

NOTES ON INDIAN ECONOMIC ENTOMOLOGY.

AN UNPUBLISHED PAPER BY THE LATE DR. E. BECHER.

Translated from the German by E. C. COTES.

I.—TRYCOLYGA BOMBYCIS.¹

[Plate V, fig. 1.]

Caput flavide nitens, fascia frontali nigra, occiput pilis canis longis præditum; oculi hirti; antennæ nigro-brunneæ; antennarum articulis tertius plus quam duplo longior secundo; palpi brunnei, in basi nigri, thorax cinereo-flavus quinque fasciis nigris fere æqua latitudine ornatus, quarum media antice inconspicua, thoracis latera cana, albide nitentia; scutellum fulvum, in basi nigrescens, setis quatuor longis in margine præditum; abdomen nigrum, segmenta singula, primo nigro excepto, antice fasciis latis albide flavescentibus, linea dorsali nigra; macrochetis marginalibus duabus in segmento primo et secundo, discoidalibus nullis; alæ fere vitreæ; squamæ albida-flavescentes, permagnæ; pedes nigri, femora albide nitentia.

Head in both sexes as broad as the thorax; the lower portion of the clypeus retracted, parts round the mouth but little prominent, whitish in colour, mouth bristles (*vibrissæ*) situated somewhat above the mouth on the sides of the clypeus; facial bristles (that is to say, the bristles situated above the mouth bristles) weak and short, not reaching as far as the middle of the clypeus, but approaching the bristles, which droop from the upper part of the head, genæ broad, of yellowish hue, not covered with fine bristles, but only having a few bristles drooping from above (there being five of these bristles in the male and three in the female), lateral portion of the clypeus about half the breadth of the eye, hairy, of whitish colour, forehead somewhat prominent, and occupying about a quarter of the breadth of the head in the male and a third of the breadth in the

¹ Becher described this insect as *Trycolyga bombycum*, nov. sp.; it has, however, already been discussed by Louis (*A few words on Sericulture in Bengal, 1880*), also by Cleghorn (*Note on the Natural History of the Bengal Silk-worm Fly in the Rajshahye District, 1887*) under the name of *Cæstrus bombycis*: the name *Trycolyga bombycis* seems, therefore, the best to adopt, as the insect has no connection with the genus *Cæstrus*.—E. C. C.

female ; in the male the borders of the forehead converge very markedly towards the vertex of the head, while in the female they are almost parallel. There are three bristles situated above the bristles on the genæ ; stripe on the forehead is smoky black ; sides of the forehead, and ocellus patch, are yellowish, the latter being a little the darker ; eyes very thickly covered with prominent hairs ; antennæ blackish brown at the base, appressed, the first joint short, the second somewhat produced, the third more than twice as long as the second with a sharp angle on the underside of the anterior portion, the hinder angle being rounded off ; the antennal bristle two-jointed, naked ; proboscis somewhat prominent, palpi almost cylindrical, but somewhat narrowed in front, the color yellowish brown with a darker base.

Dorsal thoracic shield yellowish grey, with four, almost equally broad, blackish longitudinal streaks, which nearly reach the scutellum behind, also a fifth similar streak, which becomes distinct on the transverse suture and runs quite up to the scutellum ; the inner paired streaks are somewhat narrower than the outer ; the sternal aspect of the thorax is grey with white sheen ; the dorsal aspect and sides are thickly covered with hairs.

The scutellum is brownish with black base and yellowish grey sheen ; on its outer edge are four long bristles.

The abdomen, which consists of four segments, is produced—oval in outline ; the first segment is black ; each of the following segments has a central black stripe forming a continuous line, and in front a broad yellowish white glistening connecting membrane ; genitalia, in the male, are black with reddish brown bristles at the extremity ; the ventral aspect of the abdomen is blackish grey with narrow black connecting membranes ; the sides of the second and third segments of the abdomen are of a reddish brown ground colour. There are two stout bristles on each of the first and second segments of the abdomen ; three pairs of long stout bristles on the edge of the third segment, one pair being situated on the upper surface and one pair on each side ; the posterior segment is thickly covered with hair and bristles.

