

Asilidae (Diptera) from mangrove, an unusual habitat for robber flies (Southeast Asia, Singapore)

GUY TOMASOVIC¹ & PATRICK GROOTAERT²

¹Scientific associate, Gembloux Agro-Bio Technology, Department of Entomology, University of Liège, Belgium (e-mail: guytomasovic@yahoo.fr).

²Department of Entomology, Royal Belgian Institute of Natural Sciences, Rue Vautier 29, B-1000, Brussels, Belgium (e-mail: Patrick.Grootaert@naturalsciences.be).

Abstract

In the present paper we record four species of robber flies from mangrove in Singapore: *Promachus amorges* (Walker, 1849), *Maira aenea* (Fabricius, 1805), *Orthogonis scapularis* (Wiedemann, 1828) and *Leptogaster moluccana* (Doleshall, 1857).

Introduction

During a short survey of mangrove habitats in Singapore we found four robber fly species in fairly large numbers. Asilidae or robber flies are generally found in sunny, dry habitats and hence it is surprising to find them in wet, marine habitats such as mangroves.

It could be argued that since robber flies are good flyers they could invade mangrove habitats from surrounding dryer sandy habitats. This is true, but one would expect more species than or less individuals. Anyway, the placement of the traps was generally in the middle of the mangroves and difficult to reach from outside so that the wet, muddy habitats were probably indeed used by the robber flies as their hunting and breeding ground.

According to the database of GELLER-GRIMM (www.geller-grimm.de/asilidae.htm) and our own data the number of robber flies species already known from Singapore is limited to seven: *Laphria imbellis* Walker, 1857, *Laphria inaurea* Walker, 1857, *Laphria plana* Walker, 1857, *Heligmoneura fuscinalonga* Tomasovic & Grootaert, 2008, *Heligmoneura singaporensis* Tomasovic & Grootaert, 2008, *Michotamia singaporensis* Tomasovic & Grootaert, 2008 and *Promachus lineosus* (Walker, 1857). The latter species was described from a single female from Singapore (WALKER, 1857, p. 13 n°40). We examined the holotype. In addition, many more species have been recorded from non-mangrove habitats, but have not been published since (DIKOW, in litt.).

Material and methods

The present study is based on material collected during a quality assessment study of a number of fragmented mangrove sites on the island of Singapore. This project is called SMIP or the Singapore Mangrove Insect Project that is tutored by Singapore National Parks (NParks).

Eleven mangrove sites were sampled during a one-month campaign that lasted from 5 May to 12 June 2009 with at least two Malaise traps per site. Most sites were on the north of the island because the southern side is almost completely taken by the harbour of Singapore. Following sites that all are Nature reserve were sampled (Fig. 1): Lim Chu Kang, Sungei Buloh Wetland Reserve (SBRW, Fig. 3), Kranji Nature Trail, Mandai, Sungei Cina, Pulau Seletar (Fig. 2), Pasir Ris, Changi Creek, Pulau Ubin, Belayar Creek and Semakau Island. We placed five Malaise traps on Semakau Island: three in mangrove, one on a wet sandy beach and one in beach forest. A third trap was also placed at Lim Chu Kang, because the other two traps had very poor yields. Samples were taken every week, which resulted in 104 samples.

The Malaise traps were placed in the mangrove itself and were flooded during each tide for at least 50 cm to up to 1 m.

Data from a two-year recording at Sungei Buloh Wetland Reserve in 2005-2007 and identified by Dr. Torsten DIKOW have been added as well.

Voucher specimens are conserved at the Royal Belgian Institute of Natural Sciences (RBINS) and at the Raffles Museum for Biodiversity Research (NUS, Singapore). In addition material was studied that is conserved at the Natural History Museum in London (NHM).

