

IMMATURE STAGES OF BATHYPLECTES CURCULIONIS THOMS.
(Hymenoptera, Ichneumonidae)

By

AMIRA A. IBRAHIM.

AHMED H. ELHENEIDY

Parasite Laboratory, Plant Protection Institute, Ministry of
Agriculture, Egypt.

ABSTRACT

The ichneumonid parasite Bathyplectes curculionis Thoms. is believed to be the most important parasite of the alfalfa weevil Hypera brunneipennis Bohman in Egypt. A rather detailed description of the immature forms of the parasite is given. Ovarian egg, deposited egg, three instar Larvae, cocoon, prepupa are described. It is hoped that the characteristics of the immature forms may settle some of the uncertainties about the relation between the parasite and its hosts of the genus Hypera.

INTRODUCTION

Egyptian clover (Trifolium alexandrinum L.) is the principal forage crop for feeding farm animals from November

till June. It is always infested with the alfalfa weevil Hypera brunneipennis Bohman, from February till April. This weevil has a larval parasite, Bathyplectes curculionis Thoms.

Observations on H. brunneipennis in the different governorates of Egypt indicated that it attacks Egyptian clover (Trifolium alexandrinum L.), Alfalfa (Medicago sativa L.), Fenugreek (Trigonella foenum graecum L.) and Flax (Linum usitatissimum).

The ichneumonid parasite, Bathyplectes curculionis Thoms. is considered to be the most important parasite of the Egyptian alfalfa weevil H. brunneipennis (Coleoptera, Curculionidae), Van den Bosch (1964), and El - Heneidy (1976).

This solitary internal larval parasite has been reported as being almost always able to develop successfully in H. postica, but it is often prevented from developing in larvae of H. brunneipennis because some larvae of that species make a defense reaction to it, Dietrick and Van den Bosch (1954) .

Mc Duffie (1945) liberated limited numbers of the parasite in Arizona, U.S.A, but none was recovered.

In U.S.A also, Van den Bosch (1953), recorded B. curculionis as a well adapted parasite associated with H. brunneipennis on wild clover in San Diego Country. In a further report of Van den Bosch (1959), in California, he stated that Bathyplectes curculionis destroyed about one third of the larval population of H. brunneipennis

In Egypt Van den Bosch (1964) reported that near Giza, parasitism on the larvae of H. brunneipennis by B. curculionis reached 26.7 and 44 % for the first and second parasite generations respectively. El-Heneidy (1976) reported that the high rates of parasitism were observed in Tahrir province at Nubariah locality.

The aim of this paper is to study the immature forms of the parasite.

METHODS AND TECHNIQUE

Laboratory rearing for host and parasite was as follows: Weekly samples of H. brunneipennis were collected from Egyptian clover fields by sweeping net in February. Weevils were sexed as Pienkowski et al (1969) , and pairs of weevils (♂ + ♀) were confined separately into petri-dishes lined with moistened cotton wool and covered with muslin cloth. Every dish was provided with

fresh clover leaves as food, and leaf-petioles as oviposition site. Dishes were examined daily to renew the plant parts. Stem-cuttings, with the eggs laid inside were transferred to new dishes and kept under laboratory conditions until hatching. Hatched larvae were transferred into glass tubes (1x3 inches). Tubes were examined daily to record larval instars and to change food. Pupae were left in the rearing tubes until adult emergence. Adult weevils were kept into new tubes with fresh leaves daily until aestivation started.

One complete generation of H. brunneipennis could be completed from February, 1975 till April, 1976 under laboratory conditions. This indicated that the pest undergoes but a single generation annually.

The mated female of the parasite inserts its ovipositor into the Hypera larval body for a few seconds through which eggs are laid . It puts from one to 22 eggs as a maximum number in one host larva . Females prefer the second and newly moulted third instar for oviposition. .

The parasite larva has three internal instars and the total larval period of the parasite until spinning its cocoon lasts for 14 -18 days within an average of 16 days at 20 °C

and R.H. of 60%. The prepupae of the parasite remain inside their cocoons until next season, when they pupate and issue as adult wasps.

