SYSTEMATIC POSITION OF THE GENUS CURETIS (LEPIDOPTERA ; RHOPALOCERA)

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SYSTEMATIC POSITION OF THE GENUS *CURETIS* (LEPIDOPTERA ; RHOPALOCERA)

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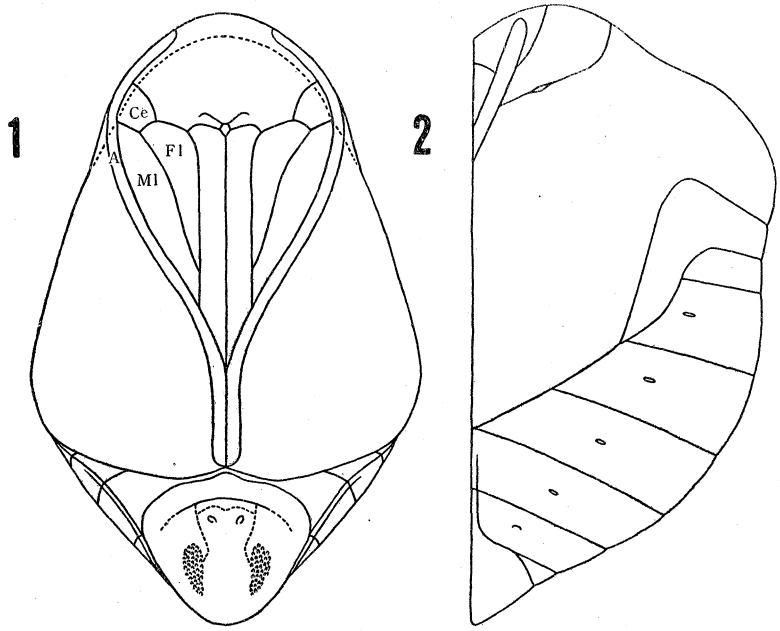
The genus *Curetis* Hübner, 1823, has been recognized as belonging to the family Lycaenidae, but it is quite different from the other Lycaenids in some structural characteristics of the pupa and the imago. In the present paper, the structural characters of the genus *Curetis* have been particularly speculated to account for the systematic position of the genus.

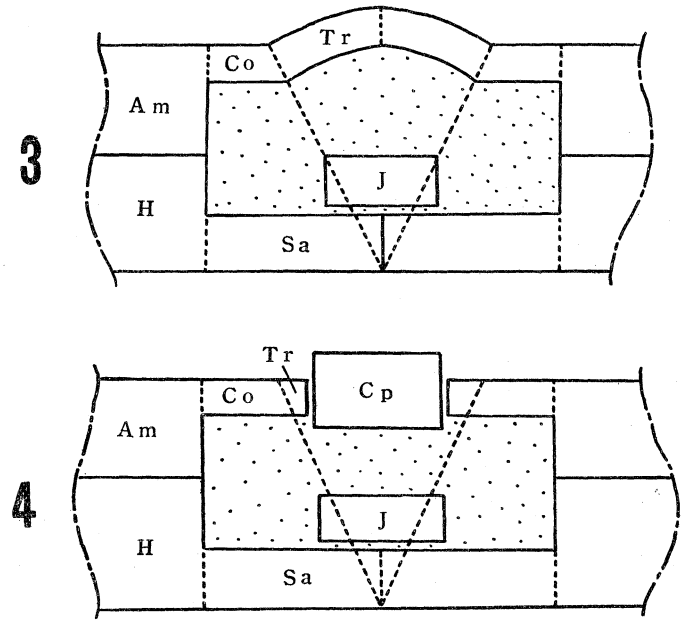
Before going further the writers wish to express their hearty thanks to Professor Teiso Esaki and Professor Keizo Yasumatsu, of the Entomological Laboratory, Faculty of Agriculture, Kyushu University, for their kindness rendered in various ways.

The general structures of the genus are well known. The full descriptions of the appearance have been given by the previous authors, such as de Nicéville (1890), Bingham (1907), Seitz (1910), Swinhoe (1911) and Evans (1954), and the structure of the male genitalia was briefly noted by Chapman (1915) and Corbet and Pendlebury (1956). In their descriptions, the fact that the genus is utterly unique in some features among the Lycaenids has been already stated. Besides the specialities which have been pointed out by them, there are some characteristics which seem to be important in order to determine the relationships of the genus. The most important characteristics are exhibited in the structures of the pupa and in the male genital armature of the imago. The descriptions of these are given here to facilitate an understanding of the discussion in the latter pages.

