

THE GENUS *PARAMEDETERA* (DIPTERA: DOLICHOPODIDAE) IN SINGAPORE, WITH A KEY TO THE ORIENTAL SPECIES

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ABSTRACT. – The genus *Paramedetera* Grootaert & Meuffels, 1997 is reported for the first time from Singapore with five species. *P. ankarum* Grootaert & Meuffels, described from South Thailand, is recorded for the first time since its description. Four species new to science are described and illustrated: *P. micropyga*, new species, *P. obscura*, new species, *P. chelata*, new species and *P. digitata*, new species. A key is given for the thirteen Oriental species of the genus.

KEY WORDS. – Diptera, Dolichopodidae, Oriental, new species, Singapore.

INTRODUCTION

Paramedetera Grootaert & Meuffels, 1997 is a genus of small flies that strongly resembles the cosmopolitan and very common genus *Medetera*. For a detailed generic diagnosis we refer to Grootaert & Meuffels (1997). *Paramedetera* has an ovoid third antennal segment with a latero-subapical arista. The ocellar tubercle is prominent and the long vertical bristles are inserted on an elevation. They possess four dorsocentral bristles of subequal size on the scutum. Rarely a very short anterior bristle is present that could make up for a fifth dorsocentral. The main characteristics to distinguish *Paramedetera* from most *Medetera* are the straight veins r4+5 and M that run parallel to the wing tip. *Paramedetera* species possess very few external characters to distinguish the species. There are slight differences in the colouration of the ocellar, vertical and dorsocentral bristles, but the colour ranges from black to pale brown or yellowish brown, depending mainly on the incidence of the light. The halteres can be whitish, pale greyish or occasionally brownish black. The females may have a specific melanization of the tergites. The basal tergites I, II or III may have unmelanized, triangular areas on both sides where the tergite is yellowish in contrast to the rest of the black tergites. These patterns are specific, but unfortunately only few females have been associated with males. A preparation of the male genitalia is generally necessary to identify the species. The shape of the aedeagus is complex and composed of a central tube with lateral wings. These wings can bear small to huge prongs and can have a rounded or pointed tip. In lateral view it may look like a bird's head. The shape of the hypandrium, if present, is diagnostic as is the position of the epandrial setae.

At present fifteen species of *Paramedetera* Grootaert & Meuffels are known in the world, including the four new species described here. *P. sierraleonensis* Grichanov, 1999 is the only Afrotropical species up to now. All other species have been recorded from the Oriental or Australasian region. Despite intensive collections in the northern coastal plain of Papua New Guinea, only a single species, *P. papuensis* Grootaert & Meuffels, was found. The area of radiation of the genus seems to be Southeast Asia with eleven species recorded now, including the four new species described from Singapore in the present paper. The number of records of the species and the number of new species found, indicate that there must be a lot more species to be described in Southeast Asia. The genus is also present in Central and South China where two species have been described from the Henan and Guangxi provinces respectively: *P. medialis* Yang & Saigusa, 2000 and *P. jinxiuensis* Yang & Saigusa, 2001. In addition we have seen at least two more species from Guangdong province and Xishuangbanna in the south of the Yunnan province.

MATERIAL AND METHODS

All specimens have been collected by sweep netting. They are stored in 75% alcohol. A register number (e.g. 23086) refers to a record of the species in a database containing all collection data. The numbers preceded by Si (e.g. Si303) refer to the position of the tube in the collection. All holotypes designated here are deposited in the Zoological Reference Collection at the Raffles Museum of Biodiversity Research, Singapore (ZRC). Voucher specimens are conserved at the

Royal Belgian Institute of Natural Sciences, Brussels, Belgium (RBINS).

The genitalia are figured with the ancestral ventral part (e.g. aedeagus) side up and their dorsal side (cerci) down.

The epandrium bears at both sides of its base, three epandrial setae. They are grouped in a pair of lateral setae and a single medial seta. The outermost seta of the lateral pair is generally the largest. The epandrial setae can be inserted on a tubercle or papilla that is either short or quite long.