Wings vitreous, proportionately of large size, without any marginal projection, the first posterior marginal cell, directed towards the apex of the wing, is open ; the fourth cell bends towards the third either along its whole length or at one corner only, without further appendage of veins, but with a wing fold that resembles a vein ; the apical transverse vein is somewhat bent in towards the posterior marginal cell ; the posterior transverse vein is slightly-s-shaped near the bend in the fourth longitudinal vein ; the second longitudinal vein has several bristles at the base ; the fifth longitudinal vein is distinctly wavy where it approaches the margin of the wing ; the sixth vein is much bent and does not reach

the margin. The alulæ are large and bluntly lancet-shaped; the valvæ are very large, in colour grey with yellowish margin.

Legs black; femora of greyish hue; femur of the front leg, on the outer side thickly covered with short hairs, on the inner side, both above and below, with rows of long bristles, the upper ones being less closely set than the lower ones; the femora of the middle and hind pairs of legs are thickly covered with hair, and also have a few large bristles. Tibiæ, besides short hairs, have some scattered bristles, which are most numerous in the hind pair of legs; in the middle pair of legs the tibia has two spine-like bristles at its extremity. Tarsi are covered with bristles; metatarsus is almost as long as the rest of the tarsal joints together, terminal tarsal joint is club-shaped; the male has large pulvelli, the female smaller ones; the claws are long and powerful, and have long slender bristles between them.

Length of body, in specimens taken from *Bombyx fortunatus* (or *Desi*), ranges in the male from 10·5 to 12 millimetres, and in the female from 8·5 to 11 millimetres: while in the specimens taken from *Attacus ricini* the length ranges in the male from 12 to 13·5 millimetres and in the female from 11 to 12 millimetres.

The flies taken from Maldah specimens of *Bombyx fortunatus* and also those from Dinajpore specimens of *Attacus ricini* belong to the same species; they differ from each other in their size, which depends on that of the host, and in the yellow colour, on the heads of the males taken from *Attacus ricini* being somewhat brighter than in the males from *Bombyx fortunatus*. *Trycolyga bombycis* is distinct from the dipterous parasite *Tachina oudji*, Guérin (Comptes Rendus, LXX, 1870, p. 844) = *Udschimya sericariae*, Rondani (Cornalia, Bull. Soc. Entom. Ital., II, 1870, p. 137), which attacks the silk-worm *Bombyx mori* in Japan: the two species may be distinguished by the fact that in *Trycolyga bombycis* the eyes are thickly covered with hair, and the abdomen is longer and more slender than in the Japan species. *Trycolyga bombycis* is very closely allied to the parasite *Exorista leucaniae*, Kirk. var. *cecropiae*, Riley (Ann. Rep. on the nox. benef. Insects of Missouri, II, p. 50), which attacks the American silk-worms *Attacus cecropiae* and *A. polyphemus*. About the latter parasite Riley writes (*loc. cit.* IV, p. 108, 1872)—

“The larvæ of this *Tachina* fly, which is also parasitic on the *Cecropia* worm, seem to produce an undue and unnatural growth of their victim. In the beginning of September 1866 I received an enormous *Cecropia* worm. It measured over 4 inches, was a full inch in diameter and weighed nearly 2 ounces, but, like many other large specimens which I have seen since, it was covered with small oval opaque white egg shells, clusters of four or five occurring on the back of each segment, invariably deposited in a transverse direction. The skin of the worm was black where the young parasites had hatched and penetrated. This large worm soon died and rotted, and in about twelve days a host of maggots gnawed their way through the putrid skin. These maggots averaged about one half inch in length, and in form

were like those of the common blow-fly. The head was attenuated and retractile and furnished with two minute curved hooks, and the last segment was squarely cut off, slightly concave, and with the usual two spiracles or breathing holes which this class of larvæ have at their tails.....They went into the ground and remained in the larva state all the winter, contracted to pupæ in the April following and the flies commenced to issue the last of May."¹

II.—CHALCIS CRICULÆ, *nov. sp.*, Kohl.

