

**FIRST DESCRIPTIONS OF THE LARVA AND ADULT MALE
PARAGOMPHUS WUZHISHANENSIS LIU
(ANISOPTERA:GOMPHIDAE)**

H.-M. ZHANG and X.-L. TONG*

Department of Entomology, College of Natural Resources and Environment,
South China Agricultural University, Guangzhou-510642, China

Received November 8, 2008 / Revised and Accepted December 18, 2008

The descriptions and illustrations are based on specimens reared in the laboratory from larvae collected from the type locality of Hainan, China. A comparison is also provided between adult ♂♂ *P. capricornis* (from Guangdong), and *P. wuzhishanensis* and *P. pardalinus* (both from Hainan).

INTRODUCTION

The species *Paragomphus wuzhishanensis* was described by LIU (1988) based on a single female adult specimen collected from Wuzhishan, Hainan in October, 1957. To date, there have been no descriptions of the larval stage and male adult of the species. During a survey of Hainan dragonflies in March, 2008, we collected 4 final instar larvae as well as a female adult. The larvae were taken back to the laboratory for rearing and all larvae emerged successfully into male adults in May, 2008. All the four males share the same characters with the description of the holotype female of *Paragomphus wuzhishanensis*, including (1) occipital margin with 5-6 small pegs at each side; (2) size close to the type female; (3) all the stripes resemble the holotype female well, including the dorsal stripe connected to collar stripe. The only female adult was collected at the same location where the larvae were found when it was laying eggs. Its valvular vulvae and abdominal stripes as well as the head structure excellently accord with the original description. The only difference is that the dorsal stripes are separate from the collar stripes and metepisternum is without a very ambiguous spot described by LIU (1988, fig. 4), but this ambiguous spot can be seen in the four males. In

* Corresponding author: xtong@scau.edu.cn

the present paper, the larva and male adult of *P. wuzhishanensis* are described and illustrated for the first time. All specimens are deposited in the Collection of Aquatic Insects and Soil Animals, Department of Entomology, South China Agricultural University, Guangzhou.

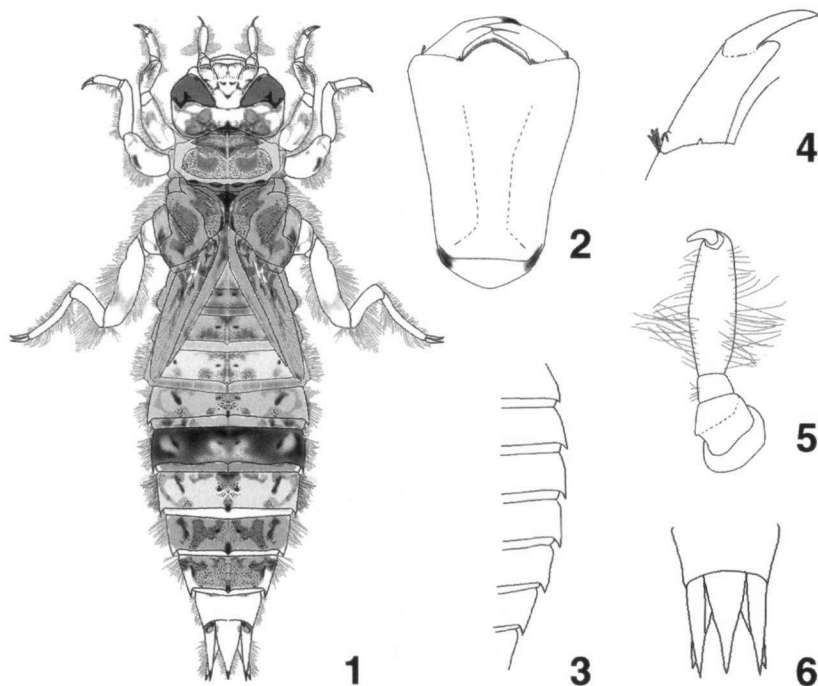
PARAGOMPHUS WUZHISHANENSIS LIU, 1988

Figures 1-12, 15

Material. – 4♂ and their exuviae, Wuzhishan, Hainan, 30-III-2008, Zhang Haomiao leg. The larvae emerged from 10-V-2008 to 18-V-2008 in laboratory; – 1♀, Wuzhishan, Hainan, 31-III-2008, Zhang Haomiao leg.

DESCRIPTION OF LARVA (Figs 1-6) – Body surface with dense fine setae with the ground colour dark yellow. Front legs fossorial. Abdomen with dark brown spots and brown markings (Fig. 1). Lateral abdominal spines present on S4-S9.

