THE IMMATURE STAGES OF THE COMMON CLEG *HAEMATOPOTA PLUVIALIS* L. (DIPTERA: TABANIDAE)

In the Field and in the Laboratory

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SUMMARY: Methods of obtaining eggs of *Haematopota pluvialis* in the laboratory are described, and a report is given of the hitherto unpublished finding of large numbers of larvae and pupae in natural pasture in Wales. A comparison is made of the incidence of larvae in uncultivated meadow and arable.

Introduction

The Castlemartin Army training area near Pembroke in Wales is heavily infested with adult clegs *Haematopota pluvialis* during the summer months of June, July and August, and the blood-sucking habits of the female fly cause considerable nuisance and discomfort to local residents, visitors, staff and soldiers on the range area. As part of a project to control the fly, attempts were made to locate breeding sites and immature stages. Tabanid larvae are typically described (Edwards, Oldroyd and Smart 1939) as requiring moist conditions in which to develop and since no previous account has been published of a systematic attempt to find larval *H. pluvialis* in the field, likely areas such as wet mud, stream margins and rotting vegetation were searched with no success.

Obtaining *H. pluvialis* eggs in the laboratory

In order to obtain some indication of the preferred oviposition site of *H. pluvialis*, glass jars of approximately one litre capacity were prepared with an inch-deep layer of damp soil and a few obliquely-placed grass-stems (Cameron 1934). In the first series, 25 adult female flies were caught in the glass tubes as they alighted to feed on human bait. They were immediately transferred to a Barraud cage which was then closely applied to the skin of a volunteer. Of the 25 flies, all but one engorged in periods varying from 3 to 27 minutes. Following the blood meal the flies were transferred individually to the glass jars. A weak sugar solution on a cotton-wool pad was provided as further sustenance. The number and type of egg-masses obtained and the site of oviposition within the jar are shown in Table I.

In a second series, a further 25 female clegs were caught in glass tubes and transferred to a 30 cm³ mosquito netting cage. A guinea pig, anaesthetised with veterinary Nembutal, was laid on the netting, and 22 of the flies engorged fully. The flies were then placed individually in glass jars prepared as before. Results of this series are given in Table II.

The wetter areas of soil in the jars were avoided as oviposition sites, and in both series double tiered egg-masses were always laid on grass stems rather than

Table I
Laboratory findings in first series of 25 adult female flies

Days after blood-meal	Number of egg masses	Tiers		Location
		Double	Single	
8	2	1	—	On grass-stem On damp soil
9	3	—	3	All on grass-stems
10	4	1	—	On grass-stem
	—	—	3	One on grass. Two on soil.
Totals	9	2	7	

Table II
Laboratory findings of second series of 25 adult female flies

Days after blood-meal	Number of egg masses	Tiers		Location
		Double	Single	
8	3	3	—	All on grass-stems
9	3	2	—	Both on grass-stems
	—	—	1	On damp soil
Totals	6	5	1	

damp soil. It is thought that these oviposition tendencies may indicate some preference in nature, but no egg-masses have as yet been found in the field.

Larval stages in the field

In an attempt to locate larvae in their natural environment a number of likely sites were investigated, including marshy borders of streams, damp ground, leaf-mould and rotting vegetation. No larvae were found in any of these areas. Cameron (1934) suggests that *H. pluvialis* may be similar to *Tabanus glaucopsis* in preferring drier sites for oviposition, in contrast to the majority of Tabanidae which seem to choose damper situations. This and the evidence of oviposition in the laboratory led to the search of open pasture-land for larval stages (Burgess, Shuttleworth and Chetwyn 1974). On one 12 foot square area of the Castlemartin range, 132 larvae were found. The soil was dug to a depth of 6 inches and fist-size pieces of turf and earth were picked through in the search for larvae. Each find was marked with a wooden peg (Fig. 1). In the early stages of the dig, the soil was moist following a spell of wet weather, and larvae were found within an inch or so of the surface. As the weather became warmer and the soil dried out over a period of 2 to 3 days, larvae were found deeper and eventually after a week of dry weather only appeared four inches or more from the surface. This would infer that the larva with its delicate integument cannot survive dessication and must maintain itself in soil which provides a sufficiently high moisture content. This factor also affects the density of earthworms and insect grubs on which larvae feed.

Several sites of similar old-field-pasture character were investigated, and all yielded a high concentration of *H. pluvialis* larvae. None of these areas had been

ploughed or fertilised for at least 30 years; the grass is cut annually for hay, usually towards the end of July.

Fig. 1. A 12-foot-square site in old-field-pasture on the Castlemartin Range area in which 132 *H. pluvialis* larvae were found. Pegs mark the location of each find.

In order to compare yields of larvae in undisturbed and cultivated pasture, twelve sites 6 foot square were dug on farm land in Devon, where the incidence of *H. pluvialis* causes discomfort, although the density of the fly is lower than at Castlemartin.

Sites in woodland and in river meadow produced no larvae; four sites in pasture which is ploughed every 3 to 4 years and chemically fertilised every year yielded a total of 5 larvae, whereas the same number of sites in undisturbed rough pasture yielded 44 larvae.

Pupal stages in the field

Cameron (1934) reported up to ten larval instars in laboratory-bred colonies. However, using his determinations of the lengths of the tentorial rods in the mouth-parts for each instar, none of the several hundred larvae found by the authors had developed beyond the seventh stage. A small number of live and relatively active pupae were discovered partly buried on the surface of soil and protected by grass-stems. Cameron suggests that a period of freezing is necessary for the full development of the larva and that the later larval stages only occurred in the laboratory when the colonies were artificially frozen, or in nature under adverse conditions. It is known that the larva will take at least a year to develop, and that there was very little freezing weather during the winter previous to the reported finds. Although it is accepted that the pupal stage is short in duration, it is perhaps surprising that so few pupae were found when larvae were so numerous.

Discussion

Although *Haematopota pluvialis* is perhaps the most common and widespread of the Tabanidae in Britain, and causes considerable nuisance and discomfort, this work would appear to be the first published description of the systematic search and discovery of large numbers of cleg larvae in the field. The authors' laboratory work confirms that of Cameron (1934) and would indicate that *H. pluvialis* lays its eggs on the surface of moist, but not wet, soil or at the base of grass-stems, and considerable finds of larvae in the field described in the present work show that the immature stages will live and develop in damp soil in pasture-land, with a high preference for undisturbed old-field-pasture which has not been ploughed or fertilised. It would seem that larvae in the field only pass through seven instars whereas those in the laboratory often have as many as ten. With the experience of some thirty digs in infested areas it is now possible to forecast suitable larval rearing sites from the appearance, situation and agricultural history of the area.

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