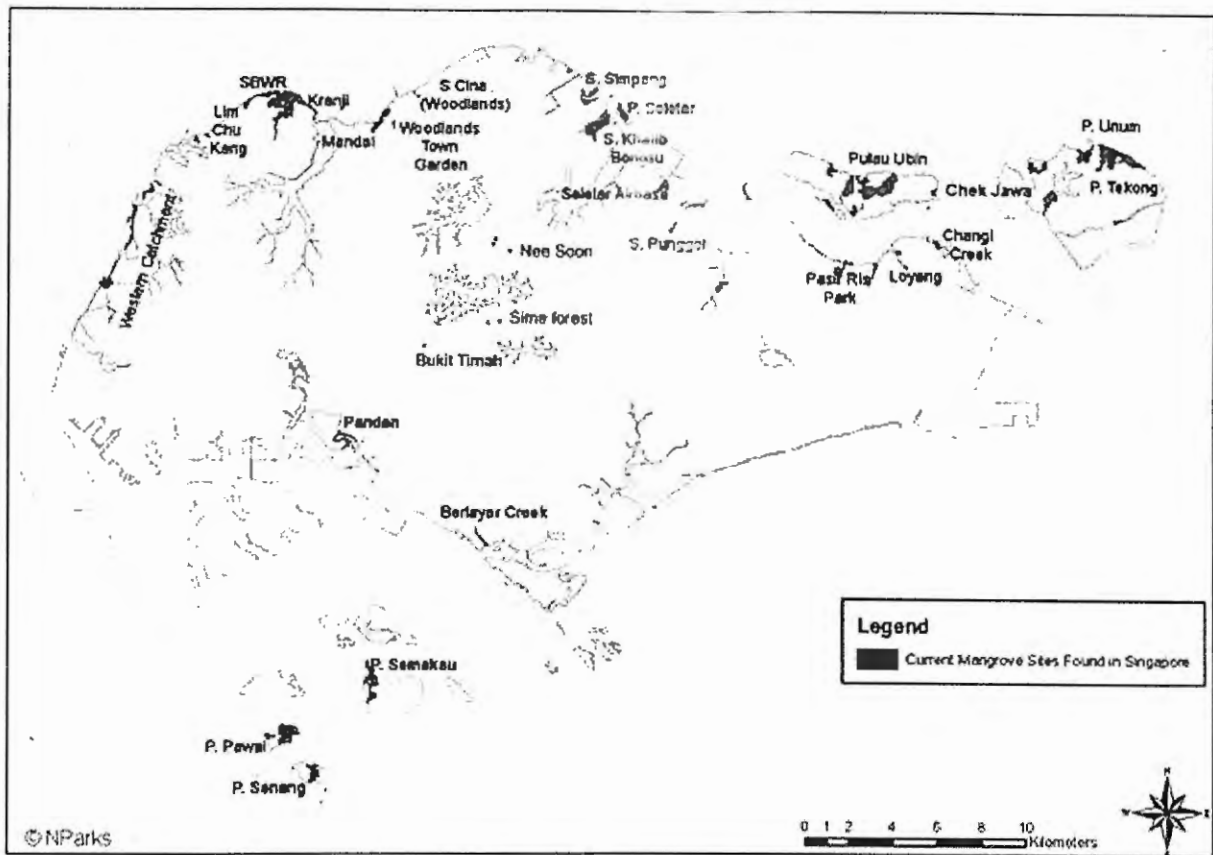


Fig. 1. Current mangrove sites in Singapore. The terrestrial reference sites of Bukit Timah (primary rain forest), Nee Soon swamp forest and Sime forest have been added to the map. SBWR: Sungei Buloh Wetland Reserve.



Fig. 2. Mangrove on Seletar Island. The Malaise trap was placed on a sandy patch in the mangrove.



Fig. 3. Mangrove at Sungei Buloh Wetland Reserve.

Faunistic account

During the one-month sampling campaign, 18 robber fly specimens were found belonging to 3 species.

Asilinae
Apocleini, Dikow, 2009
Promachus Loew, 1848

The genus unlike the other Apocleini genera is easily identifiable by the wing with three

submarginal cells, the radial fork is shorter than the second posterior cell and the antennae are wide apart.

***Promachus amorges* (Walker, 1849)**
Asilus amorges Walker, 1849
 (Figs 4-5)

WALKER (1849: 391) gives the description of a male, but does not cite the locality so that the provenance remains unknown. In the literature the



Fig. 4. *Promachus amorges* (Walker, 1849) lateral view.



Fig. 5. *Promachus amorges* (Walker, 1849) frontal view of head.

species is recorded from Borneo and Sumatra (GELLER-GRIMM, 2010). We have seen the holotype male that is conserved at NHM (London).

Material examined: SINGAPORE: 2 males, 1 female, Semakau Island, 3.VI.2009 (SMK01, reg. 29140); 2 males, 1 female, Semakau Island, 20.V.2009 (SMK01, reg. 29087); 1 male, 1 female, Pulau Seletar, 15.V.2009 (SLE01, reg. 29069); 1 male, Pulau Seletar, 29.V.2009 (SLE01, reg. 29120).

This species probably invades the mangrove from nearby sandy patches. The traps on Pulau Seletar were in a very small mangrove on a sandy soil (Fig. 2). The site SMK01 on Semakau island was on a wet sandy beach on the border of a mangrove.

