

***ENIGMADIPLOSIS AGAPANTHI*, A NEW GENUS AND SPECIES  
OF GALL MIDGE (DIPTERA, CECIDOMYIIDAE) DAMAGING  
*AGAPANTHUS* FLOWERS IN ENGLAND**

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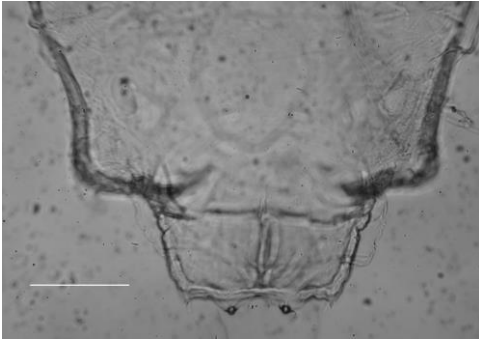
In July 2014, *Agapanthus* (Amaryllidaceae) flowers showing damage typical of that caused by gall midges was brought to the attention of the second author [AS] by Lenka Cooke (Horticultural Advisor at the Royal Horticultural Society). Examination of damaged flowers collected at the RHS Garden, Wisley, confirmed that gall midge larvae were present and a sample of damaged inflorescences was sent to the first author [KMH] for identification and taxonomic advice. Many gall midge larvae were found in affected flower buds, which remained closed or partially opened and variously distorted (Plate 3). Initial examination of larvae indicated that they belong to a species of *Contarinia*, possibly related to *Contarinia quinquenotata* (Löw), which damages developing flowers of *Hemerocallis*. But hundreds of adult midges were reared from the *Agapanthus* sample by the end of September 2014, (with further emergences in spring 2015) and all adults showed characters of the tribe Clinodiplosini, not Cecidomyiini. This enigmatic combination of larval and adult characters merits description of a new species, placed in a new monotypic genus, with authorship of both new taxa attributed to K. M. Harris.

This species is probably native to southern Africa (where *Agapanthus* species are endemic) because an undescribed and unstudied gall midge inducing identical symptoms has been recorded in South Africa (Duncan, 2002).

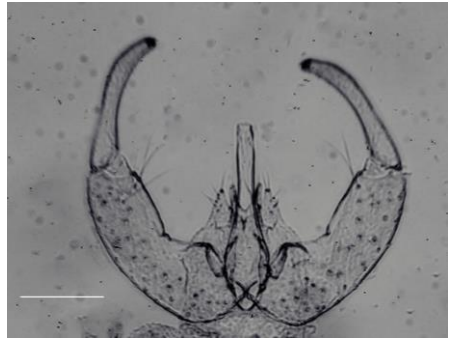
The Royal Horticultural Society has initiated a research project to elucidate the biology of this species, to establish the extent of its distribution in the UK, and to devise methods of management to limit damage to the flowers of *Agapanthus*, which are valuable ornamental garden plants, cultivated in the UK and elsewhere in warmer parts of the world. Details, including images of symptoms, biological information, and records of known infestations, are available on the RHS website (<https://www.rhs.org.uk/agapanthusmidgeproject>).

***Enigmadiplosis* Harris (new genus)**

This new monotypic genus is erected to accommodate the type-species *Enigmadiplosis agapanthi* Harris, which differs from all known species of Cecidomyiidae in having a unique combination of larval and adult characters. The third instar larvae show diagnostic characters of the genus *Contarinia*, which is currently placed in the tribe Cecidomyiini, but adult characters of reared males and females indicate closer affinity to a different tribe, the Clinodiplosini.



**Figure 1** *Enigmadiplosis agapanthi*. Third instar larva, posterior view. [Scale-line = 0.1 mm]  
Photo : Keith Harris



**Figure 2** Male genitalia of *E. agapanthi*. [Scale-line = 0.05 mm]  
Photo : Keith Harris

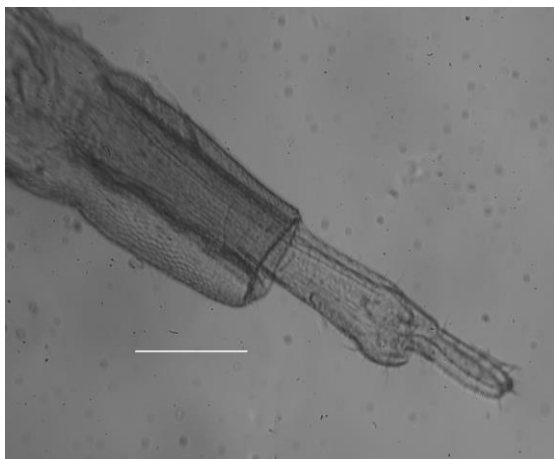
Third instar larvae of *Enigmadiplosis* have three of the four pairs of terminal papillae bearing short setae and the fourth, median pair are modified into small short, recurved, stubby hooks (Fig.1) that the fully developed larvae use to jump – by bending the abdomen forward and latching onto the blade of the sternal spatula which is then quickly released to enable them to spring a few centimetres when exiting galls and working their way into soil or other substrates. This conformation is characteristic of most Cecidomyiini and is particularly well known in the genus *Contarinia* Rondani. In complete contrast, adult *Enigmadiplosis agapanthi* show characters that are shared by most Clinodiplosini. In particular, the male genitalia (Fig. 2) have large gonocoxites with mediobasal lobes; long, slightly recurved gonostyles; a long aedeagus and other characters that suggest affinity with *Clinodiplosis* Kieffer and other Clinodiplosini.

