

WWJMRD 2016; 2(5): 36-39
www.wwjmr.com
Impact Factor MJIF: 4.25
e-ISSN: 2454-6615

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Further studies on male genitalia of *neurothemis intermedia* (Rambur) and *neurothemis Tullia* (Drury) (Odonata: Libellulidae)

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Abstract

Re-description of the male secondary genitalic attributes of two already described subspecies of genus *Neurothemis* Brauer i.e. *N. intermedia intermedia* (Rambur) and *N. tullia tullia* (Drury) have been given in the present manuscript. The significance of most important taxonomic features of penis i.e. lateral lobes, medial process and apical lobes have been emphasized.

Keywords: Male genitalia, *Neurothemis*, Libellulidae

Introduction

The genus *Neurothemis* Brauer was proposed by Brauer (1867, 1867a) with *fulvia* (Drury) as its type species. Prior to this, a genus *Polyneura* was established by Rambur in 1842 for placement of few species earlier referred under genus *Libellula* Linnaeus. However, Brauer synonymised the genus *Polyneura* under the present genus and this arrangement was accepted by all later workers. From the Indian limits, 2 species and 4 subspecies of the present genus, viz. *fluctuans* Fabricius, *fulvia* (Drury), *intermedia intermedia* (Rambur), *intermedia degener* Selys, *intermedia atlanta* Ris and *tullia tullia* (Drury) are known. In the present work, the genus is represented by *fluctuans* Fabricius, *fulvia* (Drury), *intermedia intermedia* (Rambur) and *tullia tullia* (Drury), as distribution of other species of this genus is confined to Eastern India. Several species of genus *Neurothemis* consists of polymorphic and isomorphic females which generally breed in stagnant waters and can be found in large aggregations in the neighbourhood of water bodies. Prasad (1978) made a very superficial study on male secondary genital structures of the above mentioned taxa and totally ignored the most important taxonomic structures of penis i.e. lateral lobes, medial process and apical lobes. The illustrations drawn by him are poor and not self explanatory. Due to these reason the two subspecies i.e. *Neurothemis intermedia intermedia* (Rambur) and *Neurothemis tullia tullia* (Drury) have been studied in depth and detail besides giving their illustrations.

