

REDESCRIPTION OF *LINAE SCHNA POLLI* MARTIN, 1909 (ANISOPTERA: AESHNIDAE: GOMPHAESCHNINAE)

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The sp. is redescribed and illustrated, based on the ♂ holotype deposited at the National Museum of Natural History, Leiden. Its position in the phylogenetic system of the aeshnids is discussed.

INTRODUCTION

Linaeschna is a monotypic genus, created by MARTIN (1909) for *L. polli*. His description was based on the male holotype, deposited at the National Museum of Natural History, Leiden, of North Bornean provenance. Recently, a second male of the species has been reported from Sabah, Borneo (KITAGAWA, 1999), but female and larvae remain still unknown.

TILLYARD & FRASER (1940) attributed *Linaeschna* to the aeshnid subfamily Gomphaeschninae, together with *Oligoaeschna*, *Gomphaeschna*, *Allopetalia*, *Boyeria*, *Oplonaeschna* and *Basiaeschna*. WIGHTON & WILSON (1986) made a cladistic analysis of the Gomphaeschninae Tillard & Fraser, concluding that the group is paraphyletic. In his phylogenetic analysis of the Anisoptera, LOHMANN (1996) emphasized the derived nature of the genitalia of *Gomphaeschna*, and considered this genus as the sistergroup of the remaining aeshnids. However, he did not examine all the other genera of "Gomphaeschninae". BECHLY (1999) and BECHLY et al. (2001) added several fossil genera and the extant *Oligoaeschna* sensu lato to the Gomphaeschnidae as defined by LOHMANN (1996). However, they hesitated to include the genus *Linaeschna* because of the presence of crossveins in the distal part of the antesubnodal area (lack of a "cordulegastrid gap"), and suggested that *Linaeschna* could be the sistergroup of all other extant aeshnids because of the absence of a trigonal supplement. DE MARMELS (2000) suggested that *Linaeschna* could be related to

Allopetalia and *Boyeria*.

In order to establish the position of this enigmatic genus in the phylogenetic system of aeshnids the type of *L. polli* was re-examined, and the information gathered is herein presented. After submitting the manuscript, the first description of the vesica spermalis of *Linaeschna polli* was published (KARUBE & YEH, 2001), which constitutes an excellent complement to the redescription, since dissection of the genitalia of the type specimen was not attempted.

LINAEESCHNA POLLI MARTIN, 1909

Figures 1-9

MARTIN, 1909: 136-137, figs 133-134, pl. 3 fig. 9 (description; fig. wings and ♂ terminalia in dorsal and lateral view, general dorsal view in colour plate; habitat: North Borneo).

LIEFTINCK, 1954: 98 (listed from North Borneo with the comment: "probably crepuscular in habit").

LIEFTINCK, 1971: 107 (listed as type specimen of RMNH, Leiden, from N.W. Borneo, Sabah-Sarawak boundary, Brunei Bay area).

KITAGAWA, 1999: 41-42 (record of a ♂ from Sabah, Borneo).

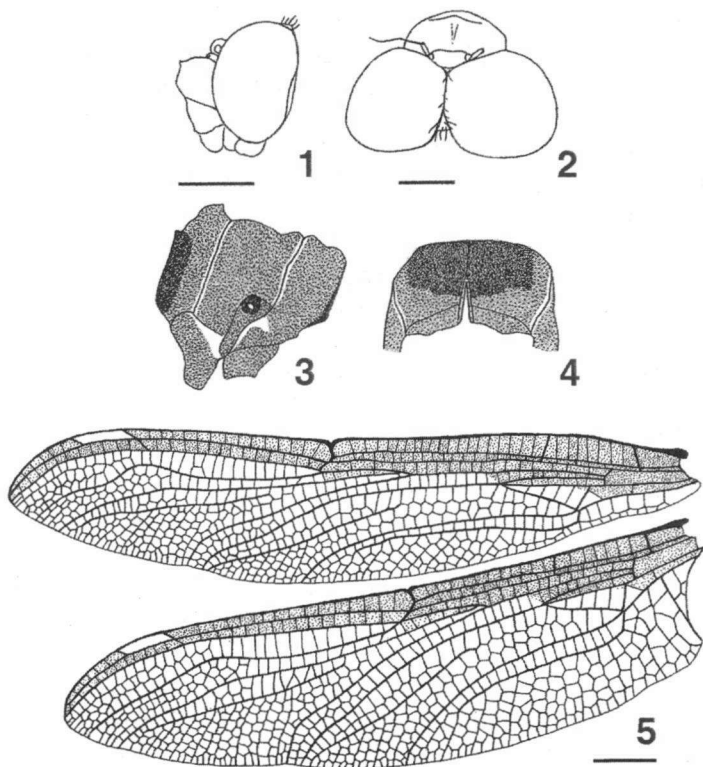
KARUBE & YEH, 2001: 6-7 (description of the vesica spermalis, based on the male from Sabah, Borneo).

Material. — **Holotype** ♂: Printed label: "M^o Marapok, Dent Province, B^o North Borneo, (Collector G.)", hand-written label by R. Martin: "*Linaeschna Polli m.*", and "*Type unique*".

REDESCRIPTION. — **Head** (Figs 1-2). — Labium, labrum and frons reddish brown; vertex and occipital triangle dark brown. Frontal carina angled anteriorly. Interocular suture longer than vertex. Eyes dark greenish grey. Head maximum width: 11.7 mm; maximum length (from frontal carina to post. margin of occipital triangle): 6.3 mm.

