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**Notes on the changes in body color with age in
male and female *Coeliccia mattii* Phan & Kompier, 2016
(Odonata: Zygoptera: Platycnemididae)**

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Abstract

The changes in coloration with age in males and females of *Coeliccia mattii* Phan & Kompier, 2016 from the Central Highlands of Vietnam are documented. Immature forms have extensive yellow markings on the thorax and S9 is yellowish, while in the fully mature male form, the thorax is largely black and covered in pruinosity and S9 is completely black. S9 is yellowish in the immature female while S9 is black in the fully mature female.

Key words: Odonata, Platycnemididae, *Coeliccia mattii*, color change, Vietnam, Chu Yang Sin National Park, Dak Lak Province, Nam Nung Nature Reserve, Dak Nong Province, Hon Ba Nature Reserve, Khanh Hoa Province

Introduction

The body and wing coloration of dragonflies and damselflies often provide essential clues for identification in nature. However many species go through dramatic color changes while maturing. Without a full grasp of all transitory stages, researchers may mistakenly consider immature forms as different species of their mature forms. For example, Wang (1994), Xu (2006) and Zhang & Huo (2011) described *Coeliccia sexmaculata*, *C. mingxiensis* and *C. wilsoni*, respectively in China but these are actually just different immature stages of one single species: *Coeliccia cyanomelas* Ris, 1912 (Yu et al. 2019). Asahina (1984) described two species *Coeliccia kazukoae* and *C. megumii* from Thailand, but in fact they are immature and mature stages respectively of *C. kazukoae* (Kosterin & Kompier 2017). Therefore, it is important to study a large series of specimens of the various stages of maturity from different locations.

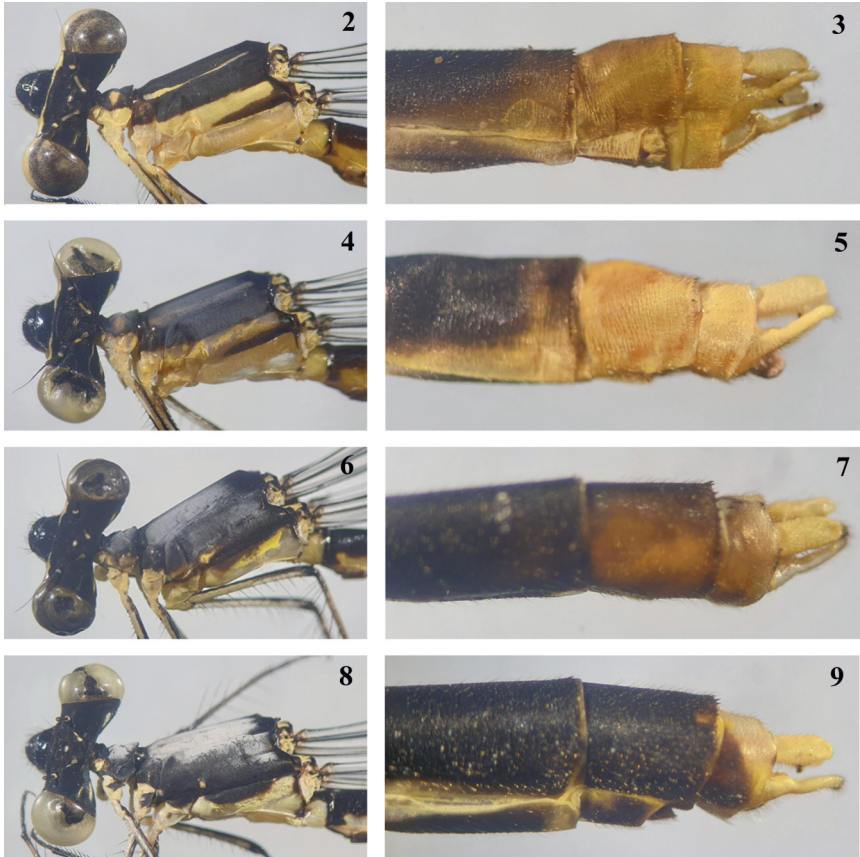


Figures 1. Distribution of *Coeliccia mattii* in Vietnam.

