ACHROIA GRISELLA (FABRICIUS, 1794) (LEP.: PYRALIDAE): OBSERVATIONS ON THE LARVA AND ADULT

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Abstract

An account is given of the larva of *Achroia grisella* (Fabricius, 1794) feeding on garden potting compost, an apparently previously unpublished pabulum. Published descriptions of the larva and its behaviour are considered in the context of observations in 2015. Wing-fanning and rotation of antennae by the adult are discussed.
Keywords: Lepidoptera, Pyralidae, *Achroia grisella*, larva, description, larval behaviour, potting compost, adult, rotating antennae, wing-fanning, song.

Introduction

Achroia grisella (Fabricius, 1794) is instantly recognisable by its pale greyish brown forewing and yellow head. It has wide distribution across the world. The larva usually feeds on wax in bee-hives, preferring old combs, but has been found at least once in a wasp's nest. It has also been recorded as a pest of stored products such as dried apples, dried currants and copra as well as dried insects (Kuchlein, 1978). Kuchlein also records that in The Netherlands it was once found in a cork product and that there was a remarkable report of an infestation from a telephone exchange in Indonesia where the larvae attacked telephone wires, the isolating material of which was made of wax.

It is a species that occasionally turns up in my garden moth trap during July and August, but as my moth trap is itself only run occasionally then this may not be representative of its status there. In 2015, however, it was locally abundant, not in my trap but in my garage where there were not only adults but also larvae that were feeding on a previously unrecorded pabulum: garden potting compost.

The garage is not a shelter for a car but an area for storing many things, mainly those that should be on their way to the local rubbish tip. One of these items is a plastic bag containing some dark blackish brown potting compost that has remained undisturbed for several, probably many, years. It has never contained any type of bee or wasp nest, fruit of any kind nor a collection of dead insects (although it no doubt has had and still has the odd dead insect and other invertebrates such as woodlice).

Thus when I came across this bag in July 2015 I was astonished to discover that it was 'alive' with *Achroia grisella*; not only were there many adults but also a considerable number of larval tubes and cocoons. 'Alive' is meant in the

sense that moths were either constantly scurrying about (which they tended to do rather than fly) or remaining more or less in one position but rapidly vibrating their wings and rotating their antennae.

I decided to investigate further both the fact that the larvae were apparently feeding on potting compost as well as the behaviour of the adults. The result was that certain observations seemed worth recording because they either differ from previous publications in the British literature or do not appear to have been published there.

Observations on the larva published in the British literature

The following accounts of the larva in the British literature do not entirely agree with my observations. I do not suggest that they are the only ones but they seem to be representative.

Fyles (1860) appears to have been the first to have described the larva and pupa in the British literature. He states:

'Larva about nine lines in length when full fed; very active, throwing itself into violent contortions at the slightest annoyance; white with a tinge of pink; rather hairy; the head and second segment reddish brown; spiracles barely perceptible.' A 'line' is one-twelfth of an inch. Thus nine lines is about 19 mm.

The following year, Fyles (1861) gives a different account of the behaviour of the larva, and also appears to be the first in the British literature to mention that the larvae make silken galleries. He states:

'In June I obtained a number of hybernated larvae, and placed them in a glass case. The way in which they formed their galleries was very interesting; they worked under cover, spinning their web loosely and then thrusting it forward. At the slightest disturbance they became perfectly motionless.'

Porritt (1879), apparently unaware of Fyles' notes, published the following account of the larva:

'Length about five-eighths of an inch [16mm], and of moderate bulk in proportion; head polished, it has the lobes rounded, and is slightly narrower than the second segment; body cylindrical, of almost uniform width throughout, but tapering a little towards the anal segment; there is a polished plate on the hinder part of the second segment: skin soft and semi-translucent, the segmental divisions well defined. Ground colour, both dorsally and ventrally, greyish-white, through which the internal workings of the muscles shows, of a purple shade; a dark purplish pulsating vessel forms the dorsal line; head dark brown; the frontal plate of the same colour behind, but paler in front; spiracles minute, very dark brown; when the larva is at rest, the segmental divisions appear white, from the overlapping of the skin, but this is not observable when it is crawling.'

No mention is made of the larva 'throwing itself into violent contortions at the slightest annoyance'.

Buckler (1901: 202-203) provides the same information as Porritt, although in a slightly different format. This is hardly surprising because Buckler had died in 1884 and Porritt was the editor of *The larvae of the British Butterflies and Moths* volume 9 that was published in Buckler's name. As editor, Porritt relied on his own observations and refers to his 1879 publication.

Barrett (1905: 150-152) cites Porritt's description but adds that it is a 'very active larva, throwing itself into violent contortions at the slightest annoyance', a comment presumably not made from Barrett's own observations but taken from Fyles (1860).

Beirne (1954: 48-49) states that 'The larva is very active, throwing itself into violent contortions at the slightest disturbance.' He must surely be following Porritt and/or Buckler when he describes the larva as follows:

'It is greyish-white with the dorsal line and other internal organs showing dark purplish through the skin. The head is dark brown behind but paler in front.'