Thorax (Figs 3-4). — Reddish brown, with black and yellow markings. Black markings: Large quadrangular spot on mesanepisternum, small spot surrounding the spiracle and narrow stripe along posterior margin of metepimeron. Yellow markings: Narrow stripes along mesanepisternum-mesepimeron and metepisternum-metepimeron grooves, and two triangular spots, one at posterior margin of mesakatepisternum and one at metepisternum base. Legs reddish brown.

Wings. — Hyaline with a reddish brown stripe extended along costal margin. Pterostigma light yellow. Wing venation as shown in Figure 5: Triangle and supratriangle crossed; 1 cubitoanal crossvein; Mspl parallel to MA; Rspl approximately parallel to RP2; RP2 with a convex and a concave bend; anal loop absent (following differences observed in right wings: 2 accessory crossveins in cubito anal space of FW; 4 cells in triangle of HW; 4 cells in anal loop). Membranule (according to MARTIN, 1909) short, narrow and whitish, not extended throughout the wing anal margin. Length FW: 54.8 mm, HW: 53.4 mm; maximum width FW (at level of nodus): 11.5 mm; HW (at level of 4 antenodals proximal to nodus): 14.2 mm; pterostigma length FW: 5 mm,

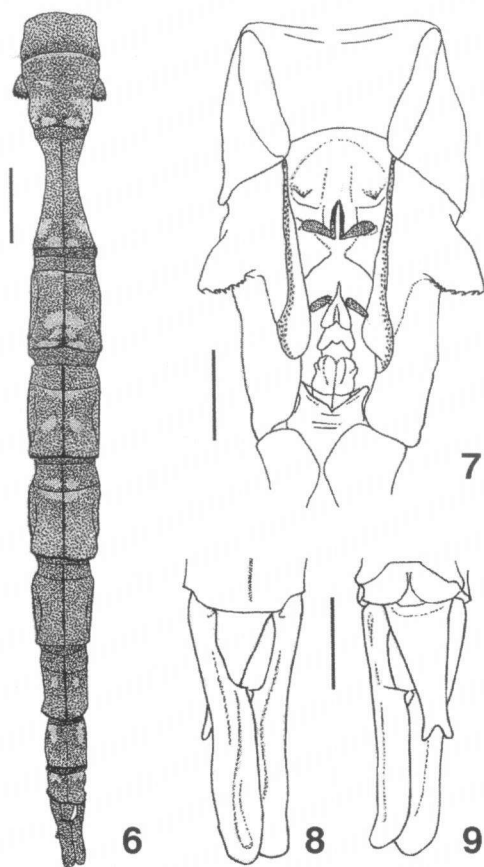


Figs 1-5. *Linaeschna polli* Martin: (1) head, lateral view; — (2) head, dorsal view; — (3) pterothorax, lateral view; — (4) pterothorax, dorsal view; — (5) left wings. — [Scale bar Figs 1, 3, 5: 5 mm; Figs 2, 4: 3 mm].

HW: 4.5 mm.

A b d o m e n (Fig. 6). — Reddish brown, with pale yellowish spots as shown in Figure 6. Dorsal carinae developed in segments III-VII; lateral carina in segments III-VIII. Abdomen length (without cerci): 54.3 mm; maximum width at segment I: 5.3 mm, at segments IV-V: 4.8 mm. Auricles bearing denticles on posterior margins, which are stronger and located in a single row on their distal portion, and smaller and unordered in their basal portion.

Secondary genitalia (Fig. 7). — Genital lobes mesally ridged, bearing numerous small denticles along their whole length; anterior lamina spines short, caudo-ventrally directed; hamuli anteriores with anterior process laminar and vertical, separated from the hamular base by a deep groove; tips of hamuli posteriores antero-dorsally curved, bearing small denticles; ligula anterior surface bearing a medio-longitudinal groove, distal end "v" shaped; segment I of vesica spermalis with lateral margins uplifted,



Figs 6-9. *Linaeschna polli* Martin: (6) abdomen, dorsal view; – (7) abdominal segments I-II, ventral view; – (8) terminalia, dorsal view; – (9) terminalia, ventral view. – [Scale bar Fig. 6: 5 mm; Figs 7-9: 2 mm].

segment II without dorsal hook, segment III short and wide, with a pair of lateral clefts on its base, segment IV (according to KARUBE & YEH, 2001) with a pair of short flagella, and unfolded lateral lobes.

Terminalia. – Cerci as shown in Figures 8-9; dorsal surface with a low longitudinal carina and ventral surface without subbasal teeth. Epiproct bifid at apex. Cerci length: 6 mm; epiproct length: 3 mm.

DISCUSSION

The dark-reddish band along costal margin of wings and the presence of three rows of cells in the base of the discoidal field of front wings are autapomorphies which characterize the genus *Linaeschna*. The contradictory opinions about the relationships of *Linaeschna* within the aeschnids (LOHMANN, 1996; BECHLY et al., 2001; DE MARMELS, 2000) were due to the insufficient information available about its morphology. It shares several unique derived characters states with *Gomphaeschna*, *Oligo-*

aeschna and *Sarasaeschna* Karube & Yeh, which support the monophyly of the Gomphaeschninae (KARUBE & YEH, 2001; VON ELLENRIEDER, in press): Ligula anterior surface bearing a medio-longitudinal groove, tips of hamuli posteriores antero-dorsally curved and bearing denticles, segment III of vesica spermalis as long and wide as IV, and shorter than II, dorsal hook of vesica segment II reduced or absent, base of vesica spermalis segment III with a pair of dorsolateral clefts, male epiproct bifid, and absence of accessory cubito anal crossveins (convergence with *Brachytron* and *Austropetaliidae*). Within Gomphaeschninae, *Linaeschna* would be the sister group of *Oligo-aeschna*, with which it shares the derived presence of short flagella in the IV segment of the vesica spermalis and the particular disposition of denticles in the auricles.

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