

REMARKS ON THE MORPHOLOGY OF THE TEAK MOTH,
HYBLAEA PUERA CR.
 (Lep. Hyblaeidae)

by

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The teak or djati moth, *Hyblaea puera* CR., is a common insect in the Malay Archipelago; it appears regularly, mostly once a year, in large numbers, seriously defoliating the teak forests in Central Java. The life history and ecology of the insect are very imperfectly known; moreover, its place in the system of Lepidoptera is uncertain. Consequently a morphological examination of the imago, and of other stages, is desirable in order to arrive at a better understanding of the systematic position of this insect.

By most authors, *Hyblaea* is placed in the so-called *Noctuidae*, on account of its facies. The insect, however, possesses certain morphological characters, which make its inclusion in *Noctuidae* impossible. These characters are:

1. the absence of tympanic organs near base of abdomen;
2. a 3-jointed maxillary palpus;
3. a peculiar secondary sexual organ on the male hind tibia, hitherto undescribed;
4. the tridentate uncus in the male genitalia, also hitherto undescribed.

ZERNY and BAYER (1936) consider the genus *Hyblaea* as a representative of a distinct family which they separate from the *Noctuidae* on the following grounds: "Maxillary palpi distinct, triangular. Discoidal cell open, areola absent, all branches

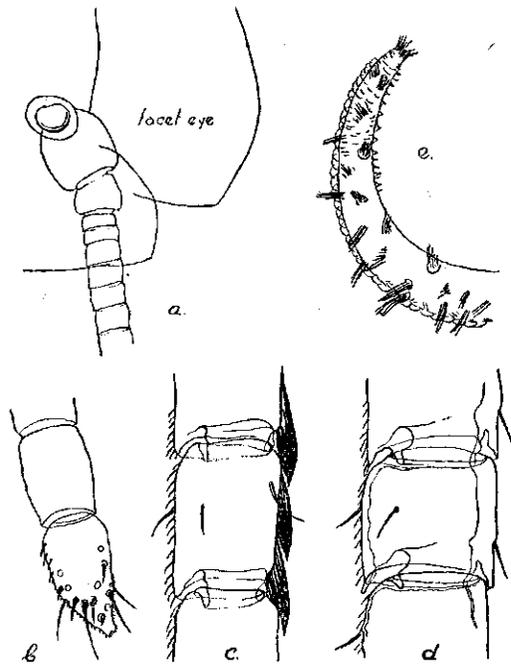


Fig. 1. a. base of antenna, $\times 30$, b. apex of antenna, $\times 150$, c and d. median part of antenna: c. right antenna σ , dorsally, $\times 150$. d. left antenna f , ventrally, $\times 150$. e. apex of the proboscis $\times 150$.

of radius free from cell. Family *Hyblaeidae*"; whereas they characterize the true *Noctuidae* as follows: "Maxillary palpi minute. Cell closed, forewing mostly with one areola. Branches of radius partially stalked. Family *Noctuidae*". To this we can add that in *Noctuidae* a tridentate uncus never occurs; such a structure is typical in *Thyatiridae* as already stated by PIERCE (1909), who points out that: "They (*Cymatophoridae* = *Thyatiridae*) are at once distinguished from the *Noctuidae* by the fact that the uncus is trifurcate".

However, *Hyblaeidae* differ also from *Thyatiridae*, viz, by the 3-jointed maxillary palpus, by the cubitus in fore wing being quadrifid instead of trifid, cf. FORBES (1923), and by the fusion of radius and subcosta in hind wing being shifted near base of cell and not beyond cell.

FORBES (1933) investigated the pupa and stated that it is pyralidoid. This is not in accordance with the characters of the imago. It is highly desirable to examine the caterpillar carefully, in order to arrive at a better understanding of the taxonomic position of the genus *Hyblaea*.

DESCRIPTION.