Promachus lineosus (Walker, 1857)

Material examined: Holotype: 1 female with two handwritten labels, one round label with *Sing.*, and one rectangular *Asilus lineosus* and also one printed round label with a red ring with Holotype and one rectangular with Holotype, *Asilus lineosus* Walker handwritten and in printed det. J.E. CHAINEY 1984. (NHM, London).

The ovipositor of the majority of female *Promachus* consists of segments 8 to 10 only, but this female has the ovipositor consisting of segments 5 to 10, telescopic like in *P. nusus* Oldroyd, 1972 and *P. indigenus* Becker, 1925 that OLDROYD (1972) put in the subgenus *Trypanoides*. According to OLDROYD (1972) this difference in ovipositor suggests differences in oviposition sites which may be linked with subgeneric or even generic groupings.

Laphriinae

All the species of this subfamily are living in forested areas. The principal character of the members of the tribe Laphriini is the characteristic shape of the proboscis that is either laterally flattened like a paperknife or triangular in cross-section.

Maira Schiner, 1866

Generally large flies with the proboscis laterally flattened and body with shining metallic colour.

The genus *Maira* contains 53 species: 16 are Oriental, 36 are Australasian and a single species is Palaearctic (South China). However there are 10 species to the south, east and west: *M. aenea* (Fabricius, 1805), *M. auribarbis* (Macquart, 1848), *M. aurifacies* (Macquart, 1848), *M. compta* Walker, 1861, *M. gloriosa* (Walker, 1858), *M. gracilicornis* Meijere, 1913, *M. hispidella* Wulp, 1872, *M. nigrithorax*, Wulp, 1872, *M. nychthemera* Wulp, 1872 et *M. tuberculata* Wulp, 1872. The six other species occur in the Indian Subcontinent.

To identify our specimens we used the keys of VAN DE WULP (1872), OLDROYD (1972) and JOSEPH & PARUI (1981, 1998).

Maira aenea (Fabricius, 1805)

(Figs 6-9)

Material examined: SINGAPORE: 1 male, Semakau Island, 12.V.2009 (SMK05, reg. 29068); 1 female, Kranji, 26.V.2009 (KNT02, reg. 29104); 1 male, Mandai, 2.VI.2009 (MAN01, reg. 29132); 1 male, Lim Chu Kang, 2.VI.2009 (LCK02, reg. 29131); 1 male, Sungei Buloh, 2.VI.2009 (SBWR01, reg. 29126).

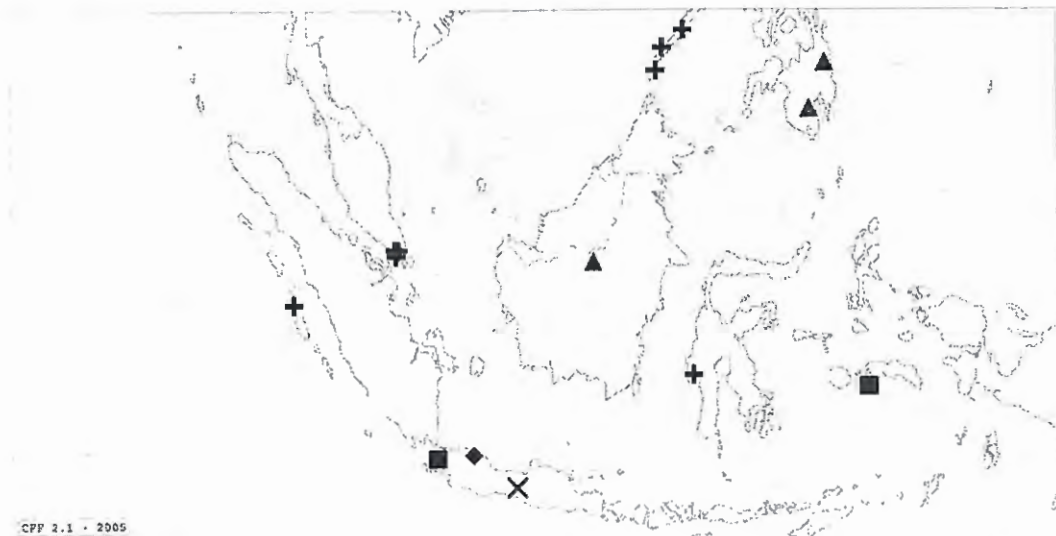
All specimens were recorded in traps in the middle of mangroves.



Fig. 6. *Maira aenea* (Fabricius, 1805) dorsal view.