For the description of the structure of the pupa *Curetis acuta* Moore was used, and for the description of the male genital armature of the imago *C. acuta* Moore, *C. bulis* Doubleday et Hewitson, *C. thetis* Drury, *C. brunnea* Wileman and *C. tagalica* C. et R. Felder were dissected.



Figs. 1–2. Pupa of *Curetis acuta* Moore. 1. Ventral aspect. 2. Lateral aspect. A, antenna; Ce, compound eye; Fl, fore leg; Ml, mid-leg.

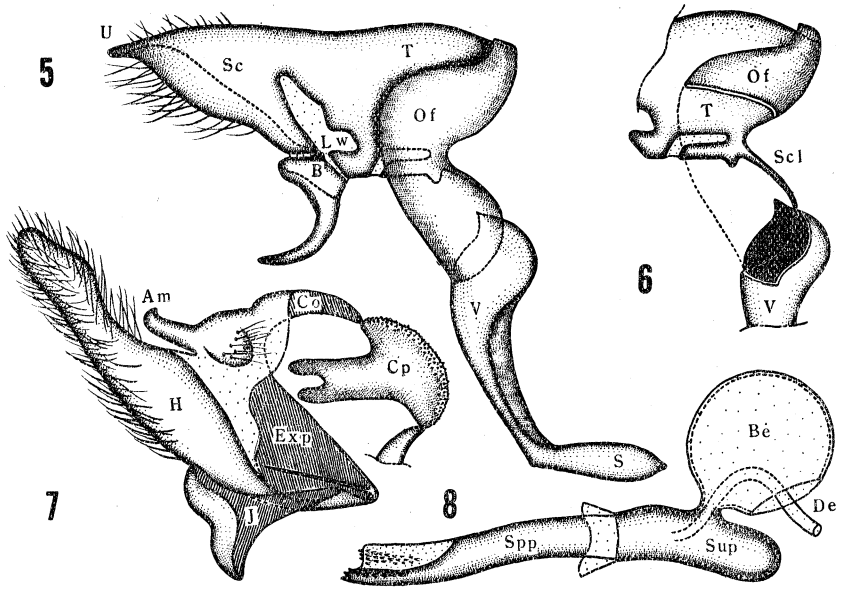


Figs. 3–4. Diagrammatic representations of the typical transtilla (fig. 3) and the central plate (fig. 4). Am, ampulla; Co, costa; Cp, central plate; H, harpe; J, juxta; Sa, sacculus; Tr, transtilla.

Descriptions of the Pupa and the Male Genitalia of the Imago

Pupa hemispherical in shape, with the ventral surface flattened, the lateral ridge sharply keeled; compound eyes with grazed eye-piece and scalloped one indistinguishable from each other; mid-leg adjoined to compound eye at the base; abdominal segments eight in appearance, with a pair of stigmata on each of the second to sixth, the last pair of stigmata rudimentary; the posterior end of fore wing reaches near the posterior margin of the sixth abdominal segment.

Male genitalia highly complicated in structure; dorsum hooded, with uncus vestigial, tegumen completely ankylosed to scaphium, the lateral windows (=the lateral parts of "okonze" of Kusnezov) reach the ventral margin; ring separated into the dorsal piece (tegumen) and the ventral one (vinculum), leaving a slender sclerite and the broad out-turned flap, the posterior margin of which closely welded to the posterior margin of vinculum, therefore vinculum becomes a double-walled ring; valvae highly



Figs. 5–8. The semi-diagrammatic representations of the male genital organs of the genus *Curetis*. 5. Ring, lateral aspect. 6. Showing the articulation between the tegumen and the vinculum, with a part of the out-turned flap is removed. 7. Right valva and its appendages, internal aspect. 8. Aedeagus, lateral aspect. Am, ampulla; B, brachium; Be, bulbus ejaculatorius; Co, costa; Cp, central plate; De, ductus ejaculatorius; Exp, external wall; H, harpe; J, juxta; Lw, lateral window; M, manica; Of, out-turned flap; S, saccus; Sc, scaphium; Scl, slender sclerites; Spp, suprazonal sheath of aedeagus; Sup, subzonal sheath of aedeagus; T, tegumen; U, uncus; V, vinculum.

specialized, with the external wall very thin, degenerated into semi-membrane in parts, harpe well developed, pubescent on the internal side, ampulla hooky, the external wall of costa extended proximally, forming transtilla, the proximal tip of which articulated to the edge of the

