CEPHONODES HYLAS (L.) (LEPIDOPTERA: SPHINGIDAE): FIRST TIME DESCRIBED IN DETAIL WITH REFERENCE TO ITS GENITALIA

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Abstract

The *Cephonodes hylas* (L.) of the family Sphingidae first time described in detail with special reference to its head components, venations of both wings and male and female genitalia. The systematic position within the genus is also briefly discussed by using apomorphic characters.

Introduction

The representatives of the genus *Cephonodes* are distributed throughout Ethiopian, Oriental and Australian regions. Eighteen species are recorded under the genus *Cephonodes* Hubner. Moore (1882-83) described only one species of *C. hylas* from Ceylon with its brief description of colour pattern and larvae. Cotes and Swinhoe (1887) mentioned only one species *C. hylas* as *Hemaris hylas* from Japan, China, and Australia, all parts of India, Ceylon and Africa in their catalogue of moths of India. Hampson (1892) in his fauna of British India including Ceylon and Burma described only one species *C. hylas* with its brief description and colour pattern of larvae.

Rothschild and Jordan (1903) revised the lepidopterous family Sphingidae including two species of the genus *Cephonodes* viz. *hylas* and *picus*. Bell and Scott (1937) in his fauna of British India Ceylon and Burma described only two species viz. *C. hylas* (L.) and *C. picus* (Cramer) with reference to the external morphological characters of imago, larvae and pupae. Efetov (1986) studied the species *C. hylas* from Russia. Hashmi and Tashfeen (1992) mentioned two species viz. *C. hylas* and *C. picus* in their checklist, Lepidoptera of Pakistan.

Kamaluddin *et al.* (1999) attempted cladistic analysis, key to the genera and distributional ranges of the family Sphingidae of Pakistan discussing the apomorphies of thirty genera. Pittaway and Kitching (2000) studied Sphingidae of the Eastern Palaearctic including Siberia, Russain Far East, Mangolia, China, Taiwan, Korean Peninsula and Japan and listed only two species viz. *C. hylas* and *C. xanthus*. Yen *et al.* (2003) gave a revised and an annotated checklist of the Tiawanese Sphingidae with a new subspecies of Hawkmoth from Lanyu, Taiwan mentioning only one species of *Cephonodes hylas*. Kamaluddin *et al.* (2007) in their checklist of moths listed only one species *Cephonode hylas* recorded from Dir agency.

Materials and Methods

The specimens were collected from various localities of Sindh and Punjab on light as well as by hand picking method and identified with the help of literature and also confirmed by Dr. Kitching, I. J. research entomologist British Museum Natural History, London. The colour photo session were made and prepared the slides of fore and hind wings. Venations of fore and hind wings were studied and draw the diagram.The measurement of the body (wing expansion) were taken with the help of a micromillimeter slide and for the study male and female genitalia the routine procedure were adopted following Kamaluddin and Haque (2000) and Younus and Kamaluddin (2010).

Results

GENUS: *Cephonodes* Hübner

Cephonodes Hübner, 1822, *Verz. Bek. Schmett*: 131; Roths. and Jord., 1903, *Revision of Sphingidae*: 460; 1907, *Gen. Ins. 57*: 87; Jordan, 1911, *Macrolep. Faun. Pal. 2*: 249; Bell and Scott, 1937, *Faun. Brit. Ind. Moths 5*: 244.

Diagnostic features: Body small sized, stout, resemble large humble bees, generally yellowish, abdomen with a black and a dark red band, sixth tergite with a black median patch, wings hyaline, head with frons broadly rounded not produced, palpi with basal segment much shorter than 2nd, eyes not lashed, proboscis short not passing thorax, antennae very strongly clubbed in both sexes, hook abrupt, fore wings large, broad with apical angle sub-acute, anterior margin convex, posterior margin concave, veins 11- in numbers, hind wings short about half the length of fore wings, veins M_3 and Cu_1 largely stalked and originating from upper angle of cell, two anal veins (1A and 2A) present.

Genitalia: In males genitalia complicated, saccus globular without saccular process, uncus curved beak-shaped, paramere asymmetrical, right paramere shorter than left and beset with thickly and large hairs, aedeagus with theca tubular, membranous conjunctival lobe elongated. Females with papillae anales comparatively small, apophyses posteriors and anteriors large, ductus bursae large, narrow tube-like, corpus bursae narrow bag-like without cornuti.

