Biology of *Craetopycrus cornutus* (GRAVENHORST), (Coleoptera : Staphylinidae) and Its Associated Species of Mite of the Genus *Pygmephorus* (Acarina : Pyemotidae)

M. SHAMSUDDIN, Rafi AL-HAFIDH and M. Amin AL-ADHAMI

*Department of Zoology, Faculty of Science, University of Mosul
Mosul, Iraq*

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*Craetopycrus cornutus* and its associated species of mite of the genus *Pygmephorus* were recorded for the first time in Iraq. The characters of various stages of the beetle were noted, measurements on these were done and certain aspects of life cycle were worked out. Incidence of the parasitic mite on the beetle host during 1966—67 was observed and the host-parasite relation and pathology were discussed. A series of measurements on the nymhal and adult stages well carried out and on the basis of laboratory and field observations the life cycle of the mite was suggested.

INTRODUCTION

There is, unfortunately, almost no biological literature available concerning *Craetopycrus cornutus* (GRAVENHORST). The only paper that could be traced is by XAMBEU, 1891, in which some details of larva and pupa of *Platystethus cornutus* have been reported. Recently, the beetle has been removed to the present genus, *Craetopycrus* from *Platystethus*, a genus about which equally little has been published regarding the biology (BELFOUR-BROWNE, 1967¹). Furthermore, the beetle has not been previously reported from Iraq (DERWESH, 1963).

Representative of Acaridae family whose adult stadia are bound to insects are encountered only rarely (SAMSINAK, 1963). Although species of *Pygmephorus* are reported to be commonly associated with insects that inhabit dung and compost (HYATT, 1966¹), there is no previous record of the mite associated with *C. cornutus*.

Studies were, therefore, initiated to determine the species of the beetle and the mite, their host-parasite relationship and their life cycle.

MATERIALS AND METHODS

Larval and adult beetles were collected from around three sites of the University of Mosul campus in Majmooah during 1966—67. Each of these sites consisted of an open roadside drain about 25 m long and with one water tap each. The

¹ Personal communication.
vegetation bordering these drains were moderately dense and consisted chiefly of grass, some moss and algae. Soil analyses of the three habitats gave an average of 63% of organic matter content.

Larvae of various sizes and under different stages of development were obtained from the mud entangled with the surrounding vegetation by washing the habitat material through a sieve. These were then stored in 7×5 cm open glass jars provided with a soil medium rich in aquatic insects and worms collected from the natural habitat. A temperature range of 21—24°C was found to be suitable for further development of the larvae.

Collection of adult beetles was easy in the sense that whenever the water tap of each site was left open for sometime, the beetles used to float and were then pipetted into collecting jars.

The mites were first encountered closely associated with the adult beetles in November 1966. Since then all collections were examined for the infected beetles. The mites were either examined alive on the host's body or recovered after fixing them in hot 70% alcohol and 10% formaline, then were made transparent and mounted in Canada balsam for further study. Detailed microscopic examination of the surrounding vegetation obtained from the collecting sites was regularly conducted to recover the mite eggs.

RESULTS

Larvae were found to be aggressive, predaceous and carnivorous and fed on soil arthropods, small insects and dipterous larvae. Forty larvae observed under a temperature range of 21—24°C pupated from 12 hr to one month. It was found that larvae kept under 10°C did not pupate and under natural conditions during December 1966 and February 1967 most of them overwintered.

The following characters of the beetle larvae were recorded: Campodeiform, average size 3 mm×0.5 mm (based on 20 specimens), body yellowish white with scattered pubescence, head oval with long inserted hairs and labrum distinct. Thoracic segments yellowish in colour and with hairs at the lateral margins. Legs terminate with a short claw. Nine abdominal segments with distinct lateral pubescence, the ninth segment truncated on either side and possesses a pair of cerci.

The pupa was enclosed into a gluing substance secreted in the last larval stage. The pupal period ranged from 15—24 days under the laboratory conditions. The average pupal period determined from 15 specimens of C. cornutus reared from larvae was 15 days.

The adult beetles thrived best in a medium containing damp grass with live worms and small insects. They were most active in media which were repressed during an interval of 3—4 days. Media containing dung or compost were found to be unsuitable. Adults were observed to be poor fliers and seldom took to their wings except at dusk. They uniformly exhibited the curious habit of curling the distal portion of the hind body over the back in a threatening manner.

The following adult characters were recorded: Slender elongate beetles with short truncate elytra. Average size 4.1 mm×0.8 mm (based on 20 specimens). Maximum width of head, thorax and abdomen, 0.8 mm, 0.96 mm and 0.93 mm
respectively. Antennae typically of eleven segments and clubbed. Tarsi three segmented and ending in a pair of well developed claws.