[Plate V, fig. 2.]

Mas: nigra alæ limpida; Femora postica rufo apice albido flava; caput et thorax subpunctata; facies deplanata; antennæ crassiculæ, apice externo flavido; scutellum convexum inerme.

Comparing this species with the palæartic *Chalcis podagrica*, Fabr. The head, which is black and slightly punctated, is similar except in having a smooth clypeus. Flabellum of antenna is somewhat slighter, the apex of the terminal joint being light yellow. The punctation on the head and sternum is less marked. On the scutellum the punctation is clearer and coarser than on the mesothorax, but on both it is so scattered that it gives the whole thorax the appearance of being distinctly more glossy than in most species of the genus *Chalcis*. The scutellum, which is not produced posteriorly, is unarmed and arched. The legs are slighter than in *podagrica* and are in proportion to the smaller size of the whole insect and its slighter antennæ. The extremities of the femora, tibiæ and tarsi of the two anterior pairs of legs are yellowish white, tinged in places with dull yellow. In the posterior pair of legs the femur is red with pale yellow extremity, and has from twelve to fourteen spines, which are smaller and more evenly arranged than in *podagrica*. The wings are vitreous. Length of the insect is

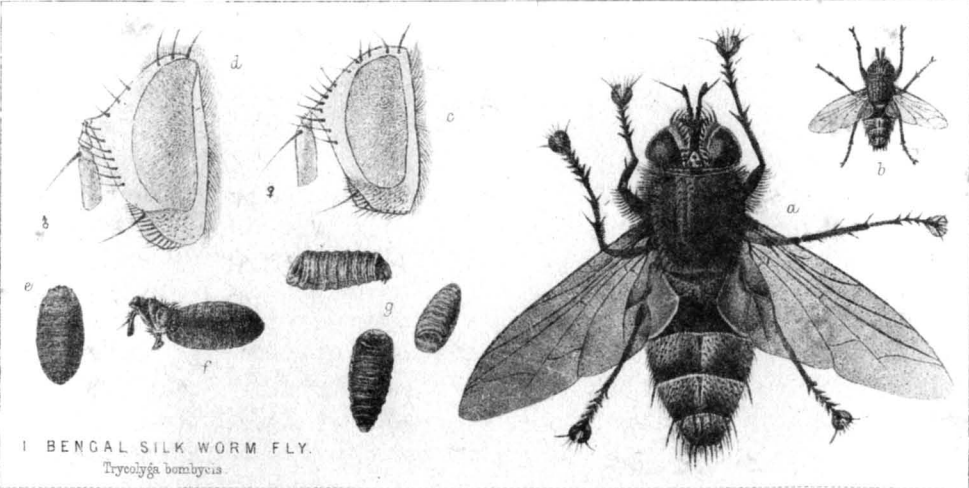
¹ Dr. Becher adds a note on the Uji Fly, whose life history he believed to be similar to that of *Trycolyga bombycis*. Apparently, however, he had only seen Sasaki's preliminary notice of his investigations on the subject (*Nature*, XXX, p. 436), and the life history as described by Sasaki was so anomalous that Dr. Becher rejected it as altogether improbable, adopting instead the older theory which, however, appears to have been based on little more than supposition. Sasaki has since published (*Journ. Coll. Sci. Tokyo, Japan*, Vol. I, 1886) an elaborate memoir on the subject, and seems fully to have established his observations, which show that this interesting species has a life history very different from that of *Trycolyga bombycis*. According to Sasaki the fly deposits its eggs, which are very small, on the underside of mulberry leaves. The silk-worms, in eating these leaves, swallow the eggs, without crushing them with their mandibles. The egg hatches in the digestive canal of the silk-worm, the maggot thence forces its way through the wall of the digestive canal into one of the nerve centres which lie below; here it remains, feeding upon the nerve cells and growing, until the membrane of the ganglion ruptures and the maggot passes into the body cavity. It then makes its way to the main trachea of one of the stigmata and fixes itself, with its head in the body cavity and its posterior stigmata in connection with one of the stigmata of its host. In this position it is enabled to respire and remains until full grown. The affected stigma of the silk-worm is easily recognized by the brown patch which surrounds it. When full fed the maggot cuts its way out of the body of its host and betakes itself to earth, where it pupates.—E. C. C.

four millimetres. The type specimen was parasitic upon a species of *Cricula* obtained in Ranchi.