Comparative notes: This genus is most closely related to genus *Gnathothlibus* Hübner in having frons short, rounded or sub-rounded, in males membranous conjunctival appendage entire or with small appendages but it can easily be separated from the same in having wings membranous, devoid of scales, uncus curved beak-shaped, paramere asymmetrical and by the other characters as noted in the description.

Type species: *Cephonodes hylas* (L.)
Distribution: Eithiopian, Oriental and Australian regions

***Cephonodes hylas* (Linnaeus)**
(Figs.1-8)

Sphinx hylas L.,1771, *Mant. Plant.*: 539.
Cephonodes hylas, Moore,1882, *Lep. Ceylon. 2* :31; Swinhoe, 1885A, *Proc. Zool. Soc. Lond.* 257; Warren, 1888, *Proc. Zool. Soc. Lond.*: 294; Hampson, 1892, *Faun. Brit. Ind. Moths. 1*: 120; Jordan, 1911, *Macrolep. Faun. Pal. 2*: 249; Seitz, 1928, *Macrolep. 10*: 544.
Hemaris hylas, Moore, 1884, *Journ. As. Soc. Beng. 3* (2): 234; Swinhoe, 1890, *Trans. Ent. Lond.*: 162.
Cephonodes* (!) *hylas, Dudgeon,1898, *Journ. Bomb. Nat. Hist. Soc. 9*: 419.
***Cephonodes hylas hylas*,** Roths. & Jord., 1903, *Revision of Sphingidae*, 468; Mell, 1922, *Biol. u. System. der. Sudchin. Sphing.*: 195; Scott,1931, *Journ. Bomb. Nat. Hist. Soc. 35* (2): 362–38; Bell and Scott, 1937, *Faun. Brit. Ind. Moths. 5*: 247.

Colouration: Dorsal side of head , thorax and abdomen yellowish, abdomen with a black and a dark red band, sixth tergite with a black median patch, venter of thorax light yellow, tail black, rest of abdomen brown.

Head (Fig. 2): Frons broadly rounded, palpi with basal segment much shorter about half the length of 2^{nd}, 3^{rd} segment very short and about $1/5^{th}$ of the second segment, proboscis short, not passing thorax.

Fore wings (Fig. 3): Fore wings large about 2X the length of hind wings, anterior margin sinuated, posterior margin deeply concave, apical margin convex with apical angle acute, veins R_3 and R_4 largely stalked later anastomosing with R_5 by a small stalk and originating from upper angle of cell, M_1 and M_2 are parallel, M_3 originating from lower angle of cell, only one anal vein (1A) present.

Hind wings (Fig. 4): Hind wings short, about half the length of fore wings, anterior margin convex, posterior margin distinctly sinuated, apical margin almost straight with apical angle sub-acute, veins $Sc+R_1$ not medially closed to Rs, Rs and M_1 stalked and originating from upper angle of cell, M_3 and Cu_1 largely stalked and originating from lower angle of cell, two anal veins (1A and 2A) present.

Male genitalia: (Figs. 5-7): Tegumen (Figs. 5 and 6) somewhat oval shaped, saccus large broad, oval shaped, uncus large broad, curved beak-shaped with sub-acute apex, gnathos reduced membranous, parameres asymmetrical, right paramere reduced, somewhat bilobed, apical lobe large beset with small hairs, basal lobe short beset with large hairs, left paramere large, broad beset with large hairs, aedeagus (Fig. 7) rod-like, narrow, membranous conjunctival lobe very large, thorn-like without cornuti or spines.

Female genitalia (Fig. 8): Papillae anales small somewhat oval shaped besets with scattered scales, apophyses posteriors large rod - like with rounded apex much longer than apophyses anteriors, later somewhat clubbed-shaped apex, ductus bursae large narrowed, gradually broaden, corpus bursae small bag-like without cornuti.

Total length: Wing expansion 45 – 73 mm.

Material examined: Three males, two females; Pakistan: Sind, Karachi university Campus, Malir, Punjab ; Murree, Ayub Park, on light 07-07-76, 27-09-77, 16-07-84, 18-08-1998, 18-07-2009, leg. S. Kamaluddin and M. Faheem younus, loged at author's collection.