Natural infection of the adult beetle by the species of mite, *Pygmephorus* sp. was recorded only in *C. corneatus* although other insect species were also collected from the collecting sites. The following table shows the incidence of mite on the adult beetle.

<table>
<thead>
<tr>
<th>Date</th>
<th>Place</th>
<th>Infection (%)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov.—Dec. 1966</td>
<td>Majmooah Site I</td>
<td>62</td>
<td>For all three sites incidence with nymphal mites was highest during Dec.—March. Adults were available from April onwards.</td>
</tr>
<tr>
<td>Jan.—May 1967</td>
<td></td>
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<tr>
<td>Nov.—Dec. 1966</td>
<td>Majmooah Site II</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Jan.—May 1967</td>
<td></td>
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<tr>
<td>Nov.—Dec. 1966</td>
<td>Majmooah Site III</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Jan.—May 1967</td>
<td></td>
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From a single beetle as many as 20 mites were recovered from the intersegmental region between metathorax and the first abdominal segment (Fig. 1). Apparently, this was the site of choice for the parasitic mites. Their tubular gnathosoma remained inserted within the host’s tissue. In extreme cases the mites brought about inactivity of the host beetle and eroded the tissue of the adjoining areas through mechanical injury. No death of the host beetle was recorded chiefly on account of the mite infestation.

The second important site of infection was the entire dorsal region of the mesothorax underneath the elytra from which a maximum of 15 mites were regularly recovered (Fig. 2). The parasites produced mild to severe damage of the elytra and the adjoining areas of the mesothorax (Fig 3).

The base of the second and third coxae harboured the mites only occasionally and the mites were rarely obtained from around the mouthports of the beetles.

The following characters of the mites were recorded: Nymphs are translucent white and are easily detected on account of their black inverted Y shaped midgut which starts between the third pair of legs. Eyes and scutum are lacking. Gnathosoma tubular and chelicerae invisible. Legs are six-jointed, anterior pair short and stumpy, second pair slightly elongate and almost of the same size as that of the third pair and the fourth pair longest. Maximum width of 112μ was recorded across the bases of the third pair of legs. The total length ranged from 182—206μ and an average 194μ was determined for the nymph based on 10 specimens. Length of gnathosoma from base to apex was found to be 16—20μ (Fig. 4).

Adults are soft bodied mites, grey to black in colour with needle-like chelicerae and minute palpi. The total length varied from 176—208μ and the width ranged
from 128–144\(\mu\). Maximum length of gnathosoma, hypostome and chelicerae were recorded as 24\(\mu\), 16\(\mu\) and 8\(\mu\) respectively.

**DISCUSSION**

*C. cornutus* is a widespread southern palaeartic species extending from the west at least to India (BIHAR). Regarding its biology other than damp places, haystack refuse and compost nothing else is mentioned in the literature consulted. DERWESH (1963), has reported collection of unidentified species of the genus *Platystethus* from wheat and lettuce fields in Baghdad. In the present study observations on *C. cornutus* concerning its behaviour life cycle and its first record
from the margins of open drains in Iraq is noteworthy.

The species of *Pygmeophorus* which has been recorded for the first time about *C. cornutus* could not be identified, unfortunately, up to the species level. Dr. K. H. Hyatt kindly provided continuous help in the matters of identification and according to him the mites obtained from the beetles belong to the genus *Pygmeophorus*.

Despite continuous search for the mite eggs from all sorts of habitat material no eggs of the mite were recorded. Field observations show that the percent infection of beetles was highest during December to March mostly with the nymphal stages of the mite. During this period adults were scarce. Starting from April until June the nymphs progressively decreased in number from the usual sites and only a few adults could be recovered. With these observations at hand and on the basis of two main types of reproduction, ooviviparous and viviparous, prevailing in the family Pyemotidae, it is assumed that the adult mites start leaving the host during spring, mating takes place, perhaps, on the soil and then the females deposit their embryos on the host beetles which develop to maturity on the host’s body.

The work on the sub-family Glyciphaginace (Samsinak, 1963) shows that the adult stadia of these mites are bound to the pasalid beetles and remain attached to the host’s body even after their death. Samsinak’s work further shows that polymorphism of the body bristles occurs in the host beetles. In our present work it has been shown that the staphylinid beetles act as an essential host for the development of the nymphal mites up to the adult stage. Our collections also show that only the immature stadia are bound to the host beetles with some evidence of pathological symptoms but with no signs of polymorphisa of the body bristles.

Although there is enough evidence of parasitism by the nymphal mites, our studies show that *Pygmeophorus* cannot be used for biological control of *C. cornutus*. However, the beetle and the associated mite could be used as a very suitable material for the class-room study of host-parasite relationship since these are so easy to collect and to maintain in the laboratory.

Further experimental work seems desirable to complete the life cycle of the host beetle, to determine the specific nature of the life cycle of the mite and its identification up to the species level.

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REFERENCES

