

THE BIOLOGY AND DISTRIBUTION OF *PSEUDAGRION RUBRICEPS RUBRICEPS* SELYS, 1876 (ODONATA: ZYGOPTERA: COENAGRIONIDAE) IN SINGAPORE

R. W. J. Ngiam

National Biodiversity Centre, National Parks Board
1 Cluny Road, Singapore 259569, Republic of Singapore
(ngiam_wen_jiang@nparks.gov.sg; yanrobin@hotmail.com)

INTRODUCTION

Pseudagrion species belong to the family Coenagrionidae, a successful family of damselflies with over 1000 known species found worldwide (Orr, 2003). Coenagrionids are small and generally perch with their wings closed above the abdomen. Members of the genus *Pseudagrion* are placed in the subfamily Pseudagrioninae or sprites (Silsby, 2001). The genus *Pseudagrion* is particularly well developed in Africa with more than 40 species exhibiting much disparity in habitat requirements, appearance and behaviour (Silsby, 2001). This genus is also diverse and widespread in Asia with 28 species including *Pseudagrion lalakense* Orr & van Tol, 2001, which was not listed by Tsuda (2000).

In Singapore, four *Pseudagrion* species are known—*Pseudagrion microcephalum* Rambur, 1842; *Pseudagrion australasiae* Selys, 1876; *Pseudagrion prunosum* Burmeister, 1839; and *Pseudagrion rubriceps* Selys, 1876. *Pseudagrion rubriceps rubriceps* Selys 1876, is common and widespread in most parts of tropical Asia (Tsuda, 2000), but in Singapore is very rare (Norma-Rashid et al., 2008) and has been categorised as nationally critically endangered (Murphy et al., 2008). Although common in Sundaland, there were no published records of *Pseudagrion rubriceps rubriceps* in Singapore until 1997 (Murphy, 1997). Currently, only one specimen is known in the Zoological Reference Collection (ZRC), Raffles Museum of Biodiversity Research (RMBR), National University of Singapore, collected from Nee Soon Swamp Forest in 1993 (Norma-Rashid et al., 2008). It was therefore believed that *Pseudagrion rubriceps rubriceps* in Singapore is confined to Nee Soon Swamp Forest. This paper reports a second locality for this species. The value of urban parks to Singapore odonates conservation is also discussed.

SIGHTING DETAILS

While conducting an odonate survey at a pond in Toa Payoh Town Park (Fig. 1) on 29 Jan.2009, a tandem pair of bluish-coloured damselflies was spotted at ca. 1100 hours. The pair was initially thought to be the common *Pseudagrion microcephalum*, a species previously recorded at the same site by me. However the bright orange head of the male suggested otherwise and on closer inspection, it was recognised to be *Pseudagrion rubriceps rubriceps* (Fig. 2). The pair remained in tandem for ca. five minutes, hovering in the vicinity of the submerged adventitious roots of weeping bottlebrush (*Callistemon viminalis*) (Figs. 3, 4). Meanwhile, several *Pseudagrion microcephalum* males were also active nearby. The tandem pair soon settled on top of the roots. The female then proceeded to oviposit endophytically while partially submerged (Fig. 5). Typical of mate ‘contact guarding’ behaviour in coenagrionids, the male remained in tandem with the female throughout the ovipositing process in the so-called ‘agrion’ or sentinel position (Corbet & Brooks, 2008). After ovipositing, the female emerged from the water and the pair, still in tandem, flew towards the pond edge thus enabling capture with an insect net. As the survey progressed, another two males were spotted in the same area.

SPECIMEN DETAILS

The following descriptions are based on the pair captured on 29 Jan.2009. The female *Pseudagrion rubriceps rubriceps* is generally of a moderate orange-yellow from the head to the thorax. In lateral view (Fig. 6), the synthorax is an orange-yellow that extends to the interpleural suture. From the metapleural suture to the legs are shades of yellowish-cream. The eyes are greenish, being darker above and lighter below. The abdomen has a continuous black marking on top at S2–S8 extending slightly into S9. There is a hint of blue below the black markings which is especially pronounced on S7–S8. S9 is blue with a small black mark and S10 is mainly blue. The dorsal side of the femur is dark. From above (Fig. 8), the head; frons; and synthorax are of orange-yellow whereas the prothorax appears slightly bluish. Dorsally, black markings on the abdomen are noticeably ‘torpedo-shaped’ on S3–S7 with blue colour along the sides (Fig. 7). There are two small ‘tooth-shaped’ markings on S9, but other than that, S9 and S10 are entirely blue. The female, being the only one sighted, was released after photography in the hope that it would continue to oviposit.