DESCRIPTION OF IMMATURE STAGES

Egg : (Fig. 1)

The ovarian egg of Bathyplectes curculionis (Thomson), (Fig. 1.A) is oval in shape and is about 0.21 mm long and 0.05 mm at its widest part. Eggs are deposited within the host larval body. The newly deposited egg is elongate cylindrical in shape, with two rounded ends. (Fig 1. B). It measures about 0.36 mm long and 0.15 mm at its widest part. The chorion is thin, transparent almost colourless and has a smooth glistening surface. Its contents appear homogenous. Twenty four hours after deposition, the egg dimensions increase to 0.52 mm in length and 0.21 mm in width and it becomes pyriform. Just before hatching, the Larva could be easily detected through the translucent chorion showing the larval head and the caudal evagination (Fig. 1.C) and its dimensions increased to 0.63 mm in length and 0.25 mm in width.

Van den Bosch (1964) stated that in the larvae of H. brunneipennis, haemocyte reaction to the eggs of B. curculionis

is rapid, occurring within five hours after egg-deposition. Full encapsulation may occur within nine hours and the degree of encapsulation increases with the age of the host. It was found that the defense reaction made by H. brunneipennis involves encapsulation of the parasite egg by the blood cells, often, but not always, accompanied by brown or dark grey discolouration of the egg shell. Extensive encapsulation or darkening leads to the death of the parasite embryo. The defense reaction, therefore, reduces the efficiency of Bathyplectes as a parasite of H. brunneipennis (Fig. 1.D).

LARVAE:-

Bathyplectes curculionis has three larval instars.

(1) First instar larva (Fig 2.A):

The newly hatched larva is translucent white or almost colourless, measures about 0.59 mm in length and 0.20 mm in width. As development proceeds, the larva increases in size reaching 0.70 mm and 0.24 mm respectively towards the end of the instar. The head is comparatively thinner than the body, being about 0.14 mm in length and 0.12 mm in width. The body is slightly narrower posteriorly than anteriorly. The mouth parts are located on the ventral surface of the head. Mandibles (Fig . 2. Ca) are sickle shaped and

sharp pointed. They are yellow in colour, curved on their inner edge and well sclerotized. Each mandible is about 0.008 mm long and 0.008 mm at its widest base. The three thoracic segments are distinguished. The abdomen is 10 segments and terminates by a well distinct anal tail which is inclined ventrally and is about 0.23 mm long. This tail gradually reduces as development proceeds and disappears towards the end of the first instar. As most first instar larvae of this family, it usually show a progressive reduction in the appendage, (Clausen 1956). The internal systems of the first instar larva are not well differentiated. However the foregut appears as a simple narrow channel (Fig.2Aa) extends between the buccal cavity and the mid gut which enlarges and extends to the anal tail. There are a simple trachea but no spiracles and thus respiration seems to take place cutaneously.

(2) Second instar larva (Fig. 2.B).

The body of second instar larva is rather straight It is creamy in colour and consists of the same segments as in the first instar. Towards the end of the instar the body becomes 2.6 mm long and 0.96 mm wide. The head is comparatively small, being narrower than the body. Early in the instar, the mandibles (Fig. 2.C.b) are slightly sclerotized and difficult to be discerned but later **they** become heavily sclerotized and appear clearly in the head. Each mandible is about 0.016 mm long and 0.008 mm wide. The

alimentary canal becomes more differentiated and consists of a narrow tubular oesophagus leading into a cylindrical blind sac, the midgut. The tracheal system (Fig.2.B.b) is easily discerned and it is still closed. It consists of two longitudinal trunks, each extending laterally along one side of the body, connected with a dorsal commissure in the posterior part of the prothorax. In each body segment, each longitudinal trunk gives off a pair of tracheal branches, one dorsal and one ventral, which are further ramified into finer tracheoles. Still no spiracles can be seen .

(3) Thrid instar larva (Fig.3) :

The third instar larva lives for a short period within the host body after which it leaves the host. This larva is creamy, cylindrical and consists of the same number of segments of the second instar. It measures about 4.16 mm long and 1.63 mm wide at its widest part. The body is spindle shaped with the broader part at the abdominal region. The head is comparatively smaller than the body segments. The mandibles (Fig.2.Cc) differ from those of the second instar, they are larger and more deeply pigmented. Each mandible has a broad forked base and tapers to a sharp edge. It is about 0.096 mm long and 0.048 mm at its widest part. The labium is surrounded by an elliptical labial suture. The respiratory system (Fig. 3.B) is almost similar to

that of the second instar larva, the main difference is the presence of two pairs of lateral functional spiracles. The first spiracle of which though mesothoracic in origin is located at the posterior margin of the prothorax then the second one at the mesothorax. The digestive system, the oesophagus opens into the stomach which extends along the body and fills a good portion of its cavity.

