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Notes on the Biology of *Codrus Carolinensis* (Hymenoptera: Proctotrupidae), a Parasite of *Platydracus Violaceus* (Coleoptera: Staphylinidae)

Author(s): E. Richard Hoebeke

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NOTES ON THE BIOLOGY OF *CODRUS CAROLINENSIS*  
(HYMENOPTERA: PROCTOTRUPIDAE), A PARASITE OF  
*PLATYDRACUS VIOLACEUS* (COLEOPTERA: STAPHYLINIDAE)

E. Richard Hoebeke

*Abstract.*—*Codrus carolinensis* (Ashmead) is a gregarious internal parasite of larvae of *Platydracus violaceus* (Gravenhorst). Mature parasite larvae rupture and emerge through the integument of the mature host larva after consuming its internal contents. Development of mature, last instar larvae to pupae takes from 3-4 days, while that of pupae to adults from 6-8 days.

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Parasitic wasps of the family Proctotrupidae are commonly collected by sweeping vegetation and flowers, but little is known about their larval habits or host relations (Muesebeck et al., 1951). Based on few biological studies, they are solitary or gregarious parasites of larvae of Coleoptera such as Staphylinidae, Carabidae, Elateridae, and Coccinellidae, and of certain Diptera (Clausen, 1944). Balduf (1935), Clausen (1944), Elliott and Morley (1911), Morley (1922), and Thompson (1943, 1958) provide partial coverage of parasite-host records for the Proctotrupidae.

Reliable host records of *Codrus* (= *Exallonyx*) species include mainly the Staphylinidae, although other coleopterous species have been reported. These records are summarized in Table 1.

This present note provides further documentation of the parasitism of staphylinid larvae by *Codrus* in a previously unreported host, *Platydracus violaceus*.

#### Materials and Methods

Larvae of *Platydracus violaceus* were collected in April, 1972 and 1973, in lower and central Michigan, respectively, and in March, 1977, in the Finger Lakes Region of New York. Larvae were collected from under loose bark and in the rotten wood of felled hardwoods. Each staphylinid larva, along with frass and woody debris, was placed in a small culture-petri dish. The rearing dishes were kept moist and in a dark location and were checked once or twice daily. Temperature in the laboratory was assumed to be room temperature (21°-24°C). Voucher specimens of both parasites and hosts are in the collections of Michigan State University and Cornell University.

#### Results

On three separate occasions, wild-collected larvae of *Platydracus violaceus* were parasitized by the proctotrupid, *Codrus carolinensis*. A summary of

Table 1. Host records of *Codrus* (= *Exallonyx*) species.

Staphylinidae	Proctotrupidae	References
<i>Creophilus maxillosus</i> (Linn.)	<i>Exallonyx ater</i> (Nees)	Frohawke (1886), Bayford (1924)
<i>Ocypus olens</i> (Muller)	<i>E. ater</i>	Elliott & Morley (1911)
<i>Ocypus ater</i> Gravenhorst	<i>E. niger</i> (Panzer)	Weidemann (1962)
<i>Quedius</i> sp.	<i>E. ligatus talpae</i> Keiffer	Falcoz (1924)
<i>Quedius vexans</i> Eppelsheim	<i>E. ligatus</i> (Nees) & <i>E. brevicornis</i> Haliday	Smetana (1957)
<i>Philonthus turbidus</i> Erichson	<i>E. philonthaphagus</i> Williams	Williams (1932)
<i>Aleochara bilineata</i> Gyllenhal	<i>E. ligatus</i>	Smith (1927)
Carabidae		
<i>Pterostichus madidus</i> Fabr.	<i>E. ater</i>	Bayford (1924)

the number of parasites infecting each staphylinid larva, the duration of life stages of the parasite, and other pertinent information is presented below.

A larva collected in the location of Okemos, Michigan (Ingham County) on 3 April 1972, yielded 4 parasite larvae. Development of mature larvae to pupae took 3 days; of pupae to adults took 8 days (two of these pupae ceased development and succumbed at this time; one specimen was lost). The two emerged adults and the one remaining pharate adult were males. On 8 April, 1973, a larva collected near Manton, Michigan (Wexford County) yielded 5 parasite larvae. Development of mature larvae to pupae took 3 days; of pupae to adults took 8 days (all pupae developed into pharate adults when development ceased). Two of the pharate adults were males and three were females. On 10 March 1977, a larva collected near Danby, New York (Tompkins County) was parasitized by 2 parasite larvae. Development of mature larvae to pupae took 4 days and of pupae to adults took 6 days. One emerged adult was a male and the other was female.

The following events summarize the author's observations. Each of the last instar staphylinid larvae constructed a closed "cell" in the rearing medium of frass and wood fragments in preparation for pupating. At this time the larvae (or prepupae) became totally quiescent. In the following 2-3 days, no changes were observed in the prepupae other than some darkening of the integument. It was at this stage of development of the staphylinid that rapid development of the parasite larvae within the hosts was readily observed. Once the contents of the hosts were consumed, the mature parasite larvae emerged through the body wall, usually at mem-



Figs. 1-2. Immature stages of *Codrus carolinensis* (Proctotrupidae) parasitizing larva of *Platydracus violaceus* (Staphylinidae). 1, four mature parasite larvae emerging from the host. 2, two developing parasite pupae anchored by their abdomens in the host carcass.

branous areas of the lateral and ventral regions of the abdomen. The caudal ends of the larvae were anchored within the hosts' carcass with only the upper third of each larva visible (Fig. 1). Three to four days after the larvae appeared through the body wall of the hosts, pupation occurred. The pupae were situated with ends of their abdomens secured within the hosts' carcass (Fig. 2). Adult emergence occurred from 6–8 days after pupation.

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Department of Entomology, Cornell University, Ithaca, New York 14853.  
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**The Crane Fly Fauna of Kansas.\***—Geographic and ecological distribution of the crane flies (Tipulidae) occurring in eastern Kansas are mainly affected by climatic and geographic factors. In the contiguous United States, there are a widespread eastern fauna and a rather restricted or fragmented western fauna. The eastern part of Kansas is in the transition zone between the eastern forests and the central plains. The crane flies occurring in forested eastern Kansas represent in general the fauna of the state. Some of the eastern species extend, along the main rivers, into the unforested, western two-thirds of the state. There appear to be few crane fly species typical of prairie grasslands. This first study of this large, ecologically important family for this region suggests that most of the crane flies found in eastern Kansas had their origins in the more eastern part of the continent, with a few having entered the region from the south and possibly southwest. The known ranges of several species were extended significantly westward as a result of this investigation.—CHEN-WEN YOUNG, *University of Kansas, Lawrence*

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