SYSTEMATIC ACCOUNT

Paramedetera micropyga, new species (Figs. 1-3)

Material examined. – Holotype - male: **SINGAPORE:** Nee Soon, 4 Dec.2002, swamp forest (22054, coll. P. Grootaert, Si303; ZRC).

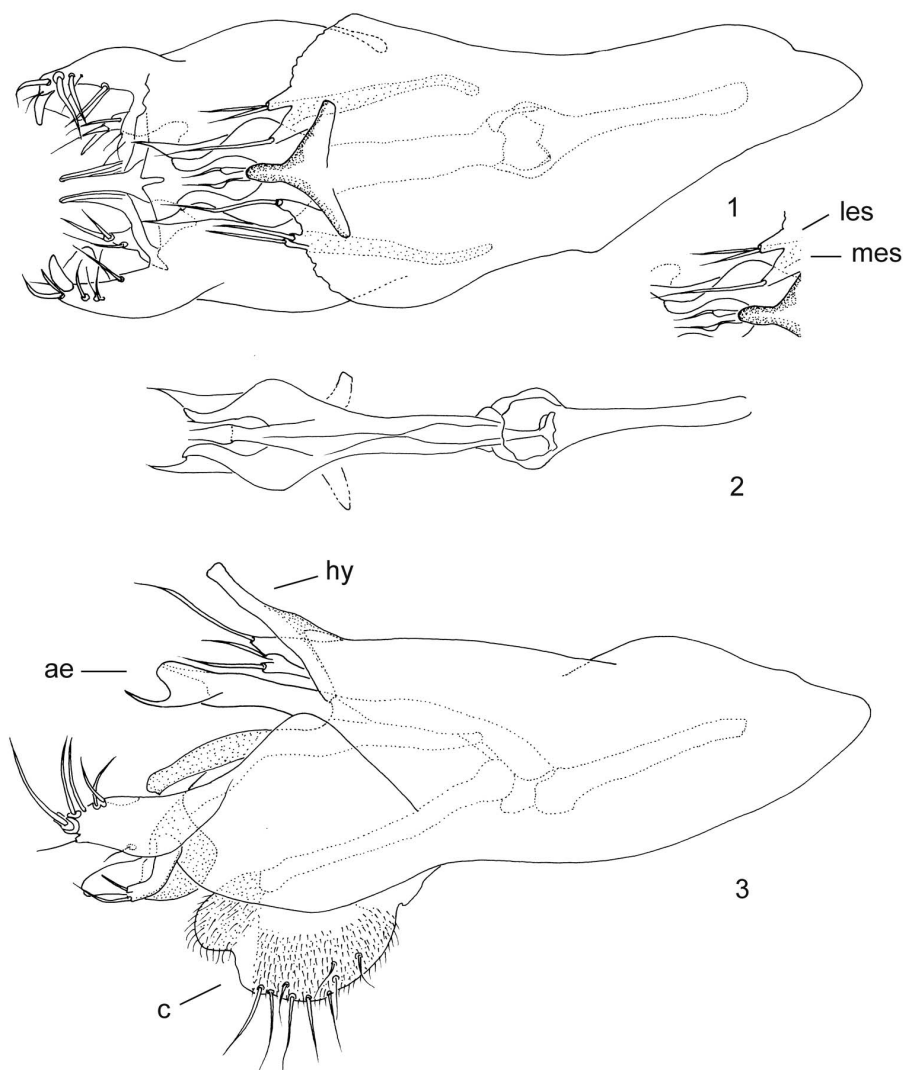
Paratypes – 1 male, Nee Soon, 25 Nov.2003 (23086; coll. P. Grootaert, Si201); 1 male, Nee Soon, 3 Dec.2003 (23102, coll. P. Grootaert, Si218; coll. RBINS).

