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## Notes on a Collecting Spot in France and a Chalcid Larva (*Stilbula cynipiformis* Rossi). (Hymenop.: Eucharidae).

By H. L. PARKER, U. S. Bureau of Entomology.

High in the Gapeau Valley near the old convent of Montrieux before the clear waters of this stream come out on to the plains below Soliès Ville—where they are sopped up by the thirsty irrigation ditches—they jump along through shady lanes for several miles. Here and there cold springs rush out from the moss and ivy-covered banks to join the passing waters on their downward journey.

At a certain point which I well know, having visited it many times, there is a small plain where the narrow valley tries to widen out but is prevented by the tree-covered hills. It lies snug at the foot of the steep hills on one side and close against the river on the other, and the river lies close to the opposite hill.

Along the banks of the stream, even in August, all things are fresh and cool. The moss is soft, the ferns are rank, and the ivy twists around every trunk. Ten yards farther out there are dogwood bushes, wild plums, roses and brambles, clematis and small oaks with a carpet of grass tufts thrown in carelessly among them. Farther away from the stream by twenty yards the carpet changes to a thick layer of spiny genet in order to hide the ragged edges of the limestones which have lain in their beds for a thousand years. Here the Spanish broom and the spiny calycotome hold their usual lordly place among the macquis and over the whole is the vague dryish provençale enchantment of mid-summer. Moving from the banks of the stream to the foot of the hill is like passing from one clime to another. Here the dragonflies play and coveys of small moths rise from the ferns, there the cigales sing praises to the heat and the great "eyed" lizard\* suns itself on the Spanish broom.

To say that this spot is a collector's paradise would be somewhat of an exaggeration. It is a good collecting place for a student in any order. Beetles and bugs abound, moths and caterpillars are everywhere. The big tents of the pine processionary dot the plain and their nests are full of parasites, the dogwood leaves hide *Iponomeuta* and she in turn is host to thousands of chalcids. The dead limbs are full of *Xylocopa* nests abounding in cocoons of the rare *Polochrum* parasite. Two species of bumble bees have their nests in spots which I well know, the undersides of the limestone rocks are thick with wasp nests, and their holes and crevices bear colonies of sympathetic little *Leptothorax*. *Formica*<sup>1</sup> nests are as high as my knee and large areas are roped off for use by the ferocious *Camponotus*<sup>2</sup> while their cousins, the dark-loving *aethiops*, have built themselves mud nests in the midst of every grass tuft or beside every stone. The closer I look the smaller they become. Here is the little *Pheidole pallidula*, its tiny neighbors *Plagiolepis pygmaea*, *Tetramorium caespitum*, and minute *Solenopsis fugax* and their nests abound in inquilines<sup>3</sup> and strange-built proctotrypids.

Here then is a fine spot, and it is good to work here and to browse here and to sit here and think, but it is better still to sit here and do nothing. Here at dusk of a summer's evening I can hear the distant axes of the charcoal burners and bark takers, I can hear the twelve Chartreux monks, first to come from their long exile home to their monastery high on the hillside, chant with lusty lungs their praises to the friendly forests of pine and cork oak.

But back to the plain; if I have wandered away from the subject I have not wandered from the plain and for the balance of this harangue we must keep in the second zone about fifteen yards from the stream until we finish our work there, when we adjourn to the microscope.

Here, if I go under the bushes and brambles, and open one

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\* *L. ocellata* sometimes attains the length of  $2\frac{3}{4}$  feet.

<sup>1</sup> *F. rufa*.

<sup>2</sup> *cruentatus*.

<sup>3</sup> *Solenopsis imitatrix* Wasm. (et al).

of the mud nests of *C. aethiops* at this time of year, I will most certainly find cocoons in abundance in the burrows and chambers near the top of the nest. I must be quick to gather them, however, else the population will seize upon them and disappear into the darkness below.

Upon examining the cocoons I find that they are of several sizes. There is, rarely, a huge one probably bearing a queen, there is a somewhat smaller one bearing wingless workers with big heads, another of about the same size bearing winged forms, probably the males, and still smaller ones bearing the smaller and more abundant workers. In some nests one variety of cocoon will be present almost to the exclusion of others such for example as small workers while in another nest most of the cocoons will be winged forms.

The rare parasite *Stilbula cynipiformis* lives as a larva in the cocoons of this ant, where it sucks the contents from the

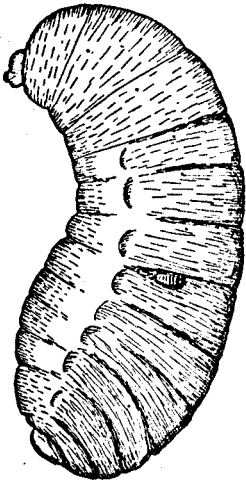


Fig.1

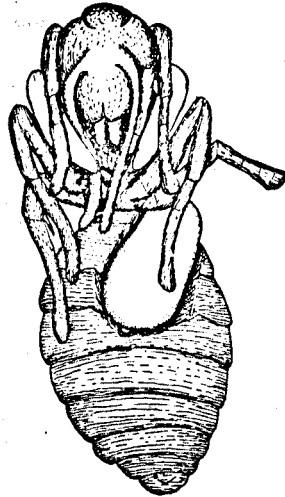


Fig.2

bodies of the large-headed worker and the winged form. How the small larva of the *Stilbula* gets into the nest is a mystery, but it does get there, for I have found it upon a larva of the ant within the cocoon. The illustration (fig. 1) shows a young larva (first stage) near the end of its feeding period, located

on the side of an ant larva. The next illustration (fig. 2) shows a larger (last stage) *Stilbula* attached in its characteristic manner to the abdomen of an ant pupa. Sometimes they are attached to the right side and sometimes to the left, but all that I have seen on pupae are attached somewhat ventrally. In this position the *Stilbula* larva completely empties the ant pupa, leaving the skin a white and useless shell.