Useful illustrated comments on Cecidomyiini and Clinodiplosini are provided by Gagné (1994), and the currently accepted classification is embodied in the world

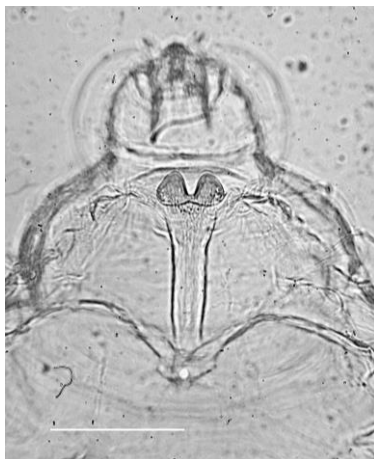
***Enigmadiplosis agapanthi* Harris (new species)**

**Adults.** Fragile, small midges (Plate 3) with wing length up to about 2 mm. Both sexes are uniformly pale orange-yellow, with conspicuous contrasting black eyes and all legs with narrow dark scales along their anterior edges. Antennae have 12 flagellomeres, each with three sets of circumfilar loops in males and with two simple appressed and linked loops in females. Maxillary palps are four-segmented and relatively long (about two-thirds as long as height of head). An occipital process (post-vertical peak) is present, bearing a pair of setae. The wing venation is indistinct, with R5 curved backwards in distal third and joining the costa beyond the wing apex. Legs are long, with simple untoothed tarsal claws curved evenly in distal half, sharply pointed and slightly longer than empodia.

**Male Genitalia (Fig. 2).** Gonocoxites are large, elongate cylindrical with quadrate medial enlargements at bases; gonostyles are elongate, curved and slightly widened in distal third; the aedeagus is long, extending well beyond hypoproct and with about 8 sensory pits distally; hypoproct as long as cerci and divided into two narrow lobes, each bearing a small apical seta; cerci triangular, with 4-5 short setae in posterior half and a pair of larger setae almost crossing medially.



**Figure 3** Ovipositor of *Enigmadiplosis agapanthi*.  
[Scale-line= 0.1 mm]  
Photo : Keith Harris



**Figure 4** *Enigmadiplosis agapanthi*  
3<sup>rd</sup> instar larva, antero-ventral  
view. [Scale-line = 0.1mm]  
Photo : Keith Harris

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Female ovipositor (Fig. 3) extendable, retracting telescopically into abdomen; terminal cerci elongate elliptical, about four times as long as wide.

**Larvae.** Fully developed third instars are up to 2-3 mm long, cream-yellow with green gut contents visible. A sternal spatula is present in fully developed third instars; shaft long and anterior blade bilobed (Fig. 4). Three pairs of terminal papillae bearing short setae and fourth pair modified into short stubby processes (Fig. 1).

### **Material Examined**

Holotype male no. 20658, UK, Wisley, Surrey, from *Agapanthus* flower buds, 30.vii.2014 (A. Salisbury). Paratypes, same data as holotype; males, nos. 20659, 20660, 20661, 20662, 20663, 20664; females nos. 20665, 20666, 20667; larvae nos. 20669, 20670, 20671, 20672, 20673, 20674; pupal exuviae, no. 20668. All of these microscope slides are to be deposited in the Natural History Museum, London, with additional larvae and adults preserved in 70% propanol in two screw-top vials.

### **Acknowledgements**

We thank Lenka Cooke (RHS Wisley) for drawing our attention to this new pest and Raymond J. Gagné, US Department of Agriculture, Washington DC, USA, for helpful review of a draft of this paper.

### **REFERENCES**

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A female *Enigmadiplosis agapanthi* – a new species of gall midge recently found attacking *Agapanthus* flowers in England. The wing length is about 2 mm (see page 17).  
Photo: Keith Harris



An *Agapanthus* inflorescence showing moderate damage to the opening buds by larvae of the gall midge *Enigmadiplosis agapanthi*. Photo: RHS / Hayley Jones