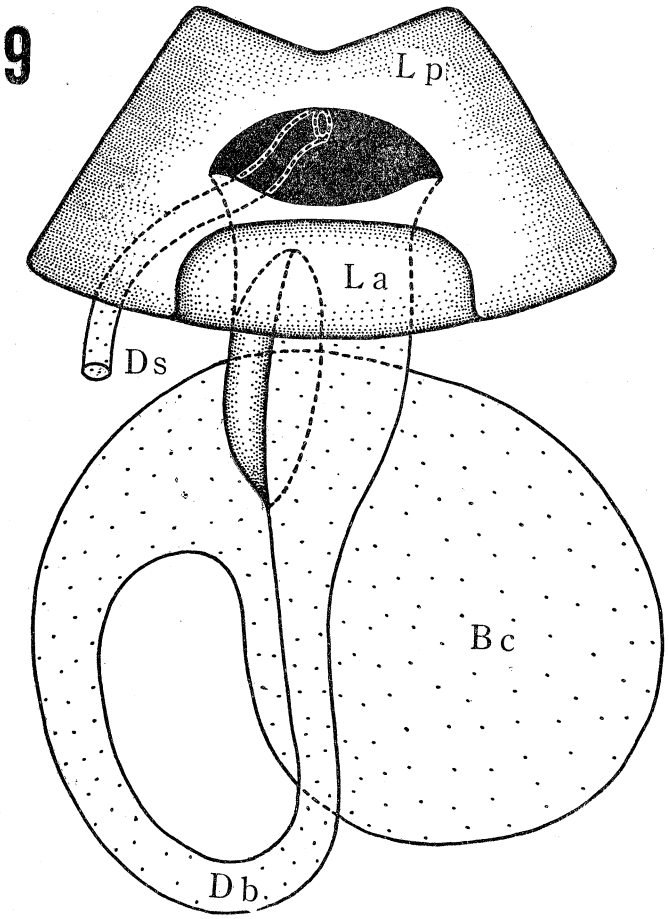
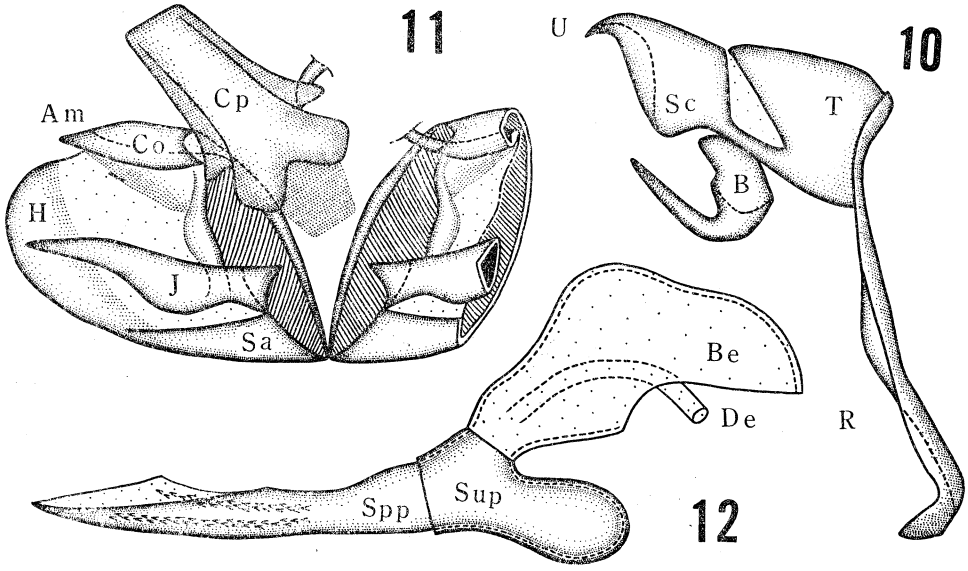


Fig. 9. Semi-diagrammatic representation of the female genitalia of *Curetis acuta* Moore. Bc, bursa copulatrix; Db, ductus bursae; Ds, ductus seminalis; La, lamella antevaginalis; Lp, lamella postvaginalis.

"central plate" (see below); juxta T-shaped; aedeagus short, thick, with the dorsal opening of the subzonal sheath discoidal, small, bulbus ejaculatorius bulbed, cornuti represented by two bunches of numerous minute spinules; brachia articulated to the lower edge of the lateral window.