Description. – Male. Body length: 1.60 mm; wing length: 1.50 mm. Ocellar and vertical bristles pale yellowish. Palp black with a black apical bristle. Four dorsocentrals, preceded by a short bristle (about a fifth length of anterior dc), 2 anterior dc shorter than posterior 2. All bristles on scutum brownish. Scutellars pale brown. Propleural bristle long, pale. Halter greyish-brown. Squama with a brown border, bearing 6 pale yellowish cilia.

Legs yellowish-brown, but all coxae and femora brown. Tibiae and tarsi paler, yellowish, 5th tarsomeres of all legs dark brown.

LI: Length of femur, tibia and tarsomeres (in mm): 0.42 : 0.40 : 0.21 : 0.12 : 0.08 : 0.06 : 0.07.

LII: Length of femur, tibia and tarsomeres (in mm): 0.52 : 0.55 : 0.31 : 0.17 : 0.12 : 0.07 : 0.06.



Figs. 1-3. *Paramedetera micropyga*, new species: 1, hypopygium ventral view; 2, aedeagus, ventral view; 3, hypopygium lateral view. ae: aedeagus; c: cercus; hy: hypandrium; les: lateral epandrial setae; mes: median epandrial seta.

LIII: Length of femur, tibia and tarsomeres (in mm): 0.56 : 0.56 : 0.21 : 0.22 : 0.13 : 0.07 : 0.06.

Hypopygium (Figs. 1, 3). Aedeagus (Fig. 2) rather small, hyaline, with a bird's headlike tip, bearing a sharply pointed tip. Hypandrium triangular, a little erect, with a elongated tip. Median epandrial bristle the longest, on a long tubercle. Lateral pairs of epandrial setae also on a tubercle.

Female unknown.

Etymology. – The name *micropyge* refers to the rather small aedeagus.

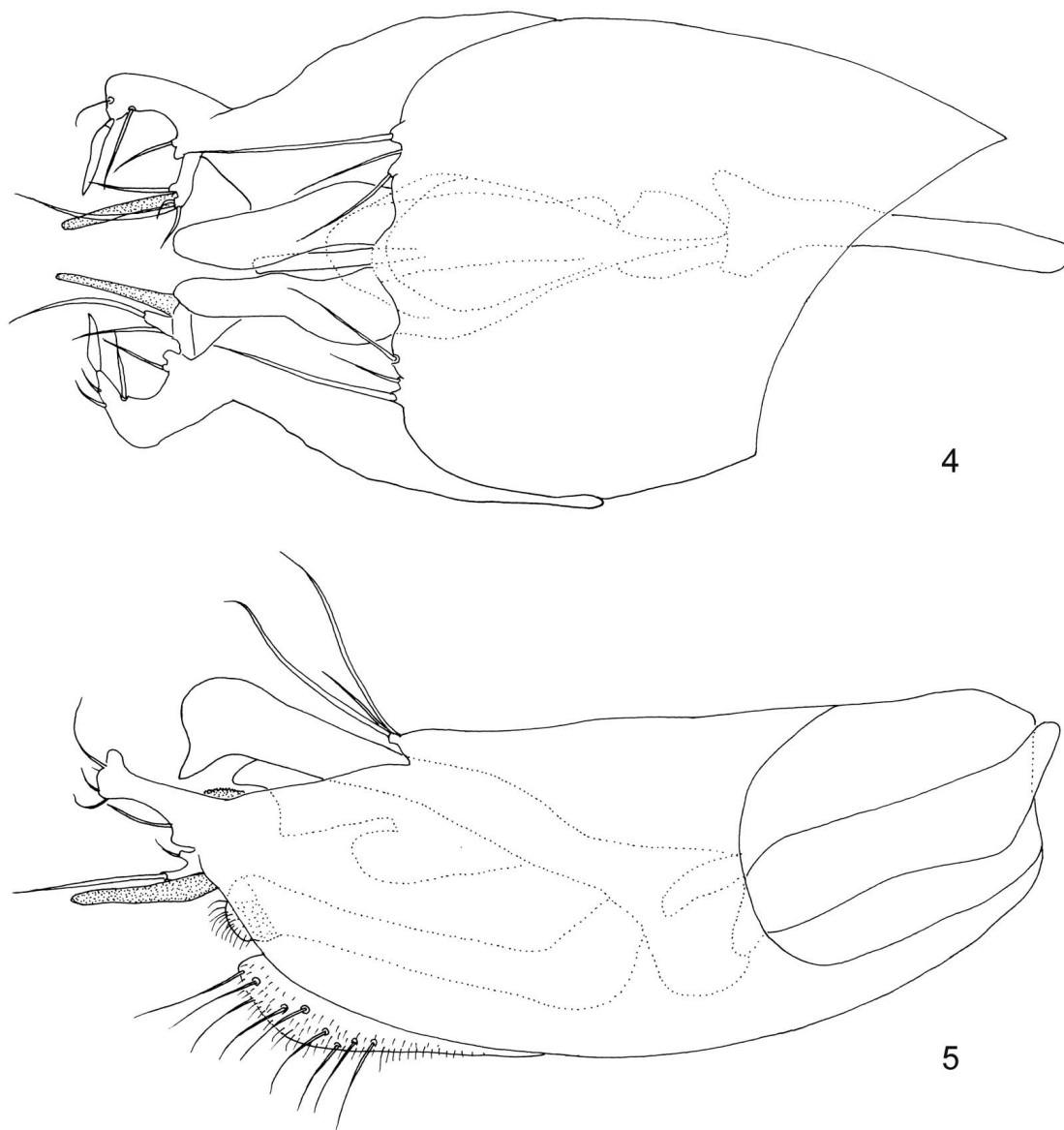
Differential diagnosis. – The aedeagus is rather small and the tips of the aedeagal wings are pointed in lateral view. The inner rim of the wings does not bear a tooth-like projection, that distinguishes it from *P. jixiensis* and *P. borneensis*.