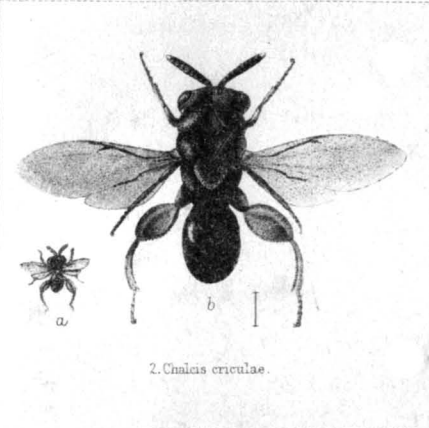
Explanation of the figures.

Plate V, fig. 1, Trycolyga bombycis; a, imago enlarged; b, imago nat. size; c, ♀ head in profile enlarged; d, ♂ head in profile enlarged; e, puparium nat. size; f, imago emerging from puparium; g, larvæ nat. size.

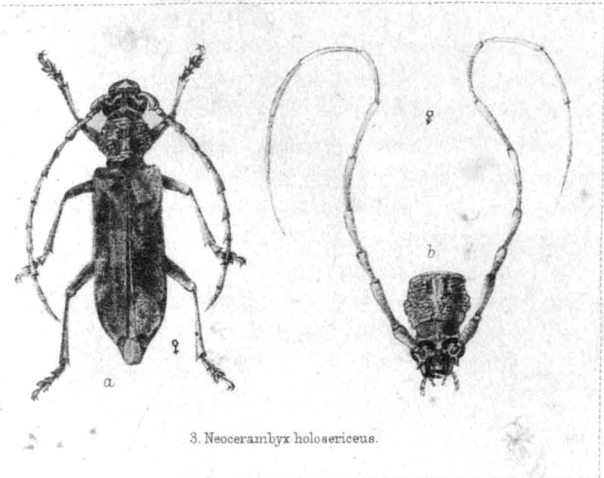
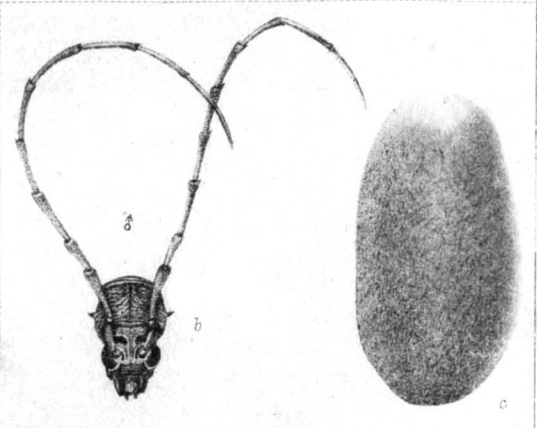
Plate V, fig. 2, Chalcis criculæ; a, imago nat. size; b, imago enlarged.



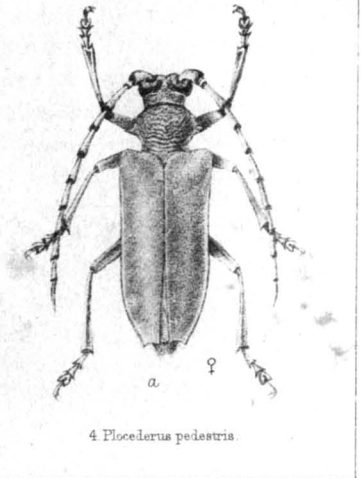
1 BENGAL SILK WORM FLY.
Trypalyga bombycis



2. *Chalcis criculae*.



3. *Neocerambyx holosericeus*.



4 *Plocederus pedestris*.

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Photo-etching from the original pencil Drawings Survey of India Offices, Calcutta, September 1889.