

**STAGES OF *OLETHREUTES ARCUELLA* (CLERCK, 1759)
(LEP.: TORTRICIDAE)**

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Abstract

An account is given of rearing *Olethreutes arcuella* (Clerck, 1759) from ova. Differences between published descriptions of the larva and those resulting from these ova are noted as well as certain differences in biology.

Key words: Lepidoptera, Tortricidae, *Olethreutes arcuella*, ovum, larva, foodplants, biology.

Introduction

Olethreutes arcuella is quite a local species in the British Isles that is usually found in broad-leaved woodland, but it also occurs on heathland. I have not been able to find any published first-hand account of the larva being found in the British Isles and it seems that that larval descriptions and accounts of the biology in the British literature have been derived from mainland European sources.

In 2010 I reared the species from ova laid by a captive female that I had caught in 2009. As is often the case, the early instar larvae differed in appearance from the later instars. The final instar also differed in some respects from such published larval descriptions that I have traced, and which I assume were all based on the final instar. Also, although the published accounts give the larval foodplants as withered, wilted or dying plants none mention that in the first instar the larva seems to require dead leaf fragments that are very small, both to feed on and hide amongst; according to my observations whole dead leaves, or even large parts of such, are too big for the larva to deal with in that instar.

Literature accounts of the larva and its biology

Barrett (1907) was unable to give a larval description, stating that the '*Larva [is] not satisfactorily described, nor indeed certainly known. Statements (which appear to be guesses) as to its habits are not rare. The most reliable suggestion which has reached me is that by Mr. W. Warren, that it "feeds on low-growing plants, skeletonizing their leaves, and not particular as to what plants."*

The first larval account that I can trace in the British literature is that provided by Meyrick ([1928]) as follows: '*Larva dark violet-grey; head light brown; plate of 2 almost black: on fallen and withered leaves and vegetable refuse on the ground*'. He gives the larval period as April. Despite Meyrick's considerable knowledge of the microlepidoptera it is unlikely that any of this

information resulted from his own observations. In the *Preface* to this publication he states that '*The descriptions of the characters of the perfect insects are drawn up in all cases from my own personal observations; but those of the larvae (which need to be studied in life) are mostly compiled to the best of my judgment from a comparison of the most trustworthy results of other observers.*' His account seems to closely follow that of Kennel (1908-1921), who, under *Phiaris arcuella*, describes the larva as dark violet-grey, the head light brown, prothoracic plate almost black and anal plate brown, and states that it lives in April (probably having overwintered) on the ground under fallen leaves and it nourishes itself there from wilted leaves and dying plant parts ('*Die Raupe ist dunkel violettgrau, der Kopf hellbraun, Nackenschild fast schwarz, Analklappe braun. Sie lebt im April (wohl überwintert) am Boden unter abgefallenen Laub und nährt sich dort von welken Blättern und absterbenden Pflanzenteilen*').

Swatschek (1958) provides a description based on a larva in the Zoologische Staatssammlung, München, Germany found by Disqué on 5 May 1909 at Speyer in the Rhine valley, Germany. He states that the larva is red-brown, strongly granular, head light brown, prothoracic plate, pinacula and anal plate dark brown ('*Raupe rotbraun, stark gekörnt, Kopf hellbraun, N, Warzen und A dunkelbraun*'). His account of the biology is in similar terms to that of Kennel.

Bradley, Tremewan & Smith (1979), followed by Razowski (2003), describe the larva as follows: '*Head yellowish brown; prothoracic plate dark brown to blackish brown or black; abdomen dark purplish grey to violet-brown; pinacula black; anal plate shining brown.*' As regards the biology they state, '*Late summer to April; feeding on withered and decaying leaves of low growing plants and on fallen leaves of shrubs and trees, overwintering under dead leaves on the ground.*' In preparation for their publication these authors undertook field work including rearing a number of species. Voucher specimens were then deposited in the Natural History Museum, London (BMNH). I have not been able to trace any specimen of this species in the BMNH reared by them, or indeed by anyone else either in the British Isles or mainland Europe.

On this basis it seems likely that the information provided by Bradley, Tremewan & Smith about the larva and its biology has been derived from mainland Europe. Although their account of the biology is in very similar terms to Kennel, the larval description differs in certain respects. Nor is it the same as that given by Swatschek (1958). Dr W. G. Tremewan tells me (personal communication) that he and the late Dr J. D. Bradley often consulted larval descriptions published by P. Benander. The only account of the larva of *Olethreutes arcuella* given by Benander that I am aware of, translated from Swedish, describes the larva as dark violet grey with a light brown head and black thoracic plate, and states that it lives in April under fallen leaves of withered plant

parts (Benander, 1950). This is in almost identical terms to those of Kennel (1908-1921) and Meyrick ([1928]), and so was presumably based on one of them.