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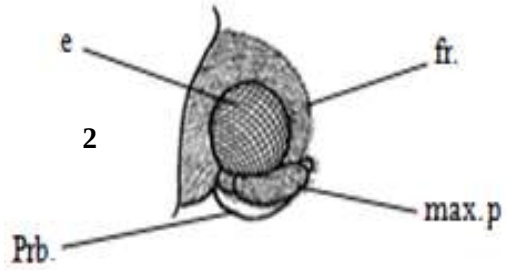

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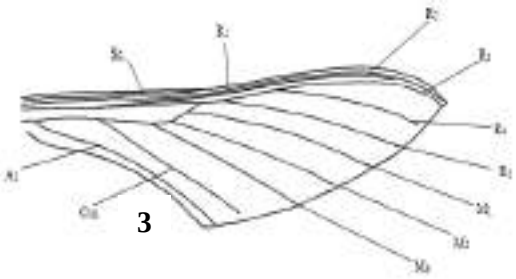

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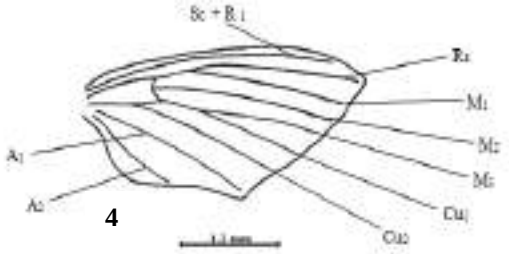

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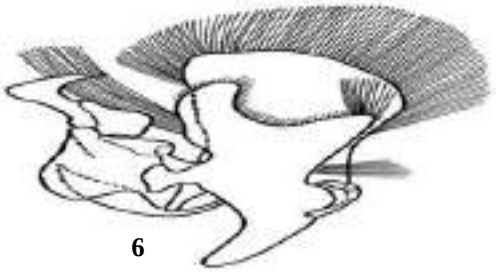

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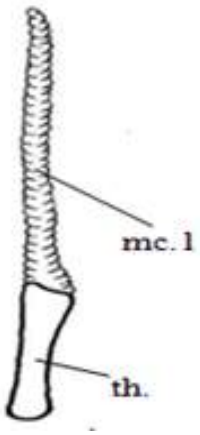

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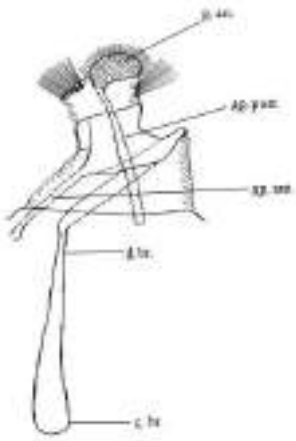

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Plate 1:

Illustration of figures: Figs. 1-8; *Cephonodes hylas* (L.)., 1. Adult, entire dorsal view; 2. Head, lateral view; 3. Fore wing, dorsal view; 4. Hind wing, dorsal view; 5. Tegumen, male genitalia ventral view; 6. Tegumen, lateral view; 7. Aedeagus, lateral view; 8. Female genitalia.

Key to the letterings: e. (eye), fr. (frons), mx. p. (maxillary palpi), prb. (proboscis), Rs. (radio-suctorial vein), Sc. (sub-costal vein), Sc + R_1 (sub-costal and radius vein), Cu_1 and Cu_2 (cubital vein 1 and 2), A_1 and A_2 (anal vein 1 and 2), R_1-R_5 (radius vein 1 to 5), M_1-M_3(median vein 1 to 3), un. (uncus), gn. (gnathos), tg. (tegumen), pr. (paramere), Sac. (saccus), th. (theca), mc. l. (membranous conjuctival lobe), p. an. (papillae anales), ap. post. (apophysis posterior), ap. ant. (apophysis anterior), d. br. (ductus bursae), c. br. (corpus bursae).

Comparative note: This species is most closely related to *C. picus* in having wings hyaline, resembled with a large humble bee but it can easily be separated from the same in having fore tibiae smooth without apical thorn, gnathos reduced membranous, paramere asymmetrical, apophyses posteriors rod-like much longer than apophyses anteriors and by the other characters as noted in the description.

Discussion

The representatives of the hawk moths genus *Cephonodes* are mostly distributed in tropical and subtropical areas of the world and no any species is recorded from Europe and new world. This genus comprised eight species, which play outgroup relation with other hawk moths by their apomorphies like body moderate, wings devoid of scales and resemble with a large humble bee. Among all the species the *C. hylas* plays sister group relationship with *C. picus* by their synapomorphies like general features and both wings are hyaline and out group relationship by its autapomorphies like second segment broad and about 5X the length of 3rd segment of maxillary palp, fore wings with veins R_3, R_4 and R_5 largely stalked to each other and originate from upper angle of cell, paramere asymmetrical, aedeagus with large membranous conjunctival lobe without cornuti, both apophysesses very large.

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