

## FIRST RECORDS OF TWO NATURAL ENEMIES OF BOX TREE MOTH, *CYDALIMA PERSPECTALIS* (LEPIDOPTERA: CRAMBIDAE), IN BRITAIN

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### ABSTRACT

This is the first report of the tachinid fly *Pseudoperichaeta nigrolineata* (Walker) parasitising *Cydalima perspectalis* (Walker) larvae in Britain. A pteromalid parasitoid wasp, identified as *Stenomalina* cf. *communis* (Nees), constitutes the first record of a chalcidoid parasitising *C. perspectalis* in Britain and the only record of this species parasitising the box tree moth worldwide. The presence of these parasitoids is discussed in the context of other predators of the box tree moth.

### INTRODUCTION

The box tree moth, *Cydalima perspectalis* (Walker) (Lepidoptera: Pyralidae) has been a serious problem on *Buxus* spp. in mainland Europe since it arrived, from Asia, in 2006. The adult moth, first recorded in Britain in 2007 with larvae reported from private gardens in 2011, is now widely distributed across southern England and has been recorded in Scotland, Wales, Ireland and Northern Ireland (Salisbury, Korycinska & Halstead, 2012; Plant *et al.*, 2019). *Cydalima perspectalis* was the top enquiry received by the Royal Horticultural Society's (RHS) Gardening Advice Service in 2015, 2017 and 2018 (RHS, 2019). The moth is now regarded as being a 'Common Resident' and is likely to be an ongoing problem for box-growers, there are at least two generations a year with feeding activity between March and October. Infestations multiple times a year and in successive years will lead to a lack of vigour and may result in box plants failing especially when coupled with disease pressures already faced by box, namely box blight (Henricot, Pérez Sierra & Prior, 2000) caused by *Calonectria pseudonaviculata* (Crous, Groenew & Hill) and *Calonectria henricotiae* (Gehesquière, Heungens & Crouch).

Although Britain and Ireland do not contain areas of box woodland as extensive as continental Europe where it is locally abundant in the Pyrenees, Southern France, the French Prealps and around the Jura mountains, there are still locations where box is of great ecological, historic and cultural value, e.g. where it is naturally found in areas including Great Kimble (the Chilterns) and Box Hill (Surrey). *Buxus* spp. are also widely grown by the home gardener and are a key feature of many period gardens such as those at Cliveden (Berkshire SU910851), Hampton Court (Surrey TQ157685), Ickworth (Suffolk TL789638) and Ham House (Greater London TQ170729).

In the moth's native range which is considered to extend across South and East Asia; specifically in India, Korea, China Japan and the Russian Far East (Mally & Nuss, 2010), there are several known natural enemies of *C. perspectalis*. These include dipteran and hymenopteran parasitoids, a thysanopteran predator (*Aeolothrips* sp.) and unidentified spider species (Wan *et al.*, 2014). It is important to know which, if any, native biocontrol agents may already be present in Britain, as some of the

recommended pesticide treatments are likely to have negative impacts for these, and other, non-target, beneficial invertebrates (e.g. hoverfly larvae).

Wan collated a list of the known natural enemies which also included an unspecified tachinid parasitoid *Exorista* (Wan *et al.*, 2014), which may or may not be restricted to Asia. *Exorista laryarum* (L.), which is present in Britain, is known to parasitise other lepidopteran defoliators, e.g. the gypsy moth *Lymantria dispar* (L.), however, although it accepts *C. perspectalis* as a host and will lay eggs on larvae it is then unable to complete its life cycle (Martini, Di Vitantonio & Dindo, 2019). Other known potential biocontrol agents include *Trichogramma* species (Göttig & Herz, 2016) and the entomopathogenic nematodes *Steinernema carpocapsae* and *Heterorhabditis bacteriophora* (Choo *et al.*, 1991). Here we report on two parasitoids recorded from *C. perspectalis* for the first time in Britain.