This assumption is strengthened by a paper that Benander published in two parts in 1964 and 1965 in *Opuscula Entomologica* entitled 'Notes on Larvae of Swedish Micro-Lepidoptera'. This records that during the last 50 years he had been writing diaries on caught and reared larvae of Lepidoptera and these included some data on microlepidoptera that he considered might be useful to have published. He makes clear that he has deliberately omitted certain families or genera from his paper but one of the families that he does not omit is the Tortricidae. He states (1964) that his reason for publishing these data is because the information about these larvae 'found in recent literature are usually not based on personal observations but copies of older descriptions and if once a mistake is published, it is repeated in one work after the other.' Significantly, *Olethreutes arcuella* is not included in the 124 species of Tortricidae that he deals with. Thus, it seems clear that the description he gave in 1950 was not based on his own observations but was taken from an earlier published account; as indicated in the above paragraph this was probably from Kennel or Meyrick. As his 1950 description differs from that given by Bradley, Tremewan & Smith (1979) then, unless he published something on the larva after 1965 which they followed and I have not traced, this was not the source of their larval description, and so this remains unknown.

Rearing *Olethreutes arcuella*

Olethreutes arcuella is locally common at Hembury Woods, South Devon (VC 3), a National Trust property. Despite searching on several occasions I had never managed to find a larva there and so on 31 May 2009 I caught a female in the hope of obtaining ova. This proved successful, because within a day 19 ova were laid, all on the sides of the container within which the moth had been kept even though some dead leaves of oak *Quercus* species and birch *Betula* species had been placed in it.

All the larvae hatched on 8 June 2009. Because the adults mainly occur in fairly open areas where there are scattered, mature *Betula* trees I offered them dead leaves of this; some entire, others being large fragments. The larvae did not eat these but simply wandered about, although one started eating part of the body of the dead adult which I had left in one of the containers. I then gave them very small fragments of dead *Betula* leaves and almost immediately they spun some silk amongst these and started to feed.

At an early stage in its growth, but I did not observe in which instar, the larva folds down part of an edge of a leaf and usually remains within this, emerging for only part of its body length to feed. The larva vacates this fold and creates a fresh one on a different leaf each time it needs more sustenance. This process continues until it pupates.

The larvae grew very slowly and by mid-August all had ceased feeding and had gone into diapause. Until then each had been kept indoors in closed plastic containers; at this stage some *Sphagnum* species was placed in each container. Some of the containers were then put into a refrigerator indoors and some were put into an outdoor shed. All were taken out of the refrigerator and shed towards the end of February 2010 and brought into a warm room indoors. All of the larvae except one were still alive and within a day or so these started feeding again on whole dead *Betula* leaves. I did not note when the larvae pupated because pupation usually took place within the folded part of a leaf, but one spun a cocoon outside a leaf and became a pupa by 31 March 2010. Moths emerged between mid April and early May 2010.

My observations on the larval stage differ in several respects from the accounts mentioned earlier. The colour of the bodies of all of the larvae in their final instar was not dark violet-grey or dark purplish grey to violet-brown but sienna brown, with no indication of violet or purple. Also, unless in the wild the larvae hatch later and behave differently, it appears that the larval period commences about mid June, and not late summer as given by Bradley, Tremewan & Smith (1979), and the larvae go into diapause by mid August, which appears to have been unobserved previously. They do not hibernate under dead leaves but seal down an edge of a leaf and overwinter within, and recommence feeding in the spring.

Description of the early stages

Ovum Flattened and almost circular. Laid in four batches, one of 10 and the other three each of three, usually with part of the edges slightly overlapping. Whitish at first, becoming pale yellow after a few days. The day before eclosion, under magnification, the larva can be seen lying in a semi-circle.

Larva First instar. Initially head very pale grey and rather translucent, stemmata black; prothoracic plate paler grey than head but not translucent; body whitish or very pale yellow, pinacula and anal plate concolorous; thoracic, ventral and anal legs translucent whitish. Shortly before the second instar head and prothoracic plate become pale brown, the body becomes orange-brown with concolorous pinacula and anal plate.

Second instar. (Plate 8). The same as shortly before the change from first instar.

If there were five instars then I did not observe the one after the second.

Penultimate instar. Very similar to final instar except prothoracic plate is yellowish brown, slightly translucent, becoming pale sienna brown laterally and thoracic legs are very pale yellowish brown, slightly darker where setae arise.

Final instar. (Plate 9). About 11 mm long. Head: labrum very pale yellowish brown, clypeus yellowish brown darker brown medially, epicranium yellowish brown mottled slightly darker yellowish brown with a few black or very dark

brown dashes laterally; prothoracic plate black or very dark brown; body sienna brown, lateral and dorsal incisions between thoracic segments 1 to 3 pronounced, very pale brownish white; pinacula inconspicuous, small, slightly shiny, concolorous with body except for a very small black mark from which arises a white or pale yellow seta (in Plate 9 the pinacula appear pale but this is due to reflections from the lighting used when photographing the larva); peritremes of spiracles black; anal plate yellowish brown, anal comb slightly shiny, sienna brown with six prongs; thoracic legs, femur and tibia black or very dark brown, tarsus dark honey brown; ventral and anal prolegs slightly translucent, very pale yellowish brown, crochets reddish brown.

Pupa Not described, within a folded leaf; exuviae pale yellowish brown, extruded or partially extruded on emergence of the moth.

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Plate 8. Second instar larva of *Olethreutes arcuella*, 21.vi.2009, from eggs hatched 8.vi.2009 by female from Hembury Woods, South Devon. Photograph © R. J. Heckford



Plate 9. Final instar larva of *Olethreutes arcuella*; 27.iii.2010, from eggs hatched 8.vi.2009 by female from Hembury Woods, South Devon. Photograph © R. J. Heckford