Carter (1984: 182-183) gives a slightly different description that reads: 'Head pale yellowish brown with reddish brown maculation; ocelli absent; body greyish white with dorsal vessel showing through skin as purplish line; peritreme of spiracles dark brown or black; prothoracic plate pale brown, shaded with darker brown or greyish brown, medial sulcus yellowish white; anal plate concolorous with integument, with yellowish brown maculation; tarsi of thoracic legs and crochets of prolegs reddish brown.' He also records the larva as 'making a silken gallery, covered with frass and debris.' No mention is made of the larva 'throwing itself into violent contortions at the slightest annoyance'.

The last account that I can find of the larva in the British literature is that given by Goater (1986: 100). As with the other species in that publication, there is no larval description but Goater states that the larva is 'Very active, thrashing about when disturbed.'

As can be seen, there are certain differences in the accounts of the larva. Fyles (1860) states that the head and prothoracic plate ('second segment') are reddish brown, the body is white with a tinge of pink and rather hairy, and the spiracles are barely noticeable. The other publications cited above mainly differ from Fyles in the shade of brown of the head and prothoracic plate, the colour that shows through the greyish white or white body being purplish with no mention of pink, and with no mention of the body being hairy. Further, Fyles describes the larva as 'very active, throwing itself into violent contortions at the slightest annoyance'. As Barrett (1905: 150-152), Beirne (1954: 48-49) and Goater (1986: 100) all describe the larval behaviour in similar terms to Fyles' 1860 account they were presumably following this and unaware of his subsequent contradictory observations published in 1861 of the larva becoming perfectly motionless at the slightest disturbance. Porritt (1879), Buckler (1901: 202–203) and Carter (1984: 182-183) make no mention of the larval behaviour.

Although Fyles (1861) comments that the larvae form 'galleries' by 'spinning their web loosely and then thrusting it forward', of the above publications only Carter (1984: 182-183) mentions that the gallery is 'covered with frass and debris.'

Personal observations on the larva

As already mentioned, I found both larvae and adults in an old plastic bag containing potting compost in July 2015. The plastic bag was not the original one that had the potting compost and so I do not know the type or make of this. Later that month I bought a new bag of multipurpose compost, stated to comprise 'recycled organic materials' as well as nitrogen, phosphate and potassium. It seemed very unlikely that the type of compost would be exactly the same as that in the plastic bag and so I considered that it would be interesting to see if the larvae also accepted this. Further, a fresh bag should ensure that the contents did not include any remains of dead invertebrates. I placed a number of larvae in enclosed containers; some with compost from the plastic bag and some with compost from the new bag. All the larvae behaved in the same way; the new compost was just as acceptable as that from the plastic bag.

According to my observations, the larva makes a long, comparatively firm, silken tube, whose diameter is slightly greater than that of the larva, covered with small granules of frass and compost (Plate 1) which it extends as it grows. The larvae would emerge only a little way from their tubes to feed. A larva could be 'encouraged' to leave its tube if the tube were gently and continuously prodded in the area where the posterior end of the abdomen was. On emergence there were no 'violent contortions' as recorded by Fyles (*loc. cit.*) and apparently followed by Barrett, Beirne and Goater, as set out in the previous section.

In general, my observations of the larvae agreed with the description given by Carter (1984), in particular the head being pale yellowish brown with reddish brown maculation and not dark brown as given by Porritt (1879), but no doubt the colour varies between individuals. Porritt (*loc. cit.*), Buckler (*loc. cit.*), Barrett (*loc. cit.*), Beirne (*loc. cit.*) and Carter (*loc. cit.*) all describe either a purplish dorsal line or a dorsal vessel showing through the skin as purplish, thus giving the impression that such a line or vessel is observable the entire length of the body. Such accounts did not agree with the several larvae that I saw. Most had a dull whitish body with a dull pale purplish area showing through the integument from about abdominal segment 1 to abdominal segment 5 or 6. Sometimes this resulted in the gut in that area, but nowhere else, showing slightly darker (Plate 2). A few larvae did not have this pale purplish area at all.

Each larva pupated in a comparatively firm, silken cocoon, and not within its feeding tube. Like the tube, the cocoon is covered with small granules of

Plate 1. *Achroia grisella* (Fabricius, 1794) larval tubes. *Photo*: R. J. Heckford

Plate 2. *Achroia grisella* (Fabricius, 1794) larva. *Photo*: R. J. Heckford

frass and compost. The exuviae are not extruded on emergence of the moth. Moths resulted from containers having both types of potting compost.

Observations on the adult

The cocoons were kept in several closed containers indoors. The first moths to emerge were females. I did not see any at the exact moment of emergence but observed them very shortly afterwards when their wings were very small and expanding. During this period they commenced rapidly and constantly rotating their antennae. Over the years I have been lucky enough to be present when moths (both Microlepidoptera and Macrolepidoptera) have emerged from their pupae and I have never seen such behaviour before. Unfortunately I was not present when the males emerged but when seen they also were rotating their antennae. As well as rotating their antennae, the males almost constantly also fanned their wings; even when not wing-fanning the males would rotate their antennae. The females often rotated their antennae but only occasionally fanned their wings. Such actions of both sexes took place even when each was in a separate container, with only one moth in each container.