An attention should be paid to the curious structure "central plate",

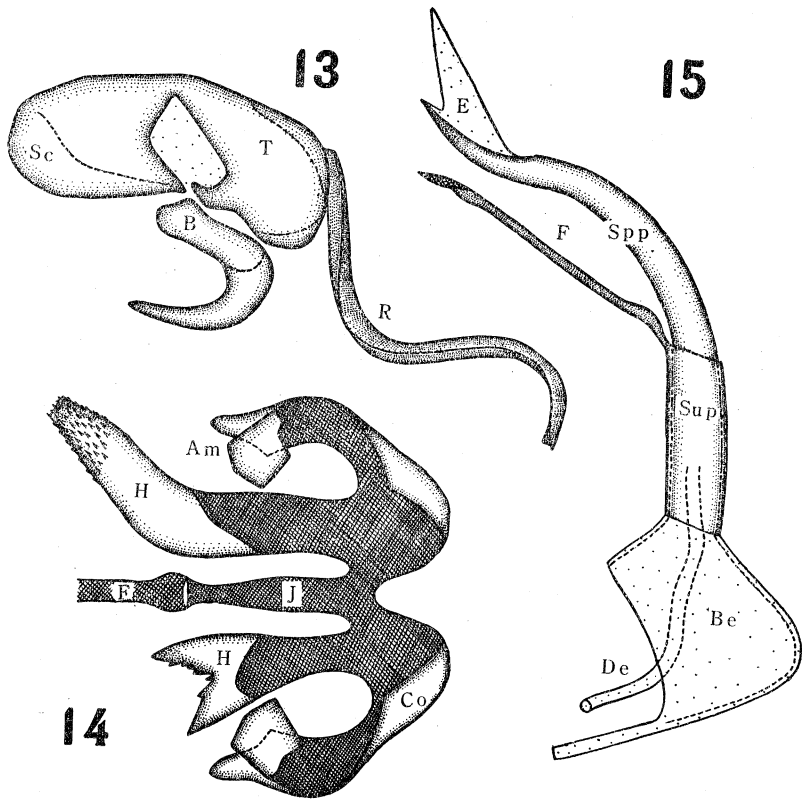
which is the plate-like sclerite situated dorsad of the aedeagus, and is well preserved throughout the genus. The organ bridges both costal elongations of the two valvae, taking the form of a fan in generalized form, with the surface scobinate. For the similar structure in the Geometridae, Pierce (1914) proposed the term "transtilla", which designates the costal elongations themselves, the direct derivatives from the valvae. On the other hand the central plate, here proposed, does not represent any valval derivatives. The organ, therefore, may deserve a special term. A more extensive discussion of this structure will be undertaken elsewhere by the senior author.



Figs. 10-12. Semi-diagrammatic representations of the male genital organs of *Zemeros flegyas indicus* Fruhstorfer (Riodinidae, Hamearinae). 10. Ring, lateral aspect. 11. Valvae and their appendages, internal aspect. 12. Aedeagus, lateral aspect. Am, ampulla; B, brachium; Be, bulbus ejaculatorius; Co, costa; Cp, central plate; De, ductus ejaculatorius; H, harpe; J, juxta; Sa, sacculus; Sc, scaphium; Spp, suprazonal sheath; Sup, subzonal sheath; T, tegumen; U, uncus; V, vinculum.

According to Chapman (1915), the male specimens of *Curetis* furnish a fan on the basal abdominal segment. The fan consists of a large pencil of hairs arising from a special area on the lower posterior angle of the dorsal plate of the second abdominal segment, and it is very similar to the fan that exists in Sphinges and in some Noctuae.

In addition to the preceding investigations, the wing venation, the cephalic appendages, the legs and the female genitalia were examined.



Figs. 13–15. Semi-diagrammatic representations of the male genital organs of *Chorinea sylphina gratiosa* (Stichel) (Riodinidae, Riodiniinae). 13. Ring, lateral aspect. 14. Valvae and their appendages, internal aspect. The two valvae and the juxta are completely welded to each other, and the sacculi are entirely obliterated. 15. Aedeagus, lateral aspect. B, brachium; Be, bulbus ejaculatorius; Co, costa; De, ductus ejaculatorius; E, vesica; F, fibula; H, harpe; J, juxta, Sc, scaphium; Spp, suprazonal sheath; Sup, subzonal sheath; T, tegumen; V, vinculum.

Discussion

De Nicéville (1890) placed the genus in the *Amblypodia* group, based on the arrangement of veins of the fore wing, but he stated, "it is quite aberrant and stands alone, and I do not know where better to place it." The first attempt to separate the genus from the other Lycaenid groups was undertaken by Bingham (1907), who created the subfamily Curetinae. But there was no author who recognized the genus as a representative outside the Lycaenidae.

