INVESTIGATION OF THE STATUS OF *TROGUS LAPIDATOR* (F.) (HYM.: ICHNEUMONIDAE) IN BRITAIN, A PARASITOID OF *PAPILIO MACHAON* L. (LEP.: PAPILIONIDAE)

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Abstract

Examples of the parasitoid *Trogus lapidator* (Hym.: Ichneumonidae) was reared from 24 larvae of *Papilio machaon* L. (Lep.: Papilionidae) collected under licence from Catfield Fen in Norfolk during August 2005. Twenty-one of the host larvae survived to pupation and these produced eight male *Trogus lapidator* (one per pupa) and nine *Papilio machaon* during 2006; four pupae died and it was not possible to determine if these were parasitized. The parasitoids emerged an average of 30 days before host emergence.

Introduction

Trogus lapidator has been known as a solitary larval-pupal parasite of the swallowtail butterfly *Papilio machaon* in Britain for some time (Morley, 1901), but published records only exist for localities in the Cambridgeshire fens, in which *P. machaon* is now extinct, until Shaw (1978) reported a specimen reared from the Norfolk Broads. Subsequently two further specimens were reared from the Norfolk Broads (M.R. Shaw, pers. comm.): one female, Horsey Mere, Norfolk, ex *P. machaon* collected as larva 29.vii.1981, em. 2.vi.1982 (T. M. Melling) and one male, labelled only Norfolk Broads, ex *P. machaon* collected as pupa winter 1981, em vi.1982 (unknown collector, don. G. R. Ayres). Both specimens are in the National Museums of Scotland. Other than these three, there have been no other modern records of *T. lapidator* in Britain, suggesting that this certainly highly restricted insect may also be very rare.

In the early evening of 17 June 2005 I went to inspect some water traps set at Catfield Fen Nature Reserve (O. S. grid reference TG 369212), where I was conducting an invertebrate survey for Butterfly Conservation Norfolk Branch, who own this part of the fen. The traps were set at a height of one-metre amongst tall vegetation, mainly in the hope of catching hoverflies. Many Swallowtail butterflies were feeding on the flowers of the many tall marsh thistles *Cirsium palustris* growing alongside an adjacent dyke. Also flying and crawling very actively amongst the flowers, were two large black ichneumonid wasps with bright orange legs. I caught one of these (Plate E) and on using Perkins (1959) this ran to *Trogus lapidator*, except that in my specimen the legs were orange rather than red. The specimen was sent to Dr Mark Shaw who confirmed that it was a male *Trogus lapidator*. On a return visit on 20 June 2005 I found several *T. lapidator* still active on the thistles and one specimen in one of the water traps. This specimen was confirmed as a male by Mark Shaw. The insects were very active on the thistles as if they were looking for something rather than feeding, probably searching for newly emerging females. As far as is known this is the first time the behaviour of *Trogus lapidator* has been observed in the wild in Britain and the first record of the species since 1982.

As this parasitoid is necessarily rarer than its host, it should be regarded as of even greater conservation concern (Shaw in Shirt, 1987), yet there has been no effort to conduct surveys for it since collecting all stages of the swallowtail became an offence under the Wildlife & Countryside Act (1981). In the light of my rediscovery of *Trogus lapidator* it was suggested by Mark Shaw that I conduct a survey at Catfield Fen in 2005/6 to gauge the extent to which *Papilio machaon* is parasitised by this ichneumonid. A licence was granted by English Nature (now Natural England) to collect 24 larvae there in 2005 to try and rear the parasitoid and to see to what extent the butterfly population was affected by it. The results of this experiment are presented below:

Methods

Twenty-four 4th and 5th instar larva were collected from Catfield Fen on 4 August 2005. It is known that *Trogus* species are able to attack early instar larval instars of their hosts (Prota, 1963) so parasitism was presumed to be well-represented (if possibly incomplete) in this sample. The larvae were fed on large flowering plants of fennel *Foeniculum vulgare* and wild carrot *Daucus carota* with their stems in bottles of water in a large, airy cage, 830cms × 220cms × 61cms, in an unheated room indoors. Reed *Phragmites australis* stems were provided as supports for the larvae to pupate on, and most used this method; others pupated on the sides of the cage. The pupae were immediately removed from the cage, most still attached to the reed stems, and stood upright in two large metal cake tins in which numerous small holes had been drilled in the lids. These were placed on a shelf in a cool outside garage and left there for the winter, occasionally being inspected to look for any sign of mould on the pupae. The pupae were brought into a cool outhouse in early May 2006 and transferred to a large aquarium to await emergence. Those attached to the reed stems were stood upright in florist's 'oasis'. Others were glued to a horizontal stick wedged along the top of the aquarium.