(4) Cocoon (Fig.4.A):

Parasitised larvae of the host transform into pre-pupae inside silken cocoons with the parasites larvae inside their bodies. Mature larvae of the parasite issue from the prepupae of the host, and immediately starts to spin a cocoon in a close vicinity encountered in the host cocoon. Parasite cocoon (Fig. 4.A) is 3.11 mm in length and 1.73 mm in width. Its colour varies from light to dark brown with a mediam distinct broad whitish band.

Prepupa (Fig. 4.B):

The prepupae of the parasite remaine inside their cocoons until next spring, when they pupate and issue as adult wasp. Within the cocoon, the midgut of the prepupa opens into the hind gut and the meconium is discharged in the form of dark brown patch in the posterior end of the cocoon. Subsequently the body becomes opaque and measures about 2.5 mm long and 1.1 mm wide .

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

دأرسه الأَطوار غير الكأمله للطفيل

BATHYPLECTES CURCULIONIS THOMS. (Hymenoptera, Ichneumonidae)

أحمد الهنأدى

أمره عبد الحميد أبراهم

Bathyplectes curculionis Thoms. يعتبر الطفيل

أهم طفيل لسوسة ورق البرسيم فى مصر . وفى هذا البحث وصف مفصل للأطوار غير الكأمله للطفيل : البيضة المبيضة والبيضة الموصومة والأطوار الثلاثة البرقية والشرنقة وطور ما قبل العذراء .

ومن المنتظر أن يضيف هذا التفصيل للأطوار غير الكأمله بعض التوضيح

للألاقة بين الطفيل وعوائله من جنس Hypera

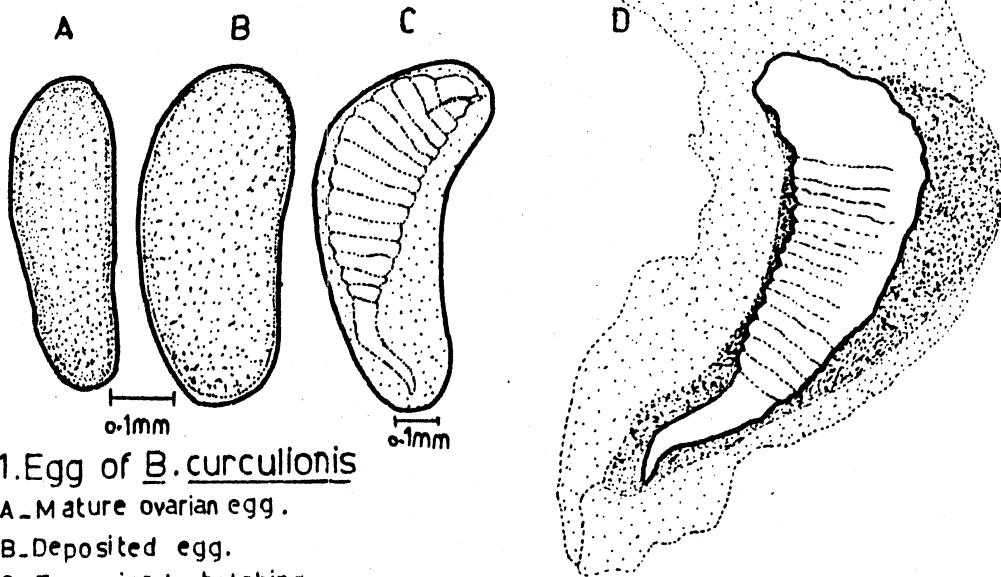


Fig.1. Egg of B. curculionis

- A. Mature ovarian egg.
- B. Deposited egg.
- C. Egg prior to hatching.
- D. Capsulated egg