Head. Ocelli absent. No frontal sutures. Antennae filiform, gradually tapering, sparsely covered with some small bristles, slightly sexually different, in the male being more covered with scale-like hairs. (fig. 1 a, b, c and d). Chaetosema absent. Clypeus broadly hatchet-shaped in dorsal aspect, not covering the mouth parts (fig. 2) Epipharynx about as large as clypeus, weakly chitinated, covered with a pilifer bearing a brush of stiff bristles. Proboscis rather short, apically with a number of sensory organs (fig. 1c). Maxillary palpi less reduced, straight, about as long as or slightly shorter than second joint of labial palpi, distinctly 3-jointed

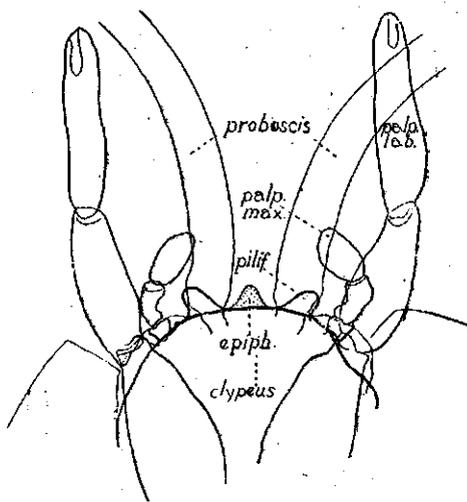


Fig. 2. Head of imago, $\times 30$.

and densely hairy (fig. 2). Labial palpi 3-jointed, about as long as 1/3 of proboscis, second and third joint hairy, though not in the same extent as the maxillary palpus, with an apical sensory cavity (fig. 2).

Thorax. Collare strongly chitinated, patagia well developed, shield-like, about 2/3 of length of anterior coxa and half as broad. Forelegs rather short, second pair the largest. Fore coxae elongated and articulating with the prothorax. Middle coxae broadly conical, outer side about

as long as base. Hind coxae with a very broad base, fused with the metathorax, from which a lobiform process covers the articulation of the trochanter in front. In hind legs the coxae are closer to each other than in middle and fore legs. The fore tibia bears a thick and adpressed middle spur (epiphysis) which reaches the apex of tibia; it may serve for cleaning antennae and proboscis. The middle tibia is elongated, with two apical spurs, the outer one half as long as the inner, or $\frac{1}{4}$ and $\frac{1}{2}$ of the length of tibia, respectively. The hind tibia in the male has developed a shield-like enlargement which exceeds the apex. A long hair-brush originates near the upper end of the tibia, in the articulation of the knee, from a small oval or circular patch; this brush is about as long as the enlargement of the tibia and may be considered as a secondary sexual organ (FORBES 1923 a.o.). At the base of hind coxa in male originates a membranaceous, club-shaped appendage, densely clothed with scales (fig. 3). This peculiar structure runs along the femur with its petiole, and widens beyond the knee in a bag-like apical part which corresponds with the enlargement of the tibia. The long scent hairs of the mentioned brush are wrapped in this organ, which consists of a three times folded layer (fig. 4).

In the female the middle tibia has a pair of middle spurs and a pair of apical ones, of the former the one as long as the shortest apical spur, the other shorter. The longest apical spur is slightly less than two times the other, and about $\frac{1}{3}$ of tibia. This tarsus is normal, 5-jointed, joint 1 at least two times as long as joint 2, joints 2-5 of about equal length. They bear 2-3 rows of strong spines on inner side. The 5th joint bears simple claws, an arolium (called pulvillus by many authors), and two small structures, "auxilia" (SNODGRASS, 1935).

Wings. The venation consists of a subcosta and a bifid radius, divided into 5 free sectors (fig. 5). Areola absent. Base of media

