobes of gonocoxites). (7) Genitalia in dorsal view (gonocoxite and gonostylus). (In colour at [www.bulletinofinsectology.org](http://www.bulletinofinsectology.org)).



**Figures 8-12.** *Macrolabis mali* sp. nov. female. (8) Adult. (9) Flagellar segments. (10) Palpus. (11) Tarsal claw and empodium. (12) Apex of ovipositor in lateral view. **Figure 13.** Anterior part of *Macrolabis mali* sp. nov. larva. (In colour at [www.bulletinofinsectology.org](http://www.bulletinofinsectology.org)).

Holotype male, S. Michele all'Adige (46°11'N, 11°07'E), 15 km N of Trento (NE Italy), ex leaf gall on *M. domestica* collected 27.VI.2003, emerged 13.VII.2003 (leg. G. Anfora), TNSM n° 1. Paratypes 10 females, 9 males, same locality and date as holotype, TNSM n° 2-20. Other material collected from orchards of the whole Trento Province during summer 2003 and 2004.

### Description

#### Male (figures 1-7)

Body length 1.0-1.5 mm ( $1.26 \pm 0.17$  mm; n=10). Colour thorax and abdomen yellowish pale orange. Antennae 2 + 11-segmented, flagellar segments separated, without stems, 2<sup>nd</sup> segment 1.1 times as long as 1<sup>st</sup>, 5<sup>th</sup> 1.15 times as long as wide, 9<sup>th</sup> 1.2 times as long as 10<sup>th</sup>, 11<sup>th</sup> appendage-like, conical and separated, narrower

than others, 0.4 times as long as 10<sup>th</sup>. Palpal segment length ratio 5:9:11:15; palpiger distinct, 4<sup>th</sup> segment slightly dilated in distal half and rounded apically. Tarsal claw arcuately rounded basally, with long and wide, nearly backwards-directed, tooth at base; empodium slightly longer than claw. Wing the widest in distal half, 2.5 times as long as wide; vein R<sub>5</sub> slightly curved, joining costa before the wing apex, Cu forked; veins R<sub>5</sub> and Cu running into wing margin at nearly equal distances from wing apex. Gonocoxite large and swollen, asymmetrical, with widely rounded outer side and nearly straight inner side, about 1.3 times as long as wide. Gonostylus slender, half as long as gonocoxite, strongly swollen and rounded at base, dorsal side nearly straight, ventral rounded, nearly parallel-sided before apex, pointed apically, 3.3 times as long as wide. Cerci with long oval lobes divided by wide triangular rounded inci-

sion and with a little lateral prominence at half. Hypoproct 0.7 times as long as cerci and 0.3 times as wide as cerci, slightly dilated toward base with wide oval incision apically between long and fine lobes. Mediobasal lobe of gonocoxites apically pointed and indented, gradually dilated to base. Genitalia infusate, with surface looking rough because of spotted relief.

#### Female (figures 8-12)

Body length 1.1-1.5 mm without ovipositor (1.32 ± 0.13 mm; n=10). Colour as in male. Antennae 2 + 12-segmented; 1<sup>st</sup> flagellar segment slightly narrowing at base and as long as 2<sup>nd</sup>, 5<sup>th</sup> segment 1.2 times as long as wide; 12<sup>th</sup> ovoid, narrower than others, 1.1 times as long as 11<sup>th</sup>. Palpal segment length ratio 3:4:5:7; palpiger distinct, 4<sup>th</sup> segment slightly dilated laterally and rounded apically. Tarsal claw nearly semicircular with long and wide, nearly backwards-directed, tooth at base; empodium slightly longer than claw. Ovipositor with fused cerci (= apical plate) which, in lateral view, is slightly narrowing toward apex and nearly pointed apically; the latter looking infusate because of more densely arranged microtrichiae. Apical plate 2.8 times as long as wide.

#### Larva (figure 13)

Colour whitish-yellow. Length 2.3-2.5 mm (2.39 ± 0.12 mm; n=20). Head with antennae 0.3 times as long as head capsule, posterolateral apodemes about as long as head capsule. Sternal spatula orange-brown with long stem and anterior part divided by long and pointed lobes; a lateral papilla each side of spatula. Terminal segment with four pairs of papillae setose.

#### Differential diagnosis

*Macrolabis mali* sp. nov. is similar in biology and morphological characters to *Macrolabis luceti* Kieffer and *Macrolabis alatauensis* Fedotova, which both live as inquilines in galls of *Wachtliella rosarum* (Hardy) (Diptera Cecidomyiidae) on various species of *Rosa* (Rosaceae). The three species are related because of the arrangement of the whole wing and the hypoproct length. The relation between *M. mali* sp. nov. and *M. luceti* is also due to the shape of the hypoproct and the length of the apical plate of the ovipositor, while that between *M. mali* sp. nov. and *M. alatauensis* is due to the shape of the gonostylus and the structure of the female antenna. *M. mali* sp. nov. considerably differs from the latter species in the cerci (lobes long and widely divided), in the shape of the gonocoxites and in the structure of the male antenna.

#### Biology

Larvae of *Macrolabis mali* sp. nov. develop as inquilines in leaf galls of *D. mali* together with the larvae of this gall-making species. The galls are reddish leaves, curled toward the midrib and swollen (figure 14). Each gall usually contain 20-50 larvae of *D. mali* and 20-40 larvae of *M. mali* sp. nov.. Pupation takes place in the soil. In the laboratory, the pupal stage lasts 10-15 days at 25 °C. Five-six generations develop per year, and, at the end of the season, the *M. mali* sp. nov. population



**Figure 14.** Leaf galls of *Dasineura mali* (Kieffer) on apple.  
(In colour at [www.bulletinofinsectology.org](http://www.bulletinofinsectology.org)).

becomes larger than that of the host. The larvae of the gall inducer may thus die because of the large number of inquilines as it is known in *M. luceti* larvae of which may cause the withering of larvae of the gall causer, *W. rosarum* on *Rosa* spp. (Robbins, 2000).

#### Etimology

The specific name of this taxon is derived from the generic name of the host plant.

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