Head. – Labrum and clypeus pale yellow with fine setae. Frons, vertex and occiput smooth without setae. Labium short, smooth and yellow. Ratio of length to width of prementum 3.5:2.1 (Fig. 2). Movable hook of usual shape, outer mar-



Figs 1-6. Larva of *Paragomphus wuzhishanensis*: (1) dorsal view; – (2) labium, ventral view; – (3) lateral abdominal spines on S4-S9; – (4) movable hook; – (5) antennae; – (6) caudal appendages.

gin with a tent shaped protuberance near the base (Fig. 4). Anterior margin of prementum strongly convex with orderly brownish short and stout setae. Outer margin of prementum with three stout setae. Antennae 4-segmented with dense long setae. Length ratio of segments 1-4 as follows: 0.50:0.25:1.38:0.45 (Fig. 5).

T h o r a x. — Pale yellow in colour. Prothorax yellow with short setae at sides. Pronotum with two depressions beset with fine strumae. Hind margin of prothorax convex outwards. Synthorax pale yellow with surface smooth. Legs short and strong with dense long setae. Front tarsi 2-segmented; median and hind tarsi 3-segmented. Wing buds divergent, approaching the hind margin of S4.

A b d o m e n. — Pale yellow with black spots. All abdominal surface with hair-like pyramidal prominence. S2-S8 with a pair of black eyebrow-shaped stripes along dorsal carina and a diagonal black stripe to the lateral margin. Dorsal hook present on S2-S9. Lateral abdominal spines present on S4-S9 with the pointed apex, brown in colour (Fig. 3). S6 extremely darkened in colour relative to other segments. Caudal appendages with orderly black short setae, surfaces smooth with hair-like pyramidal prominence. Superior appendages and inferior appendages of the same length (Fig. 6).

M e a s u r e m e n t (mm). — Body length 28.0-28.5, length of abdomen (including caudal appendages) 19.0-19.5, maximum width of head 5.0; length of hind femur 4.0; length of hindwing bud 6.0.

DESCRIPTION OF ADULTS (Figs 7-12, 15) — A medium-sized gomphid. Colour dark brown with yellow maculation.

MALE — **H e a d.** — Brown with opalescent markings. Labium brownish yellow. Labrum dark brown with a large hemicyclic opalescent band extending to the sides. Base of mandibles pale yellow. Antclypeus opalescent. Postclypeus opalescent with a black transverse stripe in the centre basally. Antefrons black. Upper frons dark brown with two big yellow spots not connected at centre. Vertex entirely black with a transverse ridge occupying 1/3 width above lateral ocelli. Lateral margin of each lateral ocellus with a semicircular protuberance. Occipital margin unbent with 5-6 small pegs at each side and fine black setae.

T h o r a x. — Prothorax dark brown, with yellow spots on dorsum of frontal and central lobes. Synthorax dark brown with yellow collar stripe not connected at centre. Dorsal crest dark brown and raised to a pointed protuberance. Dorsal stripe yellow and connected to collar stripe with a fine yellow line. Antehumeral stripe indistinct (absent in two of the four males), antehumeral spot yellow, triangular shaped. Sides of synthorax dark brown with yellow stripes across mesepimeron and metepimeron. Metepisternum with two yellow spots, one above and the other below. Metaposternum dark brown. Coxae mostly yellow. Legs dark brown, basal half of femur yellow. Wings hyaline, anal triangle 4-celled (Fig. 8).

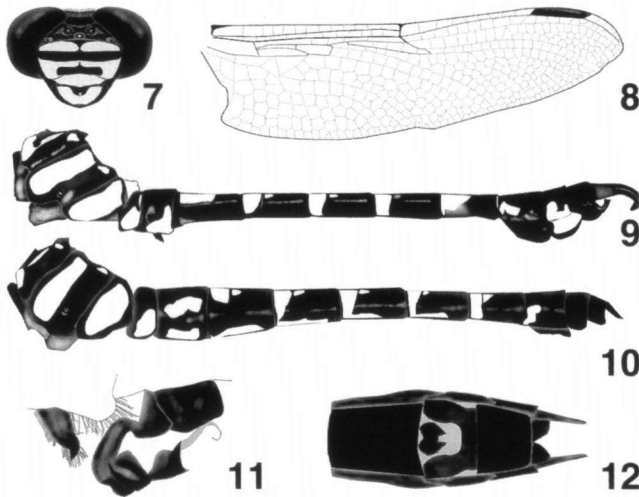
A b d o m e n. — Dark brown with yellow stripes. S1 with large yellow lateral spots below and stripe on dorsum, and a fine yellow line along the suture of S1

and S2 on sides. S2 with yellow stripes along the dorsal carina and large spots below which do not cover the auricle. Auricle yellow. S3 with broad yellow dorsal stripe basally. S4-S6 with dorsal yellow basal mark extended to the sides and a pair of indistinct spots either side of mid-dorsal carina. Basal half of S7 yellow. S8-S9 with foliaceous outgrowth. S8 with yellow spots below, foliaceous outgrowth dark brown. S9 with yellow spots below and extended to the foliaceous outgrowth. S10 with a spot at the centre of the dorsum. Appendages dark brown. Superior appendages much longer than the inferior appendages, curving strongly downwards. Inferior appendages curved upwards. Thorax and abdomen shown in Figure 9. Distal segments of penis with two long flagellae, bent downwards. Posterior hamulus with dense setae. Posterior hamulus and secondary genitalia illustrated in Figure 11.