After analysing of a considerable number of characters the writers

feel that the genus *Curetis* is never confamilial with the other Lycaenid genera. A comparison between the genus *Curetis* and the other Lycaenid genera is as follows:

Egg is more coarsely reticulated than in the other Lycaenid genera.

Larva is as aberrant as its pupa. The twelfth segment bears two long cylindrical pillars, which may be unique organ among the Rhopalocerous larvae.

Pupa. Compound eyes with grazed eye-piece and scalloped one indistinguishable from each other, while they are always set off by a suture in the other Lycaenid genera. Mid-leg adjoined to compound eye at the base, while it is always detached from compound eye in the other Lycaenid genera. The posterior end of the fore wing almost reaches the posterior margin of the sixth abdominal segment, while it does not reach the posterior margin of the fifth abdominal segment in the other Lycaenid genera.

Above all, the characteristic that the base of the mid-leg is adjoined to the compound eye is found not in the family Lycaenidae but in the group Nymphalides.

Imago. Fore wing: Vein 7 terminating on the outer margin below the apex, while it is terminating on the costal margin just above the apex in the other Lycaenid genera. Male genitalia: Tegumen and vinculum separable, while they are completely fused in the other Lycaenid genera; the external walls of the valvae degenerated into a semi-membranous structure, while they are well sclerotized in the other Lycaenid genera; the costal elongations of the two valvae connected with each other by the central plate, which is, as far as the writers could ascertain, always absent not only in the other Lycaenid genera but in any genus in Rhopalocera except for the Hamearinid genera; bulbus ejaculatorius bulbed, while it is generally trapezoidal or semilunate in the other Lycaenid genera.

As mentioned above, the male genitalic characters preserved in the genus *Curetis* are quite differentiated from those of the other Lycaenid genera, and they show a closest resemblance to those of the Hamearinid genera (Riodinidae). The fact that the male genitalia of Nemeobiinae (=Hamearinae) somewhat resemble those of *Curetis* has been already pointed out by Stichel (1910). The central plate, the hooded dorsum, and the bulbed bulbus ejaculatorius are all retained in the Hamearinid genera, in which the detailed structures of the male genitalia are as follows:

Dorsum closely related to that of the genus *Curetis*, with scaphium and tegumen separated from each other by a membranous area, which is exactly corresponding to the "lateral windows" preserved in the genus *Curetis* and in the Thecline genera; tegumen and vinculum completely united into a ring, with saccus vestigial or entirely suppressed, while, in the genus *Curetis*, they are separable; valvae highly complicated, but in

fundamental structure rather similar to those of the genus *Curetis*, harpe of normal type, not so specialized as in the genus *Curetis*, sacculus normal, costa well developed, forming a costal projection or a costal lobe, ampulla bluntly produced, sometimes forming a distinct prominence, such protrudent nature of ampulla may suggest the specialized hooky ampulla preserved in the genus *Curetis*; central plate generally well developed, tightly connected with the dorsal margin of the zone of aedeagus at the ventral margin; juxta generally highly specialized, divided into two pieces at the centre, sometimes entirely obliterated, in this case aedeagus supported by the thin membrane; aedeagus moderate in length, with cornuti represented by one or two bunches of numerous minute spinules, bulbus ejaculatorius bulbed; brachia connected to the ventral edge of tegumen.

Notwithstanding such close similarity, there is a difficulty in regarding the genus *Curetis* as one of the Hamearinid genera. The external characters of the two groups are so estranged from each other that they have apparently not any intimate kinship. In the genus *Curetis*, the external characters are entirely of Lycaenid-type: Fore leg well developed, with tarsus clearly separated from tibia; palpi long, overtopping beyond the frons; fore wing without vein 8; hind wing without precosta. On the other hand those of the Hamearinid genera are quite different from the precedings; fore leg more or less atrophied, with tarsus united with tibia; palpi short, never surpassing the frons; fore wing with always vein 8; hind wing with precosta.

In the sense of modern taxonomy, there is no doubt that the morphological characteristics in the imago or in the earlier stages give the fundamental data to a phylogenetic conclusion. But, however the genitalic characters may be so similar, it is unadvisable to regard the genus *Curetis* as one of the Hamearinae leaving the external characters out of consideration. On the other hand, it is also unreasonable to place the genus in the family Lycaenidae as the previous authors did. As a conclusion, it seems more probable that the genus may represent an independent family "**Curetidae**". Aside from the matter on the systematic unit, the genus *Curetis* may be regarded as a transitional group from the Lycaenidae to the group Nymphalides.

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