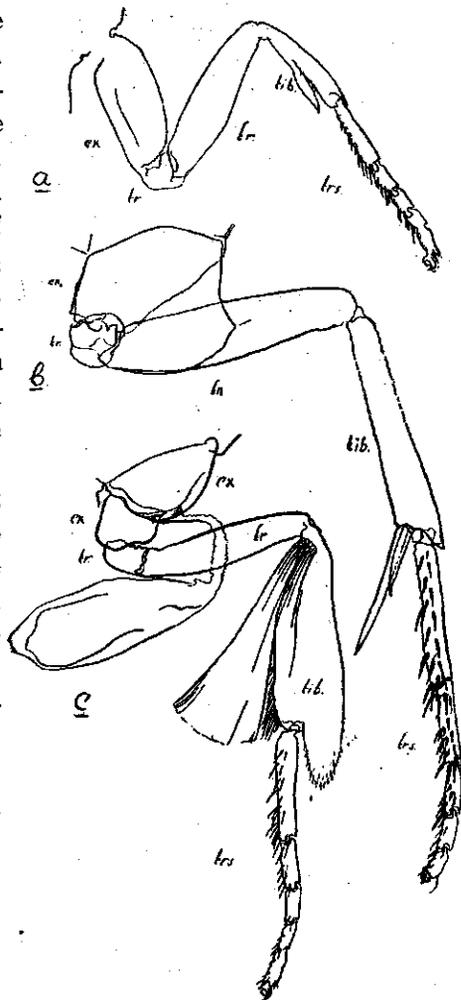


Fig. 3. Legs of imago, ♂: a, b en c resp. fore, middle and hind leg, $\times 10$.

obliterate, M_1 from near base of R_5 , M_2 and M_3 from lower angle of cell, the latter open. Cu_1 and Cu_2 normal, the latter from about $2/3$ of lower margin of cell. An_1 obliterate, only indicated by a slight fold in the wing membrane. An_2 and An_3 normal, the latter bent to the middle of hind margin, but not reaching it. Frenulum well developed in both sexes, in female trifid. The hind wing differs from the fore wing by the reduction of the sectors of the radius. S_1+R_1 from near base of cell, M_1 from upper angle of cell, M_2 slightly more remote from M_3 . Cu_1 fused with M_3 . Cu

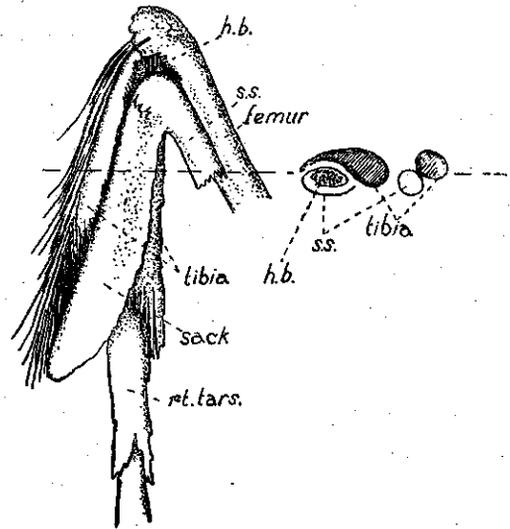


Fig. 4. The situation of the secondary sexual apparatus in hind leg of δ , about $\times 13$. Left: anterior aspect with the bag in foreground; right: section through the structure showing interior construction.

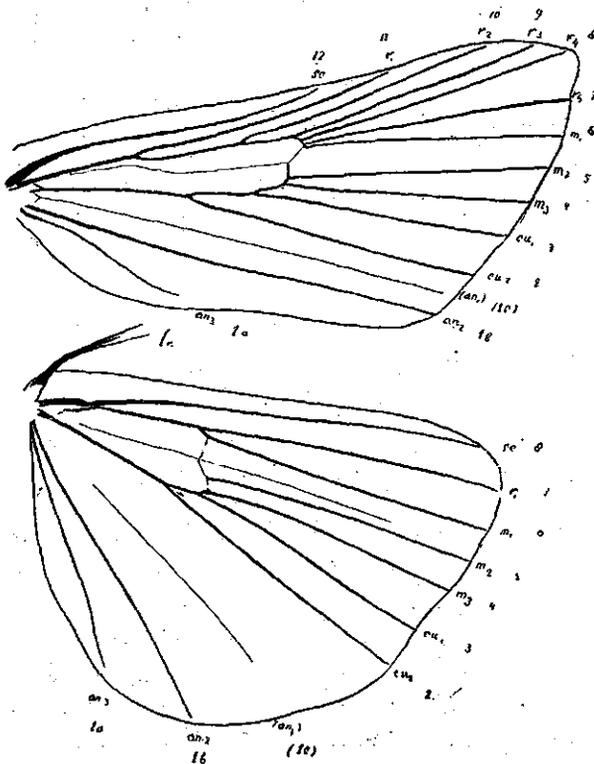


Fig. 5. Venation of fore and hind wing in female, $\times 4$.

with two branches, An_1 obliterate, An_2 and An_3 present and free.

