

Biological notes on some parasitoids of *Zygaena* Fabricius, 1775 (Lepidoptera: Zygaenidae) and an overwintering host for *Monodontomerus vicicellae* (Walker, 1847) in Britain (Hymenoptera: Torymidae)

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The gregarious parasitoid *Monodontomerus vicicellae* (Walker, 1847) has been recorded only once in Britain, from specimens reared from cocoons of a *Zygaena* sp. 'from a colony along the A421 near my school at Chesterton (Oxford)' [date not stated, but presumably in or soon before 1961] (Lane, 1961). In the Natural History Museum (BMNH), London, there are two broods, labelled respectively '1960 Elsfield near Oxford ex burnet cocoon M. Rothschild' and 'near Oxford, 1961, ex *Zygaena lonicerae*' (J. S. Noyes, pers. comm.). Miriam Rothschild was Charles Lane's mother and it is stated that she assisted him with his 1961 publication, so both broods might best be associated with Lane's (1961) record, especially as no year date is given; Elsfield (the Rothschild family home) and Chesterton are only about 10 km apart, and somewhere between the two might have been the actual sampling site. There do not appear to have been further specimens collected in Britain (J. S. Noyes and R. R. Askew, pers. comm.).

On the European mainland *M. vicicellae* is a common primary idiobiont parasitoid of *Zygaena* species, attacking and emerging as adults from the cocoon stage of its hosts. It has also been recorded from Psychidae, but its regular if not almost exclusive association with *Zygaena* species is evident. For example, in the National Museums of Scotland (NMS) there are 27 broods reared from cocoons of *Zygaena* collected from at least 13 localities in France, Italy and Turkey, by M. R. Shaw, W. G. Tremewan and A. Hofmann, and determined as *Z. carniolica* (Scopoli) (15), *Z. filipendulae* (Linnaeus) (6), *Z. occitanica* (Villers) (2), *Z. transalpina* (Esper) (2), *Z. formosa* Herrich-Schäffer (1) and *Z. fausta* (Linnaeus) (1). Emergence was almost invariably through a single hole, and brood sizes ranged from 3-50, but averaged about 16 in the 14 broods for which a count is recorded, with (in these broods) an overall ♂ : ♀ ratio of 1 : 1.07 (none of these broods was all male). The above hosts are mostly species with cocoons that are easily found by entomologists and, especially in view of the range of cocoon types represented and the fact that two subgenera of *Zygaena*, *Agrumenia* Hübner and *Zygaena* Fabricius s.str, are involved, it seems likely that most or perhaps all species of *Zygaena* would be potential hosts. In all 18 cases in which both dates of collection and emergence were recorded (and almost certainly in the other nine as well) the relatively recently formed host cocoons were collected after midsummer

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(usually in July) with adult parasitoid emergence following within a few days or weeks (July–August; exceptionally September). This material gives no indication of the means by which *M. vicicellae* overwinters, but it does rather strongly suggest that a further host taxon might be necessary as *M. vicicellae* has not been reported to overwinter as an adult, and as all *Zygaena* species overwinter as larvae.

Because cocoons of at least the three common *Zygaena* species in Britain are often collected by entomologists, the absence of British specimens of *M. vicicellae* (apart from those reared in 1960 and 1961 by Rothschild and Lane) in collections strongly suggests that it is a rare insect in Britain. It was therefore something of a surprise to rear broods of *M. vicicellae* (12 ♀, 2 ♂ on 8.vi.2005; 5 ♀, 4 ♂ on 10.vi.2005; 8 ♀, 1 ♂ on 11.vi.2005) from each of 3 cocoons of a *Zygaena* species (probably *Z. filipendulae*) collected by one of us (KPB) on 19.ii.2005 in NW. England at Ainsdale Dunes NNR, Formby, Lancashire. Each *Zygaena* cocoon contained the extremely tough overwintering cocoon of one of its solitary primary parasitoids, *Listrognathus obnoxius* (Gravenhorst) (Hymenoptera: Ichneumonidae, Cryptinae), which was the true host of the *M. vicicellae* broods. The material is deposited in NMS, apart from most of one brood, which has been donated to R. R. Askew.

Listrognathus obnoxius is the only primary parasitoid of *Zygaena* that overwinters in the host cocoon in Britain, being a common, widespread and very regularly reared parasitoid of our three common *Zygaena* species, *Z. filipendulae*, *Z. lonicerae* (Scheven) and *Z. trifolii* (Esper) (Schwarz & Shaw, 1998). It is adult in about June and July, when it attacks the cocoon stage of the host. The resulting larva develops as an external parasitoid on the prepupal or pupal contents, then overwinters (as a fully grown larva) in its own extremely tough and rigid cocoon constructed within that of the *Zygaena*. *Listrognathus obnoxius* has the added interest of attacking especially the largest of the available *Zygaena* cocoons present, and it has been suggested (Shaw, 1975) that some species of this genus (others attack *Zygaena* species in Europe and west Asia) are responsible for the male-biased adult sex-ratios sometimes seen in *Zygaena* populations.

Despite one of us (MRS) having reared literally hundreds of adult *L. obnoxius* collected as cocoons, previously the only parasitoid of it seen has been a single specimen of *Isadelphus armatus* (Gravenhorst, 1829) (Hymenoptera: Ichneumonidae, Cryptinae), which is a fairly common species in Britain (Schwarz & Shaw, in prep.) and certainly not regularly associated with *L. obnoxius* cocoons. The lack of parasitism is testimony to the extreme toughness of these rather exposed and long-lived cocoons and it is in sharp contrast to the generally very high levels of parasitism by ichneumonid and pteromalid Hymenoptera suffered by the shorter-lived and less robust cocoons of other ichneumonoid primary parasitoids of *Zygaena*, including those making their cocoons within that of the host (Shaw, unpublished data). The strength of the cocoon of *L. obnoxius* might explain the comparatively robust ovipositor of *M. vicicellae*, with its strongly serrated tip, which would seem unnecessary for a parasitoid habitually attacking only relatively frail cocoons of *Zygaena* (and perhaps cases of Psychidae), as would the effort-saving emergence habit

whereby the whole brood issues from a single hole in the host cocoon, even from the *Zygaena* species that make only paper-thin cocoons. It seems possible, therefore, that tough *Listrognathus* cocoons in those of *Zygaena* are important overwintering hosts for *M. vicicellae*, and it would be interesting to test this hypothesis in some part of Europe where both parasitoids are abundant.

References

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