***Paramedetera ankarum* Grootaert & Meuffels, 1998**
(Figs. 4-5)

Material examined. – 1 male: **SINGAPORE:** Kent Ridge, Science Park, 22 Nov.2003 (23082, coll. P. Grootaert, Si103; coll. ZRC).

Description. – Male. Body length: 1.25 mm; wing length: 1.38 mm. Ocellar and vertical bristles pale yellowish-brown. Palp black with a black apical bristle. Four dorsocentrals, 2 anterior dc shorter than posterior 2. All bristles on scutum yellowish brown. Scutellars pale brown. Propleural bristle long, pale. Halter white. Squama pale, with a brown border, bearing 4 pale cilia.

Legs paler than in the other species. Fore coxa anteriorly slightly infuscated, posterior coxae completely yellowish brown. Femora only infuscated dorsally; tibiae and tarsi yellow; 4th and 5th tarsomeres of all legs brown.
LI: Length of femur, tibia and tarsomeres (in mm): 0.42 : 0.40 : 0.21 : 0.11 : 0.08 : 0.06 : 0.07.



Figs. 4-5. *Paramedetera ankarum* Grootaert & Meuffels: 4, hypopygium ventral view; 5, hypopygium lateral view.

LII: Length of femur, tibia and tarsomeres (in mm): 0.49 : 0.52 : 0.40 : 0.14 : 0.11 : 0.07 : 0.06.

LIII: Length of femur, tibia and tarsomeres (in mm): 0.49 : 0.56 : 0.17 : 0.21 : 0.11 : 0.07: 0.06.

Hypopygium (Figs. 4-5): Wings of aedeagus with a bird's headlike tip. Inner rim of the wings smooth. Hypandrium not distinct. Epandrial setae inserted on short tubercle.

Female unknown.

***Paramedetera obscura*, new species**

(Figs. 6-7)

Material examined. – Holotype - male: **SINGAPORE:** Clementi woods, 15 Mar.2005, drain (25014, coll. P. Grootaert, Si446; ZRC).