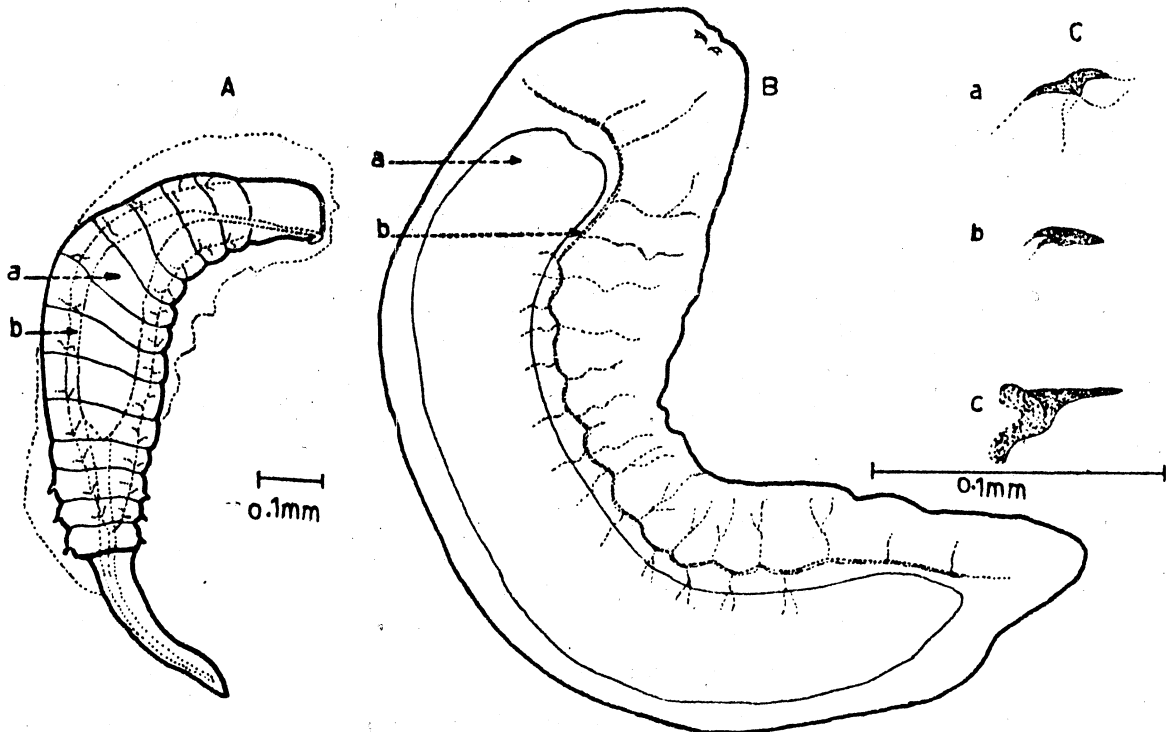


Fig.2. First and second larval instar of B. curculionis

- A. First instar.
 - B. Second instar.
 - C. Mandibles of the three larval instars.
- | | | |
|----------------------|------------------------|------------------|
| a. Alimentary tract. | b. Respiratory system. | |
| a. First instar | b. Second instar | c. Third instar. |

