
Tachinid Parasites of the Horned Passalus Beetle

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INTRODUCTION

The horned passalus, *Popilius disjunctus* Illiger, 1800 (Passalidae), is found in the eastern part of the United States (Arnett, 1960) and is reported also from Mexico, Central America, and Brazil (Blackwelder, 1944).

All stages of the life cycle are passed in tunnels which the adults excavate in rotting logs, preferably in moist situations. Larvae and adults feed on rotting wood from the tunnels, with the qualification that the larvae feed on triturated wood pulp prepared by the adults and packed against the sides of the tunnels. According to rather extensive dietary studies by Pearse et al. (1936), the only really satisfactory diet for the larvae in the laboratory is the chewed-up wood prepared by the adults.

Zelia vertebrata Say (1824), the tachinid fly whose larva parasitizes *P. disjunctus* larvae, is reported as a parasite of this host in Duke Forest in North Carolina (Pearse et al., 1936 and Gray, 1946) and in Tennessee (Mangrum, 1942), and as a parasite of other hosts around Washington, D.C. (Hyslop, 1916). No parasitized larva or pupa from which a maggot emerges ever develops into an adult, though a parasitized larva may pupate before the maggot emerges (Gray, 1946).

With regard to the life cycle of this fly, Townsend (1936) states that the females of the tribe Zellini larviposit in choria where the first instar larvae can penetrate the hosts, and Gray (1946) reports that the larvae of *Z. vertebrata* enter the *P. disjunctus* larvae almost anywhere. Mangrum (1942) reports the pupal period as varying from 11 to 14 days under conditions in which external factors were not controlled so closely as the environment would be in the decaying logs. Hyslop (1916) reports the pupal period as varying from 17 to 27 days for parasites emerging from the tenebrionid larvae of *Meracantha contracta* Beauvois (1805) collected under club moss, but does not cite temperature or humidity conditions.

This paper outlines additional knowledge of the distribution and life cycle of this fly and its parasitization of *P. disjunctus*.

METHODS AND MATERIALS

Larvae and pupae of *P. disjunctus* were collected from Oliver's Woods in Norman, Oklahoma (summer, 1965) and from Mohawk Park, located just northeast of the city limits of Tulsa, Oklahoma (summers, 1965-66). They were kept at 75 to 78 F. and their food was the triturated wood pulp scraped off the sides of the tunnels at the time of collection. The food and the larvae were kept in fingerbowls and petri dishes, all of which were covered to maintain the high relative humidity required for normal development (Gray, 1946).

Larvae seen to be parasitized were observed at recorded intervals in order to learn something of the time elapsing between emergence of the maggot parasite and its pupation. Pupae of the parasites were placed singly in glass vials plugged with moist cotton and observed at recorded intervals to learn the pupation time. Adult flies were placed in a breeding cage. This was a styrofoam ice bucket cut down in height to achieve an inside depth of 1½ inches. It contained wood pulp and a bottle cap of sucrose solution. A glass plate was glued on the top, and holes were bored around the sides for the insertion of fly-containing vials. The wood pulp was examined at intervals with a dissecting microscope to observe fly eggs or larvae.

RESULTS

From 247 larvae, 43 prepupae, and 89 pupae of *Popilius* collected from Oliver's Woods, no maggot parasites emerged. Of 194 larvae collected from Mohawk Park 42 (21.6%) were parasitized. Of these, six were doubly parasitized. Thirty-one (74.5%) of the parasite pupae eclosed to adults.

In 18 cases, emergence from the host and pupation took place in observed parasites. The average time spent in this part of the life cycle was 49 hr, with a range from 7 to 90 hr. In 14 cases, pupation and eclo-

sion took place in observed parasites. The average time spent in the pupal stage was 16 days 10 hr, with a range from 15 days 11 hr to 17 days 7 hr.

Specimens resembling eggs were observed on the wood pulp in the cage after adults had been in it for several days. They resemble very much Clausen's (1940) picture of microtype tachinid eggs. They are shiny black, oval in dorsal view, and flattened dorsoventrally. For a sample of 50 eggs, the average length was 0.056 mm and the average width 0.41 mm.

DISCUSSION

For host larvae in Duke Forest in North Carolina, Pearse et al. (1936) report 10% parasitization in late summer and autumn, and Gray (1946) reports 33% parasitization in late July and August. The eggs found in this study suggest that the host larvae become parasitized by ingesting the eggs, which presumably hatch in the gut.

The absence of *Z. vertebrata* as a parasite of *P. disjunctus* in Oliver's Woods may be correlated with the geographical location of these woods and the nature of the surrounding plant communities. In this area a moist habitat with rotting logs is restricted to the floodplain, and the higher surrounding areas are much drier and more devoid of trees. This is to be contrasted with Mohawk Park, where the floodplain woods are more widespread and broadly connected and are closer to those parts of the eastern deciduous forest which have greater rainfall and offer more widespread habitats for *P. disjunctus*.

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