Fig. 7. *Maira aenea* (Fabricius, 1805) frontal view of head.



CPF 2.1 · 2005

- + *Maira aenea* 11 specimens
- × *Maira auribarbis* 1 specimens
- ▲ *Maira aurifacies* 3 specimens
- *Maira compta* 2 specimens
- ◆ *Maira gracilicornis* 1 specimens

Fig. 8

Other material examined: INDONESIA: 1 male, Iles de Bodjo, VIII. 1884. Leg. Weyers (coll. RBINS).

It should be remarked that THEODOR (1976) notes on page 23 that the aedeagus of one species of *Maira* sp. from New Guinea is like in *Laphria* "Tubes nearly as long as sheath, curved at the end", whereas in *Maira aenea* it is like in *Choerades* Walker, 1851.

M. aenea has also previously been recorded in a wet environment in "Palawan, Puerto Princessa, sea level, second growth forest, tall grass at edge of forest OLDROYD (1972)".

Orthogonis scapularis (Wiedemann, 1828)

Materiel examined: SINGAPORE: 1 male,

Sungei Buloh, Wetland Reserve, 5.VIII.2005. Mangrove (Leg. P. GROOTAERT, malaise trap I, reg. 25284). INDONESIA: 1 male, Java (N° 191) identified by OLDROYD at RBINS.

Remark: the aedeagus of this species is remarkable of shape in bearing two long parameres.

In the genus *Orthogonis* Hermann, 1914 species have proboscis triangular in cross-section and veins at apex of discal cell forming a cross. They are rather bare flies of dark blue, black colouration and blackish wings; tergal bristles strong. The genus is in majority Australasian with 10 species. It is rare in other zoogeographical regions: 1 Afrotropical, 1 Nearctic, 2 Oriental and 1 Palaeartic species, (GELLER GRIMM, 2010).



- + *Maira gloriosa* 1 specimens
 X *Maira hispidella* 3 specimens
 ▲ *Maira nigrithorax* 1 specimens
 ■ *Maira nychthemera* 2 specimens
 ◆ *Maira tuberculata* 2 specimens

Fig. 9

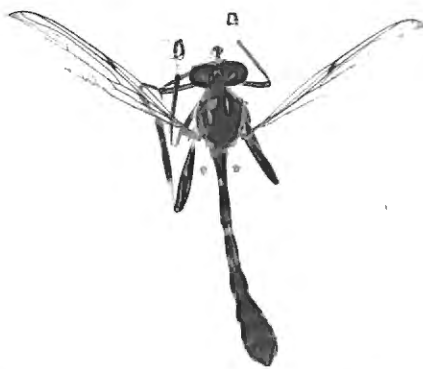


Fig. 10. *Leptogaster moluccana* (Doleschall, 1957).

Leptogastrinae

Leptogaster moluccana (Doleschall, 1957) (Fig. 10)

Material examined: SINGAPORE: 1 female, Mandai, 12.V.2009 (MAN01, 29056); 2 females, Mandai, 19.V.2009 (MAN01, 29079); 1 female, Mandai, 26.V.2009 (MAN01, 29107).
Sungei Buloh, 1 female, 10.vi.2005 (reg. 25168, leg. P. Grootaert, det. T. Dikow); 1 female, 22.vi.2005 (reg. 25172, leg. P. Grootaert, det. T. Dikow); 2 females, 22.vi.2005 (reg. 25171); 1 male, 1 female, 15.vii.2005, (reg. 25262, leg. P. Grootaert, det. T. Dikow); 2 males, 5 females, 5.viii.2005 (reg. 25284, leg. P. Grootaert, det. T. Dikow); 2 males, 4 females, 19.viii.2005, (reg. 25302, leg. P. Grootaert, det. T. Dikow); 1 male, 4 females, 27.viii.2005, (reg. 25272, leg. P. Grootaert, det. T. Dikow); 1 male, 4 females,