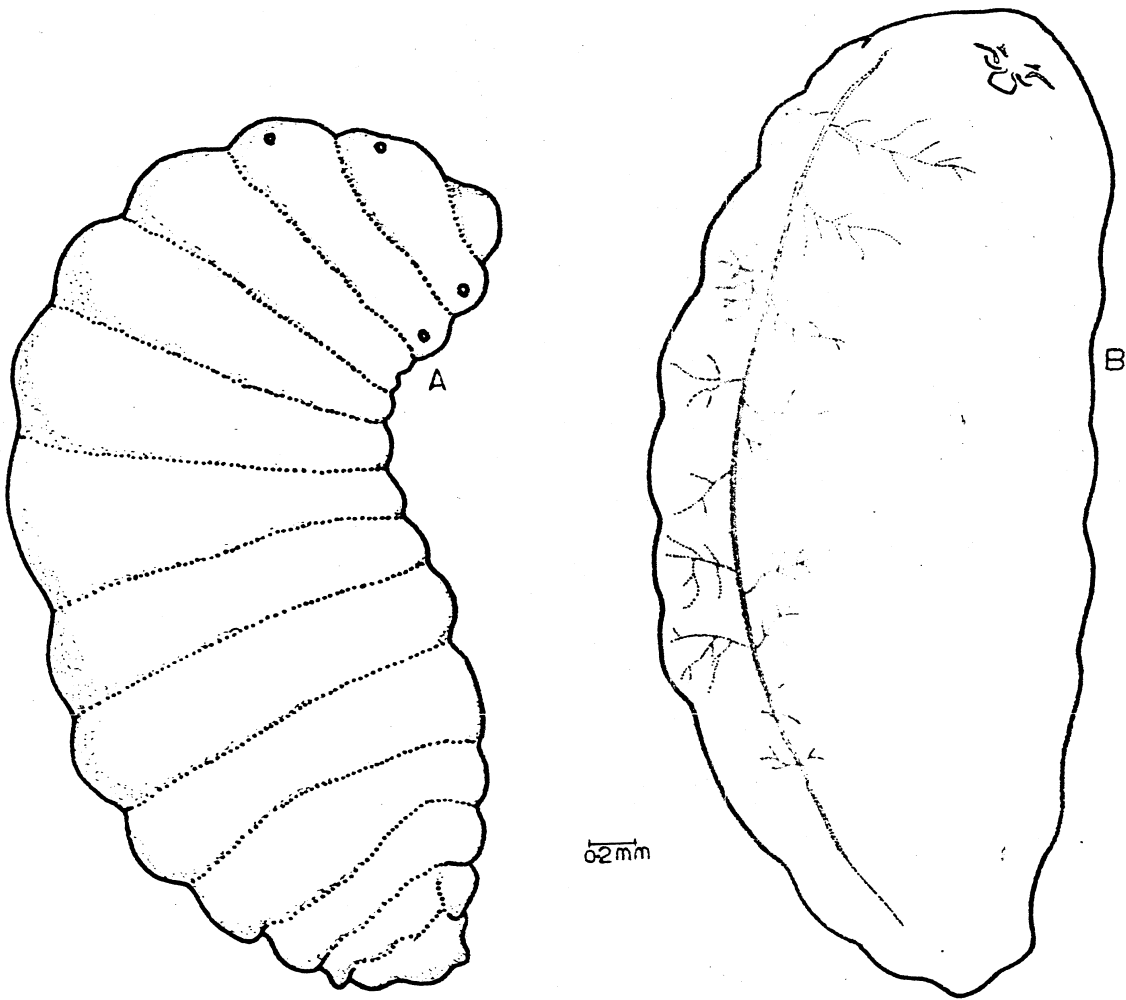


Fig.3. Third instar larva of B. curculionis.
A. Dorsal view.
B. Tracheal system.

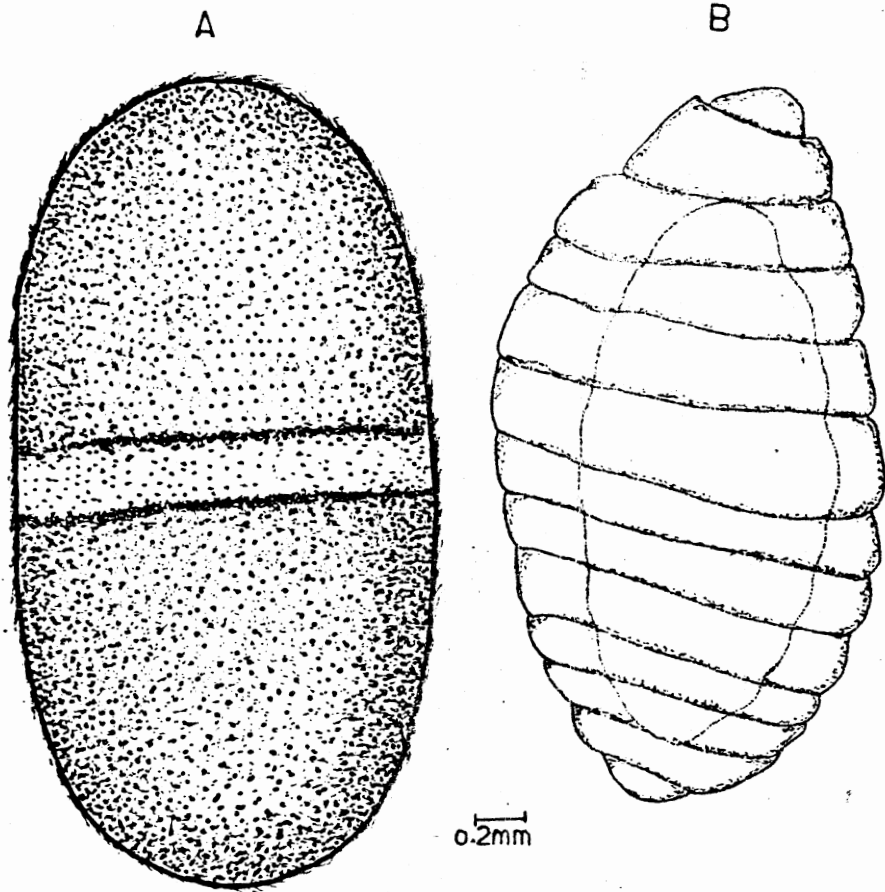


Fig. 4. A. Cocoon of B. curculions
B. Prepupa of B. curculions