Paratypes – 4 males, 1 female, same data as holotype. 30 males, 28 females, Clementi woods, major drain (streaming water containing

small fish), 23 April 2005 (25084, coll. P. Grootaert, Si742). 57 males, 34 females, same locality, 25 June.2005 (25189, coll. P. Grootaert, Si849, Si850; coll. RBINS).

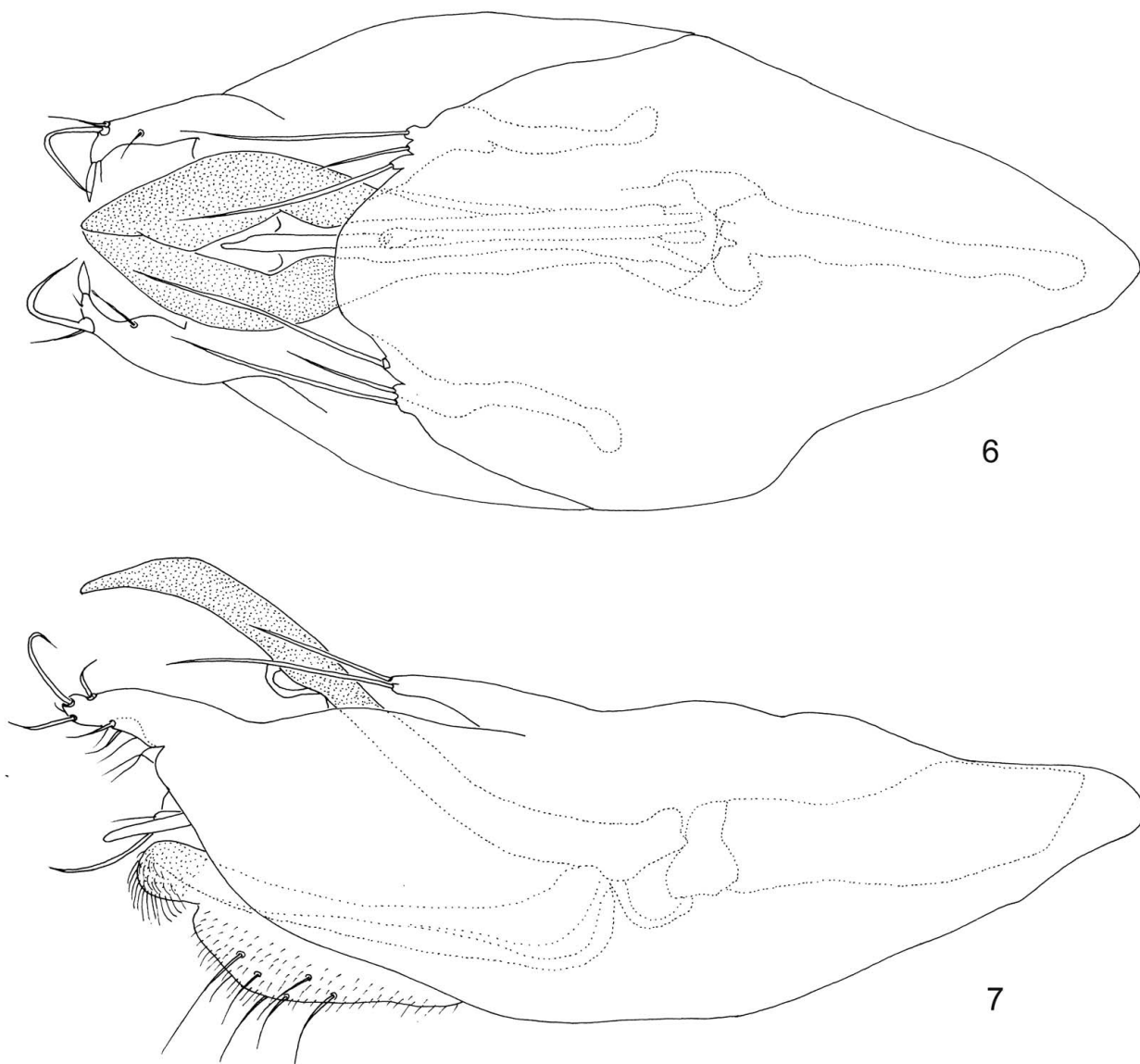
Description. – Male. Body length: 1.55-1.60 mm; wing length: 1.48-1.50 mm. Ocellar and vertical bristles yellowish brown. Palp black with a black apical bristle. Four dorsocentrals, 2 anterior dc shorter than posterior 2. All bristles on scutum yellowish brown. Propleural bristle long, pale. Halter white. Squama pale, with a brown border, bearing 6 pale brown cilia.