Material and Methods

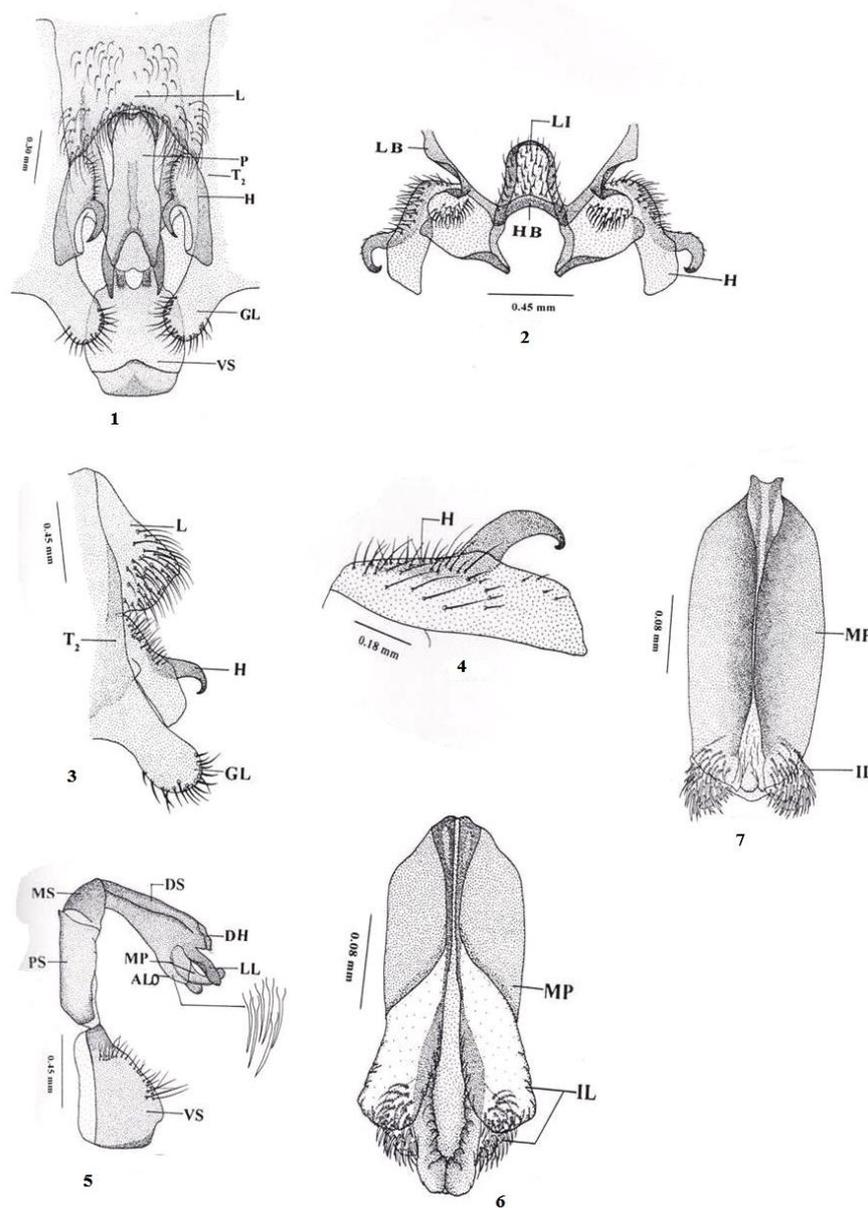
The adult dragonflies were collected with the help of insect collecting net from different localities of North-Western states of India indifferent seasons from august 1997 to October 2000. Collected adult dragonflies were killed with ethyl acetate vapors in the killing bottle incase of teneral specimens or put alive into triangular paper packets and starved to death. The dead specimens were then bristled, pinned, stretched, dried and preserved. To examine the male genitalic structures, the first three abdominal segments were cut off either from the fresh specimens or dried ones. However, in latter case, the dragonflies were relaxed in insect relaxing box for 12 hours before detaching the abdomen. The separated abdomen segments were treated with 10% KOH to dissolve the muscles and to soften the chitin. The potashed material was washed in distilled water containing few drops of acetic acid. The dissection of abdomen was done in 50 % alcohol to have a clear view of different genitalic attributes. After proper dehydration, the material was preserved in vials containing a mixture of ethyl alcohol and glycerine in the ratio of 4:1. The sketches of the genitalia were made with the help of a graph eye piece under binocular at different magnifications. The terminology given by Chao (1953) and Miller (1991) was followed for the names of the different parts of genitalia.

Results and Discussion

***Neurothemis intermedia intermedia* (Rambur): (Figs 1-7)**

Lamina deeply and broadly emarginated, moderately projecting in lateral profile, furnished with thinly scattered small and slender setae over dorsum and numerous moderately long setae along posterior margin; hamules with well developed, strongly curled anterior hook and posterior base broad and truncated, surpassing hook; genital lobes moderately elongated with apices more or less truncated, bearing numerous small and stiff setae; vesicular spermalis broadly globular, bearing stiff setae in a line on

dorsum and forming clusters distally on subdorsum; distal segment with lateral lobes long, flattened, plate like structures, deeply sclerotized; medial process modified to form a highly inflatable, large terminal lobe, bearing 2 pairs of inner lobes, first pair arising medially, not spinose, broad and truncated structure and second pair arising distally from either lateral side, globular, covered densely with acutely pointed bristles; apical lobe highly inflatable and folded structure, inner surface very densely clothed with long, acutely pointed spine like bristles pointing distally.



Figs. 1-7. *Neurothemis intermedia intermedia* (Rambur)

1. Male genitalia (Dorsal view), 2. Hamule + supporting framework, 3. Male genitalia (Lateral view), 4. Hamule (Lateral view), 5. Penis (Lateral view), 6. Medial process (Dorsal view), Medial process (Ventral process).