There have been various studies carried out on this wing-fanning behaviour by the males, for example Greenfield (1981), Spangler (1988), Jang & Greenfield (2000), Brandt & Greenfield (2004) and Limousin *et al*. (2012). These studies show that during wing-fanning the males emit a 2-component sex pheromone (Greenfield, 1981: 6) and that wing-fanning by males produces ultrasonic signals to which the females respond in mate selection, and the females may well not find males without acoustic signals (Spangler, 1988: 475). This is not the place to attempt to go into the details of the studies carried out but in general the wing-fanning causes a pair of tymbals on the tegulae, small sclerites at the base of the forewings, to buckle inwards or outwards. The resulting ultrasonic signal is described as a song. There exists among individual males considerable variation in the song characters that influence attractiveness to females (Limousin *et al*., 2012). Spangler, Greenfield & Takessian (1984: 91, 93), in a series of experiments which included simulated male signals, observed that female moths would wing-fan in response both to male wing-fanning and the simulated signals at frequencies of 40, 50, 60 and 90 Hz, but not at 20 or 30 Hz. They also observed that some females wing-fanned in response to the release of pheromones by males. I noticed that females occasionally fanned their wings, but cannot say whether this was in response to male wing-fanning; if it was then I was not in a position to determine whether males then released pheromones.

Surprisingly, in my view, the publications cited above do not make any mention of the rotation of the antennae by both sexes. Presumably such actions must relate to sexual attraction, but why did the females rotate their antennae

when they were expanding their wings and when there were no males present? Rotation of the antennae by males not only took place during wing-fanning but also when not engaged in such activity. I only observed the females rotate their antennae when they were not wing-fanning, but this may simply be due to lack of sufficient observation on my part. Also, Brandt & Greenfield (2004: 821, 823-824) appear to suggest that males only sing (by wing-fanning) during the night, but Spangler (1988: 470) states that although males prefer calling in subdued light or darkness, they may be found calling at any time under a variety of conditions. In my experience males fanned their wings, and therefore presumably sang, at any time during the day and evening. This was so even when males were individually confined to separate closed containers not near any females, which were also confined to similar containers.

Discussion

Potting compost is, apparently, a previously unrecorded pabulum of the larva of *Achroia grisella*, but is perhaps not that surprising in view of the fact that larvae have been recorded on various stored products (Kuchlein, 1978). Despite the statement by Fyles (1860) and some others since, possibly based on Fyles, that the larva throws itself into violent contortions at the slightest annoyance I did not observe such behaviour.

As regards the adult, it would be of interest to discover why the adults of both sexes frequently rotate their antennae and in particular why females were observed to do this when they were expanding their wings and when there were no males present.

As with many aspects of entomology, there are still puzzles to solve.

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Apatania muliebris McLachlan, 1866 (Trichoptera: Apataniidae), a caddisfly new to Northern Ireland

The parthenogenetic caddisfly *Apatania muliebris* McLachlan, 1866 is a local species in Ireland where it usually is found in spring-fed streams with a stony substratum. However, the larvae has also occurred in trickles and in a ditch fed by ground water. No males have been found (O'Connor, 2015. *A catalogue and atlas of the caddisflies (Trichoptera) of Ireland.* Occasional Publication of the Irish Biogeographical Society **No. 11**. viii + 646pp. Published by the Irish Biogeograpical Society in association with the National Museum of Ireland). The cased larvae feed on epilithic algae and cyanobacteria which are scraped off the stony substratum. Populations in streams are often very small and are therefore vulnerable to human and animal disturbance. Wallace (1991. Research & survey in nature conservation. No. 32. *A review of the Trichoptera of Great Britain*. Nature Conservancy Council, Peterborough) considers it to be a recently evolved glacial relict species.

In 2016, Malaise traps were set at sites on the shore of Lough Neagh in Northern Ireland by Marcel Ashby and Tristan Bantock as a part of a commercial contract undertaken for clients by Colin Plant Associates (UK). The trap samples were sorted by Colin Plant and the caddisflies were passed to JPOC for determination. Most were common lake species, the identification of which contributed greatly to a trichopteran list for Lough Neagh (O'Connor & O'Connor, 2016. *Bulletin of the Irish Biogeographical Society* **40**: 164-183). However, a female of *A. muliebris* occurred in a sample from a trap situated in a woodland area west of Toomebridge, County Derry. This is the first record for Northern Ireland and to-date, the most northern occurrence of *A. muliebris* on the island (Fig. 1).

Material examined. Derry: Lough Neagh, Northstone Sand Quay, Creagh Road, west of Toomebridge (Irish grid reference H 9790), Malaise trap in