I have given elsewhere \* a description of the young *Stilbula* larva but I shall say here that it is an extremely small animal whose body is composed of a dark head with two hooked mandibles and seven brownish ringlike segments with an eighth or terminal spinous segment. So far as I can see it has no spiracles or tracheae. When this larva has stuffed itself with the juices of the ant its body becomes a thousand times more voluminous than when it hatched, and it is so bloated that the dark rings composing the segments are widely separated, owing to the stretching of the skin.

When the skin is finally shed the next-stage larva, which I have not observed except from the remains, is apparently a rather oval whitish blotch without visible segmentation. It appears to have weak mandibles (fig. 2a), some tracheae, and two pairs of spiracles as well as several transverse rows of tiny spines on the skin.

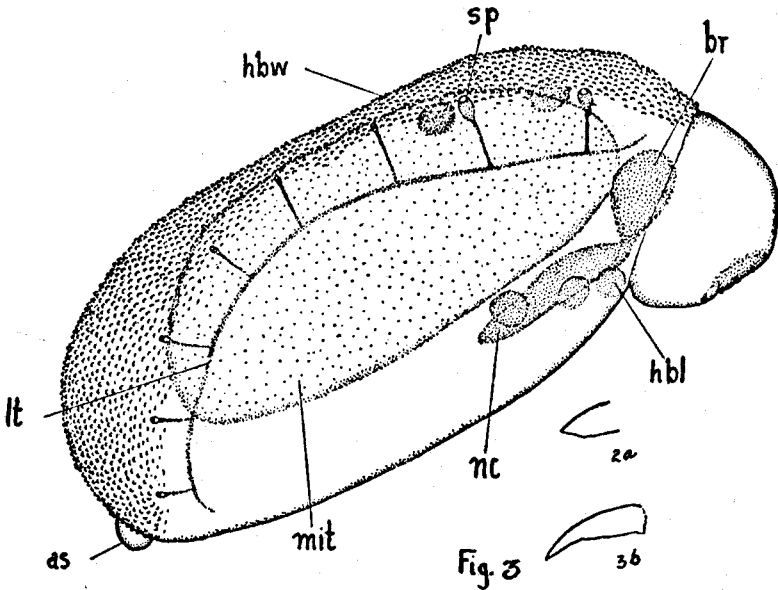
The last-stage larva (fig. 3) is a large whitish oval affair with its rather globular head bent somewhat ventrally. It is absolutely without segmentation except for the head and terminal segment, which latter is a small spherical tubercle (fig. 3 as). The body is soft and flabby and at no time have I ever seen a larva contract or contort its body as hymenopterous larvae often do. I have been unable even with the aid of a powerful microscope to observe the slightest sign of tegumentary muscles; and while I am not willing to affirm that there are not any, for fear there be some, I will say that if they are present they are reduced to the stage of tiny almost invisible fibres or else they have never developed beyond this stage. Whatever be the case, I can say that the larva of this animal

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\* Ann. Ent. Soc. Amer., Vol. XVIII, No. 3, p. 394.

is more nearly deprived of body muscles than any other Chalcid larva I have ever seen.

The head of this parasite larva is prominent enough, and is set off from the body by a slight constriction. Usually a larva of this order of insects will have certain distinguishing marks on its head such as a hard rim above the mouth, stiff cheek plates, and maxillae or else labium and sometimes antennae,



and sutures. This one has nothing except a slight depression which is the mouth and two weak mandibles (fig. 3b) but of the other organs there is no sign.

The back and sides for a way down are covered with small tubercles, and along each side is a row of eight open spiracles (fig. 3 *sp*) by which air is obtained, or else let out, or both; I have also observed a tracheal trunk (*lt*) on each side of the body and branches of various sizes but I can not place the bifurcations of these branches where they quit the main trunks. Inside the body I can also see the nervous system, or a part of it consisting of the brain (*br*) and a short ventral nerve chain (*nc*). There is a large stomach or mid intestine (*mit*)

filled with material, and fat lobes are present. In the head various structures can be seen as a whole but they can not very clearly be discerned separately and the same is true of the hind intestinal region. I have therefore put nothing in these areas in the drawing. In the one whole and stained specimen of *Stilbula* which I have I can not discern separately the salivary glands and malpighian tubes. The pads which will later form the legs and wings can be seen easily (*hbl*, *hbw*).

Thus it would appear that this insect has three larval stages. I have not observed a single individual grow from the first stage to the adult but the cast skins left by a larva during its development are invariably plastered into the skin of the ant pupa, one above the other, the smallest being near the spot where the feeding hole (and there is only one feeding hole) is located. If they are boiled and spread out in liquid gum arabic they can be pulled apart to a considerable extent and this is how I came by my present opinion.

The ants apparently do not harm the parasite but care as tenderly for the parasitized cocoon as for the other ones. The female is allowed to issue and go her way unmoisted to the outer world where in late July and early August she can be found sitting on grass blades and bushes in the plain beside the upper Gapeau and often at dusk the writer also can be found sitting close by.

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### **Duration of the Pupal Stage of *Tenebrio molitor* Linnaeus at Constant and at Alternating Temperatures (Coleop.: Tenebrionidae).**

By NELLIE M. PAYNE.

According to Uvarov (1931), few data exist on the effect of alternating temperatures on insect development. Therefore these results which were obtained with mealworm pupae will probably be of some interest. Temperature was controlled to within  $\pm 1$  degree Centigrade. Relative humidity was controlled by drawing air through an atmosphere of definite moisture content. In the temperature chambers there was free circulation of air. Freshly formed pupae which were never