Legs yellowish brown. Fore coxa brown anteriorly, posterior 4 coxae brown. Femora brown dorsally and yellow ventrally; tibiae and tarsi yellow; 4th and 5th tarsomeres of all legs brown.

LI: Length of femur, tibia and tarsomeres (in mm): 0.54 : 0.49 : 0.41 : 0.14 : 0.11 : 0.07 : 0.08.

LII: Length of femur, tibia and tarsomeres (in mm): 0.50 : 0.56 : 0.35 : 0.18 : 0.13 : 0.06 : 0.06.

LIII: Length of femur, tibia and tarsomeres (in mm): 0.56 : 0.63 : 0.22 : 0.27 : 0.14 : 0.07 : 0.06.



Figs. 6-7. *Paramedetera obscura*, new species: 6, hypopygium ventral view; 7, hypopygium lateral view.

Aedeagus almost black, with pointed apex in lateral view (Fig. 7). Hypandrium not distinct, represented by the broadly rounded margin of epandrium (Fig. 6). Epandrial setae inserted on short tubercle.

Female. Body length: 1.87 mm; wing length: 1.75 mm. Larger than male. First tergite on both sides with a pale, narrow triangular area at basal margin and a wider pale, triangular area at apical margin. Tergite II with a very small, pale triangular at both sides of apical margin. Tergite III with a large pale triangular area at both sides of apical margin.

Etymology. – The name *obscura* refers to the darkened, almost black aedeagus.

Differential diagnosis. – It is so far the only species in the genus that has a black aedeagus. However it should not be confused with the huge black prongs on the aedeagus of *P. horrorifera*.

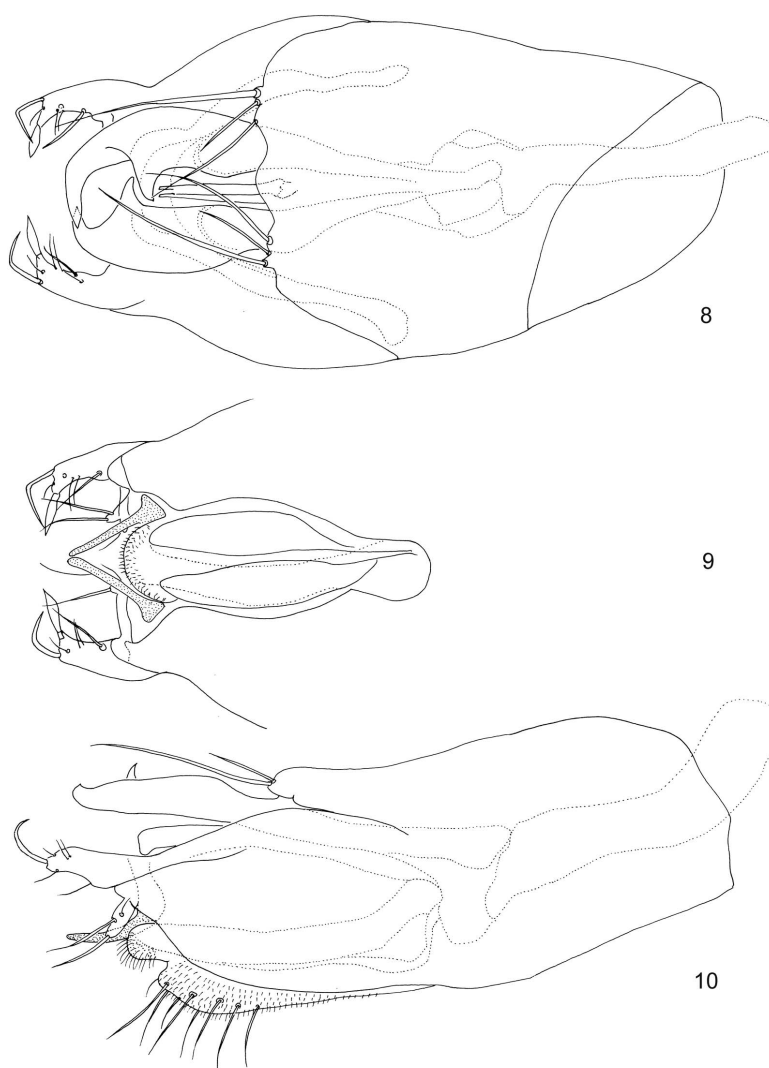
***Paramedetera chelata*, new species**
(Figs. 8-10)