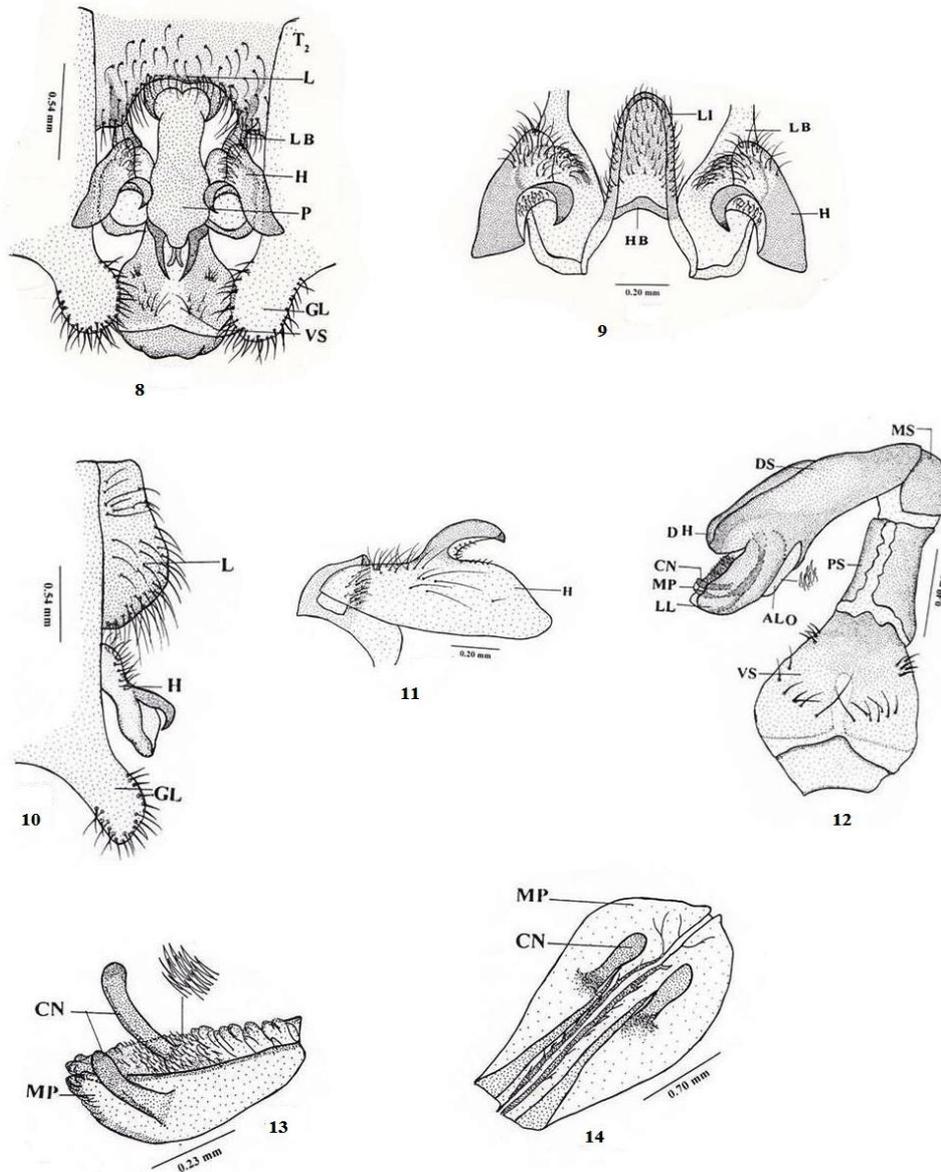
***Neurothemis tullia tullia* (Drury): (Figs 8-14)**

Lamina broadly and deeply notched, besotted with long setae along free margin and short spines and setae sparsely

scattered all over surface; hamules same as that of subspecies *intermedia intermedia* (Rambur); genital lobes moderately long, bearing short spine like setae along

margin; vesicula spermalis short and globular, setosed with short spine like setae on either side of middorsum medially and a tuft of them towards either side of distal end; penis with distal segment slender at base, broadening near apex in lateral view, latter reaching upto middle of vesicular spermalis; lateral lobes long, flattened plates concealing medial process, latter prolonged, forming an extensively inflatable lobe, furnished with bristles middorsally and

bearing a pair of small and stout cornua mediolaterally; apical lobe highly inflatable and spinose. It can be inferred that important secondary male genitalic attributes i.e. penis and its structure like lateral lobes, medial process and apical lobes are of high taxonomic significance. These additional taxonomic characters can be incorporated in detail diagnosis of the above two subspecies of genus *Neurothemis*.



Figs. 8-14. *Neurothemis tullia tullia* (Drury)

8. Male genitalia (Dorsal view), 9. Hamule + supporting framework, 10. Male genitalia (Lateral view), 11. Hamule (Lateral view), 12. Penis (Lateral view), 13. Medial process (Lateral view), 14. Medial process (Dorsal view).

Abbreviations

AL- anterior lamina; ALO- apical lobe; DS- distal segment; F- flagellum; GL- genital lobe; H- hamule, HB- horizontal bar; L- lamina; LB- lateral bar; LL- lateral lobe; LI- ligula; ML- medial lobe; MS- middle segment; P- penis; PS- proximal segment; T₂- second abdominal tergite; VS- vesicula spermalis.

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