FEMALE – **H e a d**. – Same as the male.

T h o r a x. – Dark brown with yellow stripes. Dorsal stripe not connected to collar stripe. Antehumeral stripe absent, antehumeral spot yellow, oval-shaped. Sides of synthorax dark brown with yellow stripes across mesepimeron and metepimeron. Metepisternum with a yellow spot above. Metaposternum dark brown. Coxae mostly yellow. Legs dark brown, basal half of femur yellow. Wings hyaline.

A b d o m e n. – Dark brown with yellow spots and stripes. S1 with large yellow lateral spots below and stripe on dorsum. S2 with two parallel lateral transverse stripes. S8-S9 with black foliaceous outgrowth much narrower than males.



Figs 7-12. *Paragomphus wuzhishanensis*, Hainan: (7) head, male, frontal view; – (8) hindwing, male; – (9) thorax and abdomen, male, lateral view; – (10) same, female, lateral view; – (11) posterior hamulus and secondary genitalia, lateral view; – (12) valvular vulvae.

The female valvular vulvae are shown in Figure 12.

M e a s u r e m e n t s (mm). — Male: body length 52.0-53.0; abd.+app.39.5-40.0; hindwing 28.5-30.0. Female: body length 49.0; abd.+app. 36.0; hindwing 30.0.

DISTRIBUTION. — Hainan (China).

BIOLOGICAL NOTES. — The adults of *P. wuzhishanensis* were found in Wuzhishan Nature Reserve, Hainan, in March, 2008. The female was observed to lay eggs along the sides of a shallow running stream while the male guarded alongside. The larvae have a burrowing habit and can be found in the stream bed, but are not abundant. Four final instar larvae were found and then taken back to the laboratory for rearing. All four emerged successfully into adults in May, 2008. The larvae have been observed climbing above the water level or with 1/2 of the body exposed on rocks or plants near streams before emerging. The duration of emergence is about 90 minutes, usually at night and at dawn. Emergence is erect. The newly emerged adults will fly away before sunrise.

REMARKS. — Four species of the genus *Paragomphus* have been recorded from China (NEEDHAM, 1931, 1942; LIU, 1988; CHAO, 1990, 1995), including *P. capricornis* (Förster, 1914) (Guangdong, Guangxi, Fujian and Hong Kong), *P. pardalinus* Needham, 1942 (Hainan, Guangdong and Guangxi), *P. wuzhishanensis* Liu, 1988 (Hainan) and *P. hoffmanni* (Needham, 1931) (Hainan). WILSON (2005, figs 21-22) made a comparison of *P. capricornis* and *P. pardalinus* and pointed out that the best feature to separate the male adults of the genus is the extent of the foliaceous outgrowth at the ventero-lateral margin of S8 and S9. The male foliaceous outgrowth of *P. wuzhishanensi* is compared with *P. capricornis* and *P. pardalinus* in Figures 13-15. The outgrowth in *P. wuzhishanensis* males is much more extensive than in *P. pardalinus* and *P. capricornis*.



Figs 13-15. Comparison of the abdomen of three *Paragomphus* species: (13) *P. capricornis*, Guangdong; — (14) *P. pardalinus*, Hainan; — (15) *P. wuzhishanensis*, Hainan.

ACKNOWLEDGEMENTS

This project was funded by the Kadoorie Farm and Botanic Garden, Hong Kong Special Administrative Region, China. We are most grateful to Mr GRAHAM REELS for providing information on Hainan dragonflies and for revising the manuscript; and Mr Y.-H. JIANG for his assistance with the study.

RERERENCES

- CHAO, H.-F., 1990. *The gomphid dragonflies of China (Odonata: Gomphidae)*. Sci. & Technol. Publishing House, Fuzhou, Fujian.
- CHAO, H.-F., 1995. New or little known gomphid dragonflies from China (Odonata: Gomphidae), 1. *Wuyi Sci. J.* 12: 1-47.
- LIU, Z.-R., 1988. A new species of the genus *Paragomphus* from China (Odonata: Gomphidae). *Ent. Contrib.* 8: 167-169.
- NEEDHAM, J.G., 1931. The dragonflies (Odonata) of Hainan. *Lingnan Sci. J.* 10: 223-232.
- NEEDHAM, J.G., 1942. A new species of dragonfly from Hainan and some new distribution record. *Lingnan Sci. J.* 20(2/4): 251-252.
- WILSON, K.D.P., 2005. Odonata of Guangxi Zhuang Autonomous Region, China, 2: Anisoptera. *Int. J. Odonatol.* 8: 107-168.