

**DESCRIPTION OF THE LAST INSTAR LARVA
OF *HYLAEOTHEMIS CLEMENTIA* RIS FROM LAOS
(ANISOPTERA: LIBELLULIDAE)**

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The larva is described and illustrated for the first time, based on the last instar exuvia. It is compared with the known Tetrathemistinae larvae and appears similar to the African *Neodythemis* rather than to the Asian members of the subfamily.

INTRODUCTION

The genus *Hylaeothemis* RIS, 1909 is placed in the Tetrathemistinae, which was for a long time considered a primitive group in the Libellulidae, based mainly on wing venation (FRASER, 1957). Recently, in his study of the African representatives, VICK (2000) has shown the phylogenetically heterogeneous nature of this subfamily.

Hylaeothemis contains four known species: three of these occur in India and Sri Lanka, whereas *H. clementia*, a rare and local species, was sporadically recorded from Borneo, Peninsular Malaysia, Vietnam, Thailand and Laos. ASAHINA & KITAGAWA (1992) noted a few minor morphological differences between the Bornean and Thai specimens. From Laos, the species was for the first time reported by YOKOI (2000), who provided also some notes on its habitat and oviposition behaviour.

The first author had a chance to visit Yokoi's site at Phatan, central Laos, and recovered a living larva, that was subsequently reared to the adult. The habitat is a submontane humid forests, where males are holding territories at muddy and grassy places, with a weak but a constant water current, and some sunshine per-

truding through the foliage. The larva was located in muddy and almost stagnant water, downstream of the male territories.

No larva of any *Hylaeothemis* species was so far described.

HYLAEOTHEMIS CLEMENTIA RIS

(Figures 1-6)

Material. — 1 ♀ exuviae (dried and pinned), Laos: Vangvieng distr., Phatang (19°10'N, 102°27'E, alt. ca 330 m a.s.l., larva collected 20-IV-2002, adult emerged 28-IV-2002, A. Sasamoto leg. & bred.

Coloration. — Body in general appearance unicoloured, almost buff, in darker parts faintly yellowish or reddish tinged. Head, thorax, wing sheaths, legs and abdominal terga buff, but the latter rather pale and translucent; ventral surface buff, paler than dorsal surface; cerci dark, tinged reddish brown; epi- and paraprocts apices also tinged reddish brown.

MORPHOLOGY. — General shape elongate and slender, appendages moderately long and robust. Body surface fairly smooth and shiny, with scarce setae and spines.

Head. — Head capsule (Figs 1, 3) rather large and transversely rectangular, clearly wider than prothorax, and slightly narrower than pterothorax; dorsum weakly depressed. Antennae (Fig. 2) 7-segmented, filiform, almost as long as the length of head capsule; relative length of each antennal segment from scape as follows: 1.00: 1.10: 2.00: 1.10: 1.15: 1.40: 1.50; scape short and thick cylindrical; pedicel rather elongate and cylindrical, a little longer than scape; basal flagellar (3rd) segment the longest, twice as long as scape; 5th flagellar (7th terminal) segment elongate, spindle-shaped with sharply pointed apex. Compound eyes (Fig. 1) rather small and rounded in dorsal view, not much expanded laterad, their length clearly shorter than that of postocular lobes. Postocular lobes (Figs 1, 3) furnished with scattered spines and with short setae scattered on dorsal surface; dorso-posterior areas each with five longitudinal glabrous areas; both hind angles evenly round. Labrum short and transversely pentagonal, 0.4 times as wide as maximum width of head capsule; lateral margins almost straight on basal 2/5, divergent anteriorly and clearly constricted at the basal part, forming a corner and then abruptly convergent towards the anterior shallow corners; anterior margin feebly arcuate, very shallowly concave in its central part. Anteclypeus short and transverse, almost as long as labrum; the surface glabrous and smooth; side margins weakly arcuate, directly connected to rounded anterior corners. Labium (Figs 4, 5) deeply cup-shaped as a whole, relatively large and wide; the posterior margin of hinge between prementum and mentum reaching hind marginal level of foreleg coxae in the folding situation; prementum 0.8 times as wide as maximum width of head capsule; anterior margin of prementum triangular, pointed anteriorly at the cen-

tre; the central part as a corner, regularly scattered with minute setae; normal premental setae absent, but with a pair of series of minute setae in the central part, half-length of prementum; lateral lobes large and triangular; inferior margins slightly curved, roughly scattered with minute setae; distal margins almost straight, but forming shallow serrae, each with 9 very flattened teeth, each with 1 to 3 short setae; lateral setae completely absent, a longer seta near movable hooks on dorsal (exterior) margins only; movable hooks rather short and slender, slightly incurvate, sharply pointed at apex, antero-posteriorly more or less depressed, appearing blade-like as a whole; exterior borders 0.3 times as long as the exterior margins of lateral lobes.