#### PARASITIDS OF *CYDALIMA PERSPECTALIS* IN BRITAIN

Two parasitoid species were reared from samples of *C. perspectalis* received from the South East of England in 2016 and 2017. Late larval instars were collected from infested box plants in Fulham, London (VC21, TQ236772) on 18 August 2016. All larvae from this location, 29 individuals, were reared collectively in plastic boxes until they pupated and then separated into separate specimen tubes. On 22 September one was found to have been parasitised; a parasitoid wasp emerged 19–22 September, which was identified as the chalcidoid wasp *Stenomalina* cf. *communis* (Nees) (Hymenoptera: Pteromalidae) by Natalie Dale-Skey; photographs were sent to Hannes Baur (Natural History Museum of Bern), a Pteromalidae expert, who confirmed the identification (Fig. 1). The following year two pupae of a tachinid fly were received on 17 August 2017 within a parasitised sample of *C. perspacitilis* from a private garden in Addlestone, Surrey (VC17, TQ051647) via RHS Gardening Advice. On 25 August one was found to have emerged. This tachinid was tentatively identified by Andrew Halstead as being *Pseudoperichaeta nigrolineata* (Walker) (Diptera: Tachinidae) and confirmed by Chris Raper (Fig. 2). The chalcidoid wasp is deposited at the Natural History Museum, London (specimen NHMUK011507856), whilst the pupa and the emerged specimen of *P. nigrolineata* are stored in the RHS insect reference collection.

Though little is known about the biology of *Stenomalina* species, records suggest they are primarily endoparasites of stem-feeding insects, mainly Diptera (e.g.



Fig. 1. Chalcidoid wasp *Stenomalina* cf. *communis*, antennae missing, scale bar 1 mm. © The Trustees of the Natural History Museum, London.

Fig. 2. Tachinid fly *Pseudoperichaeta nigrolineata*, scale bar 1 mm.

Graham & Claridge, 1965); *S. communis* has been recorded from Chloropidae species as well as from one Cynipidae and one Pyralidae (Noyes, 2019). Although Chen *et al.* (2005) and Wan (2014) previously documented another chalcidoid wasp, *Brachymeria lasus* (Walker), reared from *C. perspectalis* pupae, this species is not known to be present in Britain (Dale-Skey *et al.*, 2016; Noyes, 2019). Conversely, *Stenomalina communis* is not reported from South East Asia. However, due to the recent distribution expansion of *C. perspectalis*, there is now an overlap in the ranges of *S. communis* and *C. perspectalis*. This overlap spans most of Europe; both species are found in countries including Croatia, Germany, the Netherlands, Spain and Britain (Dale-Skey *et al.*, 2016; Noyes, 2019; Plant *et al.*, 2019), although *C. perspectalis* has not yet crossed the Kattegat into the Northern Scandinavian countries.

*Pseudoperichaeta nigrolineata* is a generalist parasitoid of medium to large-sized microlepidoptera; 90% of the records are from the lepidopteran families Tortricidae and Pyralidae (Belshaw, 1993; Tschorsnig & Herting, 1994). This species has previously been found parasitising *C. perspectalis* in Switzerland at levels of less than 1% (Nacambo, 2012); in Britain *P. nigrolineata* is distributed across England, Wales (Glamorgan) and southern Scotland (Belshaw, 1993), so the range overlaps extensively with that of *C. perspectalis*. It is possible that other generalist tachinid parasitoids present in Britain such as *Compsilura concinnata* (Meigen), will also be encountered parasitising *C. perspectalis*; *C. concinnata* has already been found to be a natural enemy in other countries where the ranges now overlap, i.e. Iran (Farahani *et al.*, 2018).

## DISCUSSION

It is not known what level of control either species of parasitoid identified here will provide and so further research is required to determine current levels and if any other species of parasitoid are present. However, other invertebrates have been observed preying on *C. perspectalis* larvae; for example ants (pers. obs., 2018) and spiders (pers. obs. 2019).

Several species of bird have been observed preying on *C. perspectalis* larvae. Mostini (2018) documents observations of blackbirds, blue tits, great tits, house sparrows, magpies, starlings and oystercatchers feeding on the caterpillars. The head gardener of a National Trust property in Richmond-upon-Thames, London, has observed jackdaws feeding on *C. perspectalis* from the spring of 2019 (pers. comm. 13. vi.19).

Although *C. perspectalis* continues to spread across the UK it is not completely unchecked by our parasitoids. *Cydalima perspectalis* does have natural enemies in Britain; the tachinid fly *Pseudoperichaeta nigrolineata* and the pteromalid parasitoid wasp *Stenomalina communis*, however, currently these parasitoids do not seem to be giving good control, monitoring may indicate if they will do in the future.

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