Coeliccia mattii was originally described from the Central Highlands of Vietnam with the male being characterized by its black thorax that is largely covered in pruinosity (Phan & Kompier 2016: Fig. 3C). During several field surveys in the Central Highlands and in the South of Vietnam (Fig. 1) we collected immature male specimens of *Coeliccia mattii* that display rather different color patterns on the thorax and abdominal tip compared to the fully mature males (Figs 2, 3). However, the structure of the genital ligula of all immature males examined is identical to the *hayashii*-group (as defined by Phan & To, 2019) with the terminal segment divided at the base, forming two long flagella. Moreover, the flagella of the genital ligula of all these specimens resemble the genitalia of *Coeliccia mattii* as characterised by the arrowhead-shaped tip (see Phan & Kompier 2016: Fig. 4G). Finally, these immature males show a nice transition through various stages and co-occur with the fully mature *Coeliccia mattii* found in both Chu Yang Sin National Park and Nam Nung Nature Reserve. All of this evidence demonstrated that the immature males are actually *Coeliccia mattii*. In the female, S9 is yellowish in immature individuals, but black in mature ones. The genus *Coeliccia* is known for the often dramatic changes in coloration during maturation; this process may take quite a long time. This study is the first one to present the transformation of pruinosity on the thorax and color variation of males and females of a species in the *hayashii*-group.

Material and Methods

Specimens used in this study were collected from Dak Lak, Dak Nong, Lam Dong and Khanh Hoa Provinces in Vietnam, including the type specimens listed in Phan & Kompier (2016). Collecting and preservation of specimens follows Phan & To (2019). They are deposited in the Zoological Collection of Duy Tan University, Danang, Vietnam except for the specimens collected by Haruki Karube, which are deposited in the Kanagawa Prefectural Museum of Natural History, Japan. Photos of *Coeliccia mattii* in nature were taken with a Nikon D850 camera with a Nikon AF Micro 200 mm f/4.0D lens.



Figures 2–9. Head, thorax and abdominal tip of *Coeliccia mattii*, male. (2, 3), early immature, Chu Yang Sin; (4, 5), intermediate-immature, Nam Nung; (6, 7), young mature, Nam Nung; (8, 9), fully mature, Nam Nung.

Specimens were examined and photographed in the laboratory with the Microscope Zeiss Stemi 508 equipped with the camera Axiocam Eric 5s.

Abbreviations: S1–10 = abdominal segments 1 to 10.

Coeliccia mattii Phan & Kompier, 2016) (Figures 2–17)

Examined specimens. 12 males, 9 females, Chu Yang Sin National Park (12.4267 N, 108.3468 E, alt. 834 m; 12.3857 N, 108.3458 E, alt. 1352 m), Dak Lak Province, 6.v.2020, Q.T. Phan & Q.P. Ngo leg.; 18 males, 11 females, Nam Nung Nature Reserve (12.2026 N, 107.7583 E, alt. 906 m), Dak Nong Province, 13.v.2020, Q.T. Phan & Q.P. Ngo leg.; 1 female, Hon Ba Nature Reserve, Nha Trang City, Khanh Hoa Province, 18.iv.2019, Q.T. Phan leg.; 3 males, same location, 12.v.2009, Haruki Karube leg).