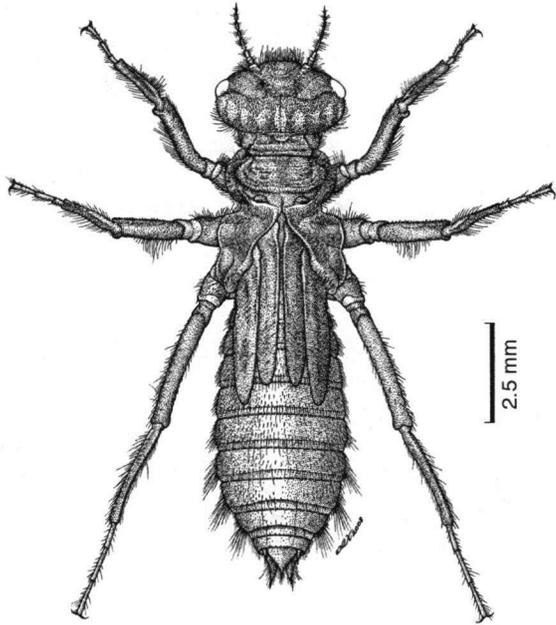
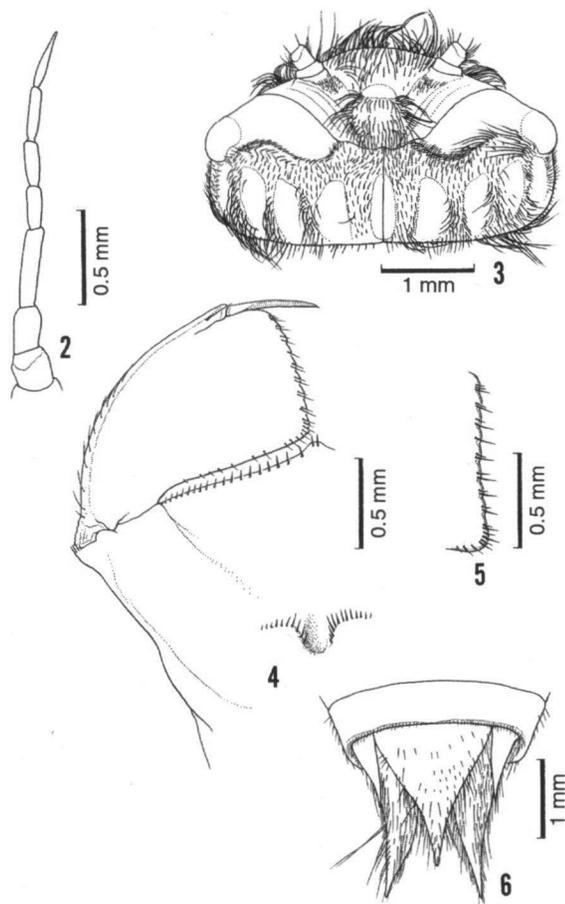


Fig. 1. *Hylaeothemis clementia* Ris, last instar larva (exuviae), dorsal view. — [Scale: 2.5 mm]

T h o r a x (Fig. 1). — Relatively large and wide; pronotum relatively large, transversely spindle-shaped, rounded at both sides; sides hardly bulged laterad; dorsal surface widely glabrous; longer setae and/or bristles arising at the posterior angle areas to posterior margin. Pterothorax (meso- + metathorax) large, slightly wider than the maximum width of head capsule, almost smooth, with a few longer hairs and setae only. Wing sheaths (Fig. 1) parallel, elongated behind; hind wing sheaths 2.5 times as long as wide; apices exceeding half-length of the 5th abdominal segment in exuviae. Legs (Fig. 1) rather long and robust; apices of hind femora reaching the half-length of 6th abdominal segment in exuviae; tarsal formula 3-3-3; 1st tarsomeres usually the shortest, obliquely articulated to 2nd; 3rd usually the longest, almost as long as the total length of the preceding two tarsomeres in fore- and midlegs combined, while clearly shorter than the corresponding length in hindlegs. Claws small and simple.