7.ix.2005 (reg. 25336, leg. P. Grootaert, det. T. Dikow); 3 males, 1 female, 16.ix.2005 (reg. 25355, leg. P. Grootaert, det. T. Dikow in ZRC); 2 females, 3.v.2006 (reg. 26073, leg. K. Yeo, det. T. Dikow); 1 female, 2.vi.2006 (reg. 26130, leg. K. Yeo, det. T. Dikow); 4 females, 23.vi.2006 (reg. 26133, leg. K. Yeo, det. T. Dikow); 3 females, 11.vii.2006 (reg. 26136, leg. K. Yeo, det. T. Dikow); 4 females, 26.vii.2006 (reg. 26138, leg. K. Yeo, det. T. Dikow); 1 female, 4.viii.2006 (reg. 26140, leg. K. Yeo, det. T. Dikow); 2 males, 5 females, 16.viii.2006 (reg. 26142, leg. K. Yeo, det. T. Dikow); 2 females, 25.viii.2006 (reg. 26143, leg. K. Yeo, det. T. Dikow); 2 females, 6.ix.2006 (reg. 26145, leg. K. Yeo, det. T. Dikow); 1 female, 14.ix.2006 (reg. 26147, leg. K. Yeo, det. T. Dikow); 2 males, 5 females, 25.ix.2006 (reg. 26149, leg. K. Yeo, det. T. Dikow); 1 male, 4 females, 3.x.2006 (reg. 26151, leg. K. Yeo, det. T. Dikow); 2 males, 4 females, 3.xi.2006 (reg. 26157, leg. K. Yeo, det. T. Dikow); 1 females, 24.xi.2006 (reg. 26161, leg. K. Yeo, det. T. Dikow); 1 male, 11.xii.2006 (reg. 26163, leg. P. Grootaert, det. T. Dikow).

Nee Soon (swamp forest), 2 females, 18.xi.2005 (reg. 25425, leg. P. Grootaert, det. T. Dikow, in ZRC)

All specimens were caught in Malaise traps.

Comments: This species is widespread in Asia and not restricted to mangrove alone (http://synthesis.eol.org/tdikow/leptogastrinae_specimen_map?field_species_value=moluccana).

Here in Singapore it is most common in mangrove and rather rare in terrestrial habitats. There was only a single record in the swamp forest at Nee Soon, during a one-year sampling in 6 terrestrial stations with Malaise traps. During the 2005 survey, yet another *Leptogaster* species has been observed, but remain unidentified until now (Dikow, in litt.).

Acknowledgements

The authorities of National Parks are thanked for issuing the Research permits to collect in the National Parks and granting the Singapore Mangrove Insect Programme (SMIP). Special thanks go to Dr. Lena CHAN, Deputy Director of the National Biodiversity Centre at NParks and her staff who assisted P.G. with a lot of enthusiasm during the field work: Linda GOH MEI EE, Jeffrey LOW KIM YEW, Tong HOR YEE (COLLIN), Lim WEI LING and Shufen YANG. We received help in the field on Pulau Ubin from Jacky SOH SWEE MENG, Justin TAN CHEK HWEN and Alan TAN YONG HONG; at Sungei Buloh from Ramakrishnan s/o R KOLANDAVELU and Mohamad AZLIN BIN SANI. We want to thank also Dr Erica MCALISTER of Natural History Museum of London for the loan of types.

References

- DIKOW T., 2007. - *Phylogeny, classification, & biodiversity of robber flies (Diptera : Brachycera: Asiloidea : Asilidae) with special reference to Leptogastrinae*. Ph.D. dissertation at Cornell University, Ithaca, NY, USA.
- GELLER-GRIMM F., 2010. - Database of Asilidae. www.geller-grimm.de/asilidae.htm
- JOSEPH, A.N.T. & PARUI, P., 1981. - New and little-known Indian Asilidae (Diptera) V. The genera *Laphria*, *Maira* and *Orthogonis* with descriptions of nine new species. *Entomologica Scandinavica* 12 : 213-222.
- JOSEPH, A.N.T. & PARUI, P., 1998. - Fauna of India and adjacent countries, Diptera (Asilidae), Part I. Calcutta: *Zoological Survey of India* 278 pp.
- OLDROYD, H. 1972. - *Robber flies (Diptera, Asilidae), of the Philippine Islands*. Pacific Insects. Department of Entomology, Bishop Museum 14(2): 201-337.
- THEODOR, O., 1976. - On the structure of the spermathecae and aedeagus in the Asilidae and their importance in the systematics of family. The Israel Academy of Science and Humanities. 175pp.
- TOMASOVIC G. & GROOTAERT P., 2008. Four new species of robber-flies (Diptera : Asilidae) from the Oriental Region. *Bulletin de la Société royale belge d'Entomologie*, 144: 71-78.
- WALKER F., 1849. - List of the specimens of dipterous insects in the collection of the British Museum. Pt. 2: 231-484.
- WULP, F.M. van der, 1872. - Bijdrage tot de Kennis der Asiliden van den Oost-Indischen Archipel. *Tijdschrift voor Entomologie* (2)7(15): 129-279, pls. 9-12.