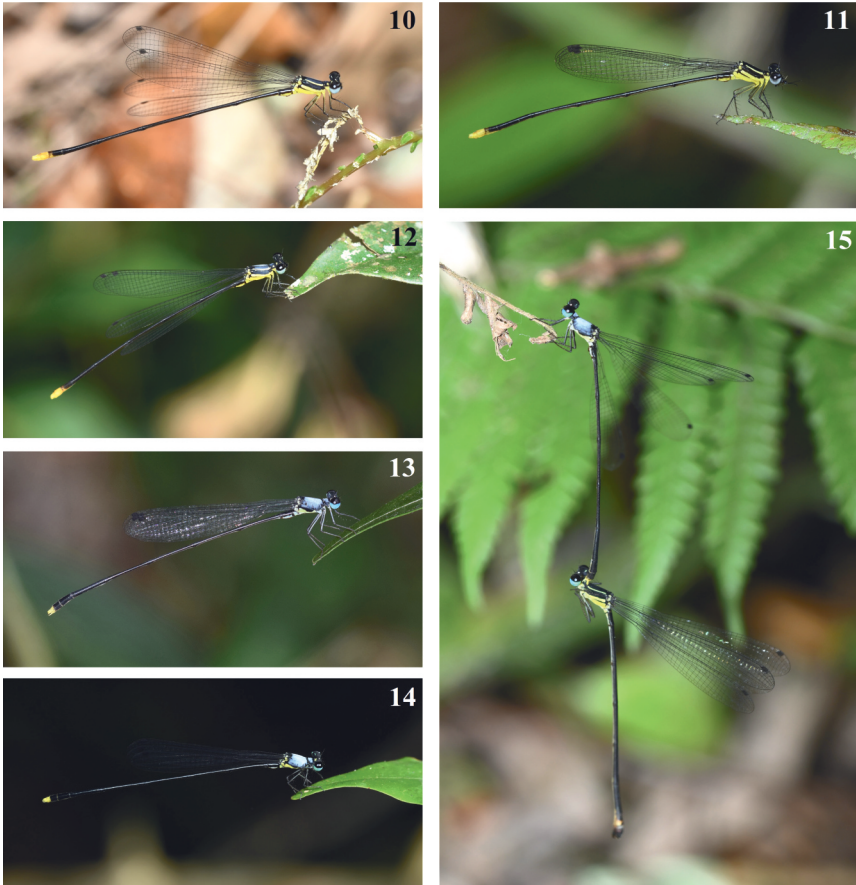


Figure 10–15. *Coelliccia mattii* in nature. (10), early immature male, Chu Yang Sin; (11), early immature male, Nam Nung; (12), intermediate-immature, Nam Nung; (13), fully mature male, Chu Yang Sin; (14), fully mature male, Nam Nung; (15), a pair in tandem, Nam Nung.

Remarks

Fully mature males of *Coelliccia mattii* are largely pruinose on the thorax, lacking antehumeral stripes (Figs 6, 8) and S9 is entirely black; S10 including appendages is yellowish (Figs 9, 13, 14). We collected male specimens of various stages, from lacking pruinosity (Figs 2, 3) and with antehumeral stripes, S9–10 yellowish (Figs 2, 4, 5) and with thin pruinosity (Fig. 4), to extensively black, S9 dark yellowish (Figs 6, 7) and heavily pruinose, S9 entirely black (Figs 8, 9). It can be postulated that the intermediate forms are also intermediate in age. Following, we describe the immature and intermediate stages in age of *Coelliccia mattii* based on the development of pruinosity on the male synthorax as follow:



Figure 16–17. *Coeliccia mattii* in Nam Nung. (16), immature female; (17), fully mature female.

- Early immature stage (2 males from Nam Nung and 2 males from Chu Yang Sin). These are males lacked pruinosity both on prothorax and synthorax (Fig. 2). Middle pronotal lobe of prothorax black with a large oval yellowish spot; Mesepisternum with narrow yellowish antehumeral stripes; metepisternum yellow with incomplete narrow black metapleural stripe ending ventrally above spiracle; metepimeron entirely yellow (Figs 2, 10, 11). S8 black with pale yellowish marking ventrally and posteriorly; S9–10 completely yellowish (Fig. 3).
- Intermediate immature (2 males from Nam Nung). Body color pattern of this stage similar to the early immature male but the yellowish markings on thorax opaque due to the development of pruinosity (Figs 4, 12) and S8 is darker (Fig. 5).
- Mature: In a young mature male from Nam Nung, the pruinosity covers prothorax and synthorax, the yellowish marking on prothorax and mesepisternum of synthorax

disappears (Figs 6, 8); metepisternum gradually becomes very dark with a pale yellowish stripe in young mature males (Fig. 6) and becomes completely black in fully mature males (Fig. 8). S8 in mature males is completely black; S9 gradually becomes darker in young mature males (Fig. 7), and turns completely black in fully mature males (Fig. 9). S10 black ventrally with yellow markings as in the specimens from type locality (see Phan & Kompier 2016).

The immature females of *Coeliccia mattii* differ from the fully mature individuals by yellowish S9 (Fig. 16). The yellowish markings on the synthorax and in the abdominal abdominal tip is brighter (Figs 16, 17).

Distribution. Vietnam: Dak Lak (Chu Yang Sin National Park), Dak Nong (Nam Nung Nature Reserve), Lam Dong (Bao Loc; Da Lat) & Khanh Hoa (Hon Ba Nature Reserve) Provinces.

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