Results

The results may be summarized as follows:

- Thirteen caterpillars had pupated by 8 August and eight more by 13 August. The remaining three larvae died;
- Seven *T. lapidator* emerged in the period 27 May to 3 June 2006, and a further individual on 10 June 2006;
- Nine adults of *P. machaon* emerged in the period 16 June to 12 July 2006 (all but the first were between 24 June and 12 July);
- The mean dates of emergence were separated by 30 days (*T. lapidator* 30 May; *P. machaon* 29 June);
- Four pupae failed to emerge. These were opened and were found to be hollow and dry, but it was not possible to tell whether or not they harboured parasitoides;

- *Trogus lapidator* emerged from the centre of the wing case of the host pupa, making an oval hole about 4mm x 5mm. Six emerged through the right wing case and two through the left;
- All reared parasites and hosts were returned alive to Catfield Fen where the larvae were collected in 2005. The empty host pupal cases are now housed at the National Museums of Scotland.

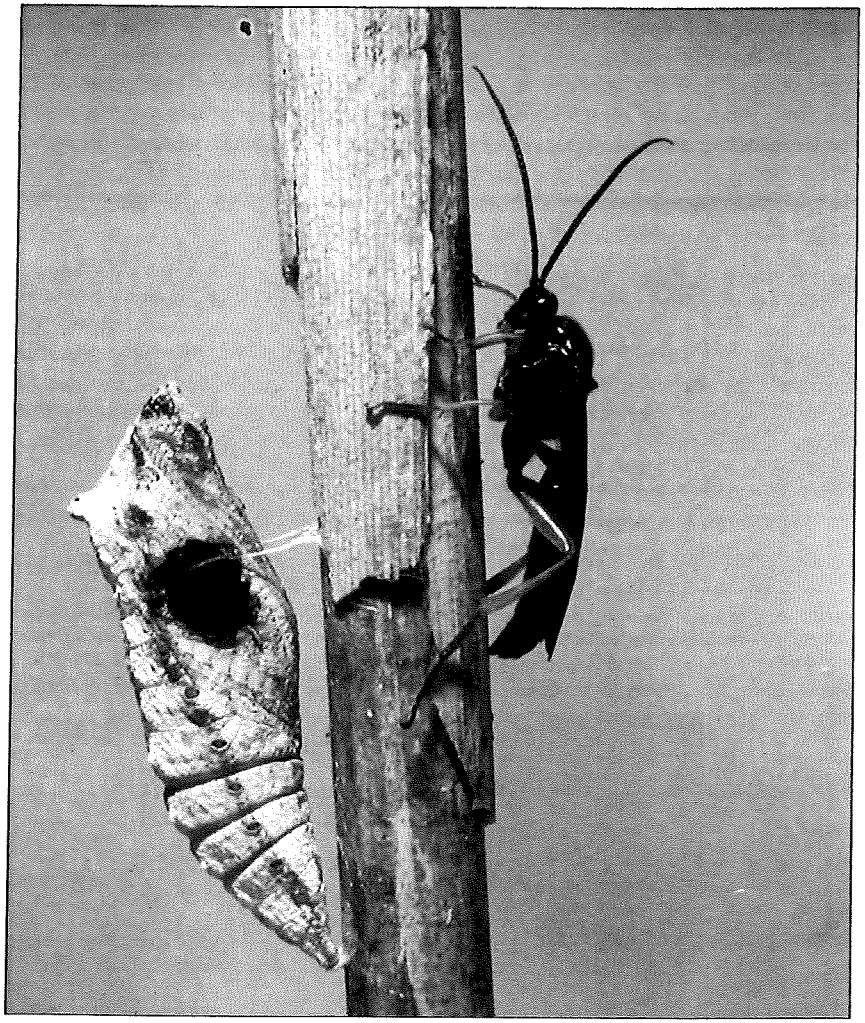

Plate E. Adult male *Trogus lapidator* (F.) adjacent to the *Papilio machaon* L. cocoon from which it emerged.

Discussion

It would appear from this experiment that, in spite of recent pessimism for its survival (Shaw in Shirt, 1987), that *Trogus lapidator* is still well-established in this part of Catfield Fen in the Norfolk Broads. It also seems that the extent to which *P. machaon* larvae are infested is fairly high. Forty-seven percent of the emergences from the pupae reared were of *T. lapidator*. Of interest is that all the parasites appeared to be males and that they all emerged before any *P. machaon* adults, with mean emergence dates separated by 30 days. This seems remarkable, but it is possible that the captive rearing conditions affected *P. machaon* more than *T. lapidator*, as the latter emerged at a time when the normal spring emergence of *P. machaon* should have been well underway. It is hoped to repeat this experiment to see whether the swallowtail population is parasitised by *Trogus lapidator* to the same extent as it is at Catfield Fen in other parts of the Norfolk Broads and if the degree of parasitism is constant between years.

Acknowledgements

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