Fig. 1. The pond at Toa Payoh Town Park. It is a typical urban park surrounded by tall public housing.



Fig. 2. The tandem pair of *Pseudagrion rubiceps rubiceps* at Toa Payoh Town Park on 29 Jan.2009.



Fig. 3. Mature stands of weeping bottlebrush (*Callistemon viminalis*) where *Pseudagrion rubriceps rubriceps* was encountered at the pond.



Fig. 4. The submerged adventitious roots of weeping bottlebrush.



Fig. 5. Half submerged female ovipositing onto the adventitious roots with the male in a sentinel contact guarding position.

The male *Pseudagrion rubriceps rubriceps* was 37 mm in total length. Its abdomen plus appendages was 31.5 mm long, and the hindwing 19 mm long. It was generally blue with most of the head a distinctive orange. Laterally (Fig. 9), the thorax and synthorax were mostly blue except for the olive antehumeral stripe. The eyes were a combination of orange in the front and black-bluish at the back. The dorsal side of the femur was dark. The side of abdomen was blue at S1–S2 with the colour decreasing in intensity onwards till S8–S10. S8 had a black spot at the top end. S9 and S10 were entirely blue. The superior anal appendage was black and longer than the inferior. Dorsally the head was mostly orange, the prothorax was blue while the synthorax was olive with blue at the sides (Fig. 10). In frontal view, the eyes and entire face were bright orange. In dorsal view, black markings of the abdomen were continuous from S3–S7. S8 was blue and black while S9–S10 were completely blue. The superior anal appendages were shaped like hooked pincers (Fig. 11). The male was deposited as a voucher specimen in the ZRC (ZRC.ODO.0012).



Fig. 6. Lateral view of the female *Pseudagrion rubriceps rubiceps*. Hindwing length = 21 mm.



Fig. 8. Dorsal view of the female specimen showing the 'torpedo-shaped' black markings on the abdomen.



Fig. 7. Dorsal view of the female specimen showing the orange-yellow frons, head and synthorax.

DISCUSSION

Pseudagrion rubriceps rubiceps inhabits slow running water in open, degraded habitats with rich aquatic vegetation as well as rivulets on the landward side of mangroves (Lieftinck, 1954; Orr, 2005). The specimen collected in 1993 was at a swampy forest habitat shaded with trees and low vegetation in Nee Soon swamp forest. The location was near a fallen tree, which had created a small-disturbed area within the forest (H. K. Lua, pers. comm.). This habitat was very different from the open pond in Toa Payoh Town Park, which is a typical landscaped urban park. At one side of the pond are stands of mature weeping bottlebrush whereas the other side is a mixture of aquatic plants— *Cyperus* species, *Nymphaea* species, *Thalia* species and *Typha angustifolia*. In the online website—Asia Dragonfly (undated)—sightings



Fig. 9. Lateral view of male *Pseudagrion rubriceps rubriceps* specimen (ZRC.ODO.0012) collected on 29 Jan.2009. Total length = 37 mm.



Fig. 10. Dorsal view of the male specimen.



Fig. 11. Close up view of the hook-like pincers of the superior anal appendages of the male specimen.

of *Pseudagrion rubriceps rubriceps* in Thailand were reported to be very common in lakes and ponds. Therefore in Singapore, the distribution of this species is enigmatic and intriguing. There are several open ponds in urban public parks and other forested areas in Singapore but *Pseudagrion rubriceps rubriceps* has not been recorded in any of them. The known habitat requirements for this species should not have confined it to Nee Soon Swamp Forest only. Indeed, it is highly possible the Nee Soon Swamp Forest record in 1993 was of an individual from an unknown population moving into an open forested area created by the fallen tree. Thus yet unknown inhibiting factors could be restricting the species distribution in Singapore. One reason could be due to ecological niche segregation from the more common and dominant *Pseudagrion microcephalum*. Another reason could be fastidious larvae habitat requirements as demonstrated by the female ovipositing on submerged adventitious roots. Larvae of the species might require similar microhabitats to thrive and these are not available in other public parks.