A b d o m e n (Fig. 1). — Elongate oval, weakly dilated to the widest 6th segment, and then, gradually narrowed towards the distal 10th and triangular small periproct; each segment rectangular in dorsal and ventral views; lateral and dor-



Figs 2-6. *Hylaeothemis clementia* Ris, last instar larva (exuviae): (2) right antenna; - (3) head capsule; - (4) apical portion of labium, showing prementum, left lateral lobe and movable hook, left half; - (5) distal margin of left lateral lobe; - (6) periproct, dorsal view. - [Scale: 0.5 mm (Figs 2, 4 & 5); 1.0 mm (Figs 3, 6).

rather long setae and hairs. Cerci (Fig. 6) rather long and thick, sharply pointed and feebly curved outwardly at apical section, 0.50 times as long as the length of epiproct, and 0.44 times as long as the length of paraprocts.

Measurements (in mm). - Body length (from anterior margin of frontal area to epiproct apex) 15.45; maximum head width (across compound eyes) 3.60; maximum pronotum width 2.40; maximum abdomen width (on 6th segment) 3.80; hindwing sheaths length (on upper margin) 4.40; hind tibia length (on upper margin) 3.90.

sal spines completely absent; surface of abdominal terga rather smooth and weakly shiny, only minute spines, and short and longer setae appear along posterior margin of each tergite; setae arising from the central areas especially long. Valvula vulvae vestigial, as a pair of minute lobes barely seen between 8th and 9th abdominal segments. Periproct (Fig. 6) rather short and thick; triangular as a whole, 4.5 times as long as the length of the 10th abdominal segment; epiproct (Fig. 6) elongate triangular with sharply pointed apex, clearly shorter than paraprocts; dorsal surface rather smooth, scattered with minute, thin setae; both sides gradually convergent distally, and then, abruptly narrowed in distal two-third; paraprocts (Fig. 6) pointed and weakly curved outwardly in distal 2/3; exterior and inner margins not serrated; exterior surface with

DISCUSSION

The larval morphology of *Hylaeothemis clementia* is characterised by the following features: (1) relatively small compound eyes, (2) anterior margin of prementum abruptly produced as an obtuse corner, (3) while the normal premental and lateral labial setae are absent, there are only minute marginal setae, (4) shallow serrae and flattened teeth on the distal margins of lateral labial lobe, (5) rather hairy abdomen, and by (6) the absence of abdominal dorsal and lateral spines.

The larvae of only a few representatives of two Tetrathemistinae genera were so far described from Asia and Australia, viz.: *Tetrathemis i. irregularis* Brauer (NEEDHAM & GYGER, 1937), *T. i. cladophila* Tillyard (THEISCHINGER & HAWKING, 2006), *T. platyptera* Selys (M.A. LIEFTINCK, in VAN TOL, 1992), *Nannophlebia risi* TILLYARD (1913), *N. buruensis* LIEFTINCK (1930). General features of the Australian *Nannophlebia* larvae were summarized by THEISCHINGER & HAWKING (2006). All, “tetrathemistines” (sensu DIJKSTRA & VICK, 2006) larvae have several long and lateral labial setae and abdominal dorsal spines (that vary per species) and lateral spines on the 8th and 9th segments.

The above features separate *H. clementia* from the known allied genera, to which it is only distantly related.

Surprisingly, the *Hylaeothemis* larval morphology appears similar to that of the African *Neodythemis*. The latter, and *Micromacromia*, endemic to tropical Africa, were shown to represent a monophyletic group, called the “neodythemistine genera” (DIJKSTRA & VICK, 2006). The larvae of the Malgasian *N. hildebrandti* Karsch and the Cameroonian *N. afra* (Ris) were described by BUTLER et al. (2006). Based on their descriptions, *Hylaeothemis* resembles the two *Neodythemis* species by having relatively small compound eyes, two rows of minute setae around the centre of prementum (without the normal long premental setae), shallow crenulations on the distal margins of the labial lateral lobe, rather hairy abdomen, and it is lacking the abdominal dorsal and lateral spines.

H. clementia can be separated from *N. hildebrandti* by the absence of the lateral labial setae and by the ratios of the antennal segments, and from *N. afra* by the arrangement of the minute setae in the centre of prementum, the ratios of antennal segments, the more rounded posterior corner of the head, and by the rather thick periproct.

Based on the shape of the genital hamulus, RIS (1909) already noticed the affinities between *Hylaeothemis* and the “neodythemistines” *Allorhizucha*, *Micromacromia* and *Neodythemis*. DIJKSTRA & VICK (2006) also emphasized the similarities in the general appearance and hamulus structure in the adults of these taxa.

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