Abdomen. Tympanic organs absent. Male genitalia concealed in segments VII and VIII. Tergite IX, called tegumen by most authors, is elongate, narrow and fused with tergite X, the so-called uncus. The latter is conspicuous, consisting of three long blade-like portions, bent downwards. Two big lateral lobes originate from tegumen below uncus, densely clothed with bristles. The valvae are very simple, hairy, and bear near base each a strong, hook-shaped process which may be the same as the harpe.

The outer border of this hook is denticulate near its apex. The aedeagus is short and rather weak, with a long, extruding, membranaceous vesica, but without chitinous structures. In the female the ostium bursae is connected behind sternite VII by a long ductus with

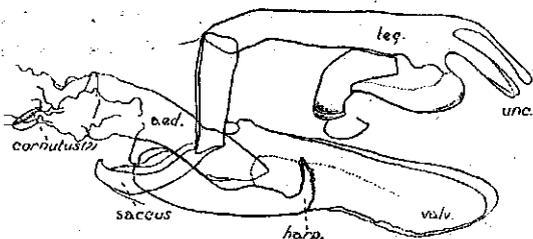


Fig. 6. Male genitalia, laterally, $\times 30$.

the large, balloon-shaped bursa copulatrix (fig. 8). Its inner chitinous membrane is concentrically wrinkled, and bears a signum, consisting of two large spines, of unequal length, divergent from a common base. These spines are heavily covered with smaller spines. The ostium bursae is situated on a triangular, chitinous plate, belonging to sternite VIII, its margins are bent upwards. The tergite VIII is membranaceous, the apex is formed by a hairy anal papil, considered as a combination of segments IX+X. The tendons are very weakly developed. It may be remembered here, that in Lepidoptera, as probably in all insects possessing a so-called "ovitubus", the primary genital aperture in the female, the oviporus, is situated between sternites IX en X. Under "ovitubus" we understand the terminal abdominal, more or less telescoping segments.

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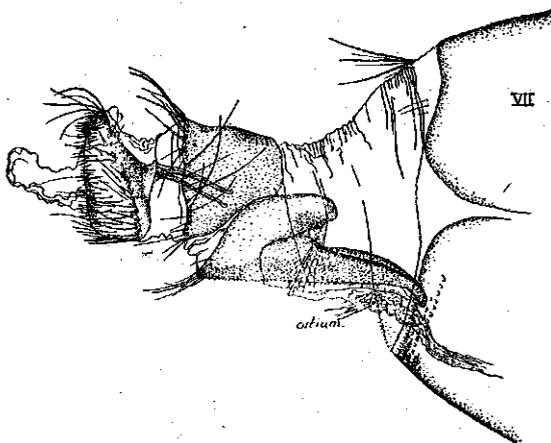


Fig. 7. Female genitalia, $\times 20$.

TECHNIQUE.

This investigation was carried out already in 1939, in the Entomological Laboratory of the Agricultural University, Wageningen, under the supervision of the second author. The material — a number of specimens of *Hyblaea puera* CR. from Java — was procured by the Laboratory. The dried specimens were treated with KOH 10% on a water-bath about $\frac{1}{2}$ hour; after being soaked in H_2O they were heated during

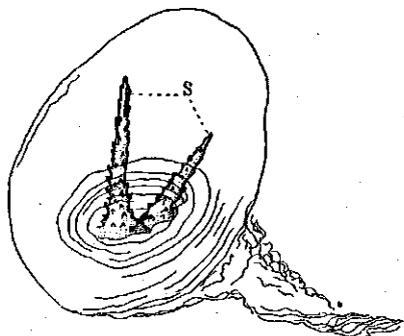


Fig. 8. Bursa copulatrix, $\times 20$.

5 min. in a mixture of phenol and chloral hydrate, and mounted in Canada balsam, using creosote as a medium. This method gives excellent results. For the genitalia, the KOH was replaced by lactic acid 70%, but it was not possible to make the vesica clearly visible in this way. Also the method recommended by JANSE (1932), consisting of blowing up the macerated abdomen with a small pipet, gave no satisfactory results. The wings were also mounted in balsam, after removing of the scales mechanically, but without maceration.

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