Material examined. – Holotype - male: **SINGAPORE**; Nee Soon, 18 Mar.2005 (25018, coll. P. Grootaert, Si559; ZRC).

Paratype – 1 male, same provenance as holotype (coll. RBINS).

Description. – Male. Body length: 1.50 mm; wing length: 1.45 mm. Ocellar and vertical bristles black. Palpi black with a black apical bristle. Four black dorsocentrals, 2 anterior dc shorter than posterior 2. Propleural bristle long, pale. Halter black. Squama brown, with a brown border, bearing 6 pale brown cilia.

Legs yellowish-brown. Fore coxa brown anteriorly, posterior 4 coxae brown. Femora dorsally brown, ventrally yellow; tibiae and tarsi yellow; 4th and 5th tarsomeres of fore and mid legs brown, apical 3 tarsomeres of hind legs brown.



Figs. 8-10. *Paramedetera chelata*, new species: 8, hypopygium ventral view; 9, tip of dorsal surstylus, cercus dorsally; 10, hypopygium lateral view.

LI: Length of femur, tibia and tarsomeres (in mm): 0.42 : 0.38 : 0.24 : 0.10 : 0.07 : 0.06 : 0.06.

LII: Length of femur, tibia and tarsomeres (in mm): 0.42 : 0.49 : 0.28 : 0.14 : 0.11 : 0.07 : 0.06.

LIII: Length of femur, tibia and tarsomeres (in mm): 0.49 : 0.52 : 0.15 : 0.21 : 0.1 : 0.07 : 0.07.

Hypopygium (Figs. 8-10). Aedeagus orange brown, with tip of wings rounded. Inner rim of the wings in ventral view, with two claw-like projections: one at tip and one near middle. Hypandrium not distinct, represented by a small rounded projection. Median epandrial seta not on a tubercle.

Female unknown.

Etymology. – The name *chelata* refers to the large claw-like projections on the inner rim of the wings of the aedeagus.

Differential diagnosis. – The strong claw-like projections on the inner rim of the wings of the aedeagus are specific. Similar projections, but much smaller, are present in *P. sumatrensis* Grootaert & Meuffels. The species *P. jinxiuensis* Yang & Saigusa and *P. borneensis* Grootaert & Meuffels have also small projections on the inner rim of the wings. The extreme is found in *P. horrorifera* Grootaert & Meuffels with

its huge sharp prongs on the aedeagus. *P. chelata* new species is a darker species than the others, with all bristling black and even black halteres.