The presence of *Pseudagrion rubiceps rubiceps* in Toa Payoh Town Park underlies the importance of urban park ponds in the conservation of Singapore odonates. With more than 20 different pond habitats scattered across Singapore, urban parks are ideal habitats for common odonates and also refuges for the rarer species. Together, these ponds support not only subpopulations occupying different habitats but the entire metapopulation of Singapore odonates. Parks as well as the nature reserves also play an important outreach role in bringing odonates closer to the public hence using odonates as flagship species in freshwater conservation awareness-building. The current dragonfly project in National Parks Board (NParks) aims to fulfill these objectives with baseline surveys, odonate habitat creation and management, monitoring in nature reserves, staff training; and outreach initiatives. These multipronged approaches are important tools in conserving Singapore odonate diversity.

ACKNOWLEDGEMENTS

I am grateful to Tang Hung Bun and Cheong Loong Fah, both of whom directly ignite my interest and passion for odonates. They are also most unselfish in sharing information and expertise. I thank Lua Hui Kheng (Raffles Museum of Biodiversity Research) for providing specimen information and Lua Hock Keong (National Parks Board) helped in tree identification. Leong Tzi Ming (National Parks Board) gave valuable advice in the manuscript write-up. The encouraging comments by an anonymous reviewer are most appreciated. Last but not least, I thank the management and colleagues at National Parks Board for supporting and aiding in the dragonfly project.

LITERATURE CITED

- Asia Dragonfly, undated. *Pseudagrion rubiceps rubiceps* Selys, 1876. <http://www.asia-dragonfly.net/globalResults.php?Species=422>. (Accessed 27 Mar.2009).
- Corbet, P. S. & S. J. Brooks, 2008. *Dragonflies*. Harper Collins Publishers, London, UK. 454 pp.
- Lieftinck, M. A., 1954. Handlist of Malaysian Odonata. *Treubia*, **22**(Supplement): 1–202.
- Murphy, D. H., 1997. Odonata biodiversity in the Nature Reserves of Singapore. *Proceedings of the Nature Reserves Survey Seminar. Gardens' Bulletin, Singapore*, **49**(2): 333–352.
- Murphy, D. H., L. F. Cheong, L. K. Wang & S. Ang. Springtails, peripatus and insects (to moths). In: Davison, G. W. H., P. K. L. Ng & H. C. Ho (eds.), 2008. *The Singapore Red Data Book: Threatened Plants and Animals of Singapore. 2nd Edition*. The Nature Society (Singapore), Singapore. Pp. 247–249.
- Norma-Rashid, Y., L. F. Cheong, H. K. Lua & D. H. Murphy, 2008. *The Dragonflies (Odonata) of Singapore: Current Status Records and Collections of the Raffles Museum of Biodiversity Research*. Raffles Museum of Biodiversity Research, Singapore. 24 pp. http://rmbn.nus.edu.sg/raffles_museum_pub/Dragonfly_of_Singapore.pdf. (Accessed 26 Mar.2009).
- Orr, A. G., 2003. *A Guide to the Dragonflies of Borneo: Their Identification and Biology*. Natural History Publications (Borneo) Sdn. Bhd., Malaysia. 195 pp.
- Orr, A. G., 2005. *Dragonflies of Peninsular Malaysia and Singapore*. Natural History Publications (Borneo) Sdn. Bhd., Malaysia. 125 pp.
- Silsby, J., 2001. *Dragonflies of the World*. Smithsonian Institution Press, USA. 216 pp.
- Tsuda, S., 2000. *A Distributional List of World Odonata*. Privately published, Osaka. 430 pp.