***Paramedetera digitata*, new species**
(Figs. 11-12)

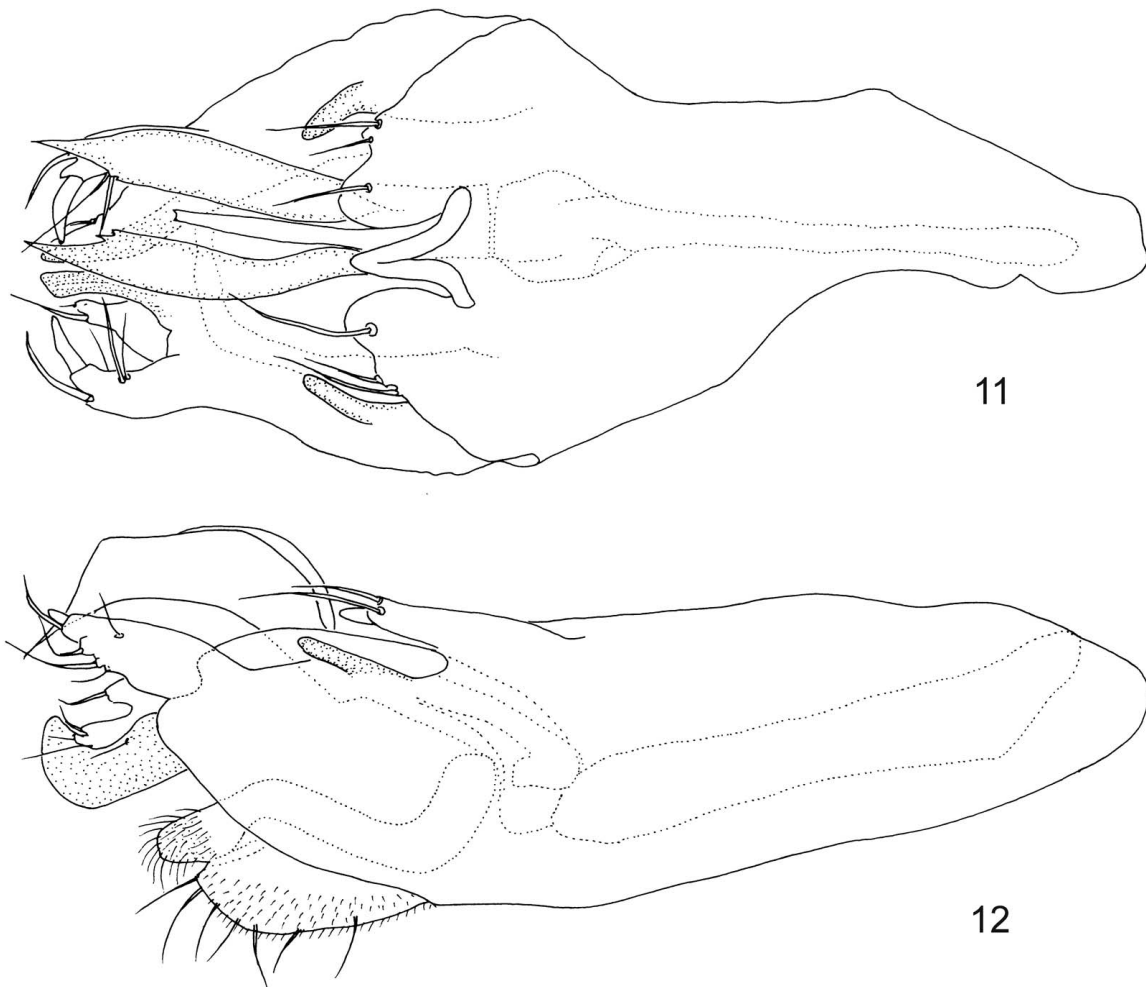
Material examined. – Holotype - male: **SINGAPORE**: Nee Soon, 9 Mar.2005, swamp forest (25004, coll. P. Grootaert, Si384; ZRC).

Description. – Male. Body length: 1.50 mm; wing length: 1.25 mm. Ocellar and vertical bristles brown. Palpi black with a black apical bristle. Four dorsocentrals, anterior 2 shorter than posterior 2. All bristles on scutum dark brown. Propleural bristle long, pale brown. Halter greyish-brown. Squama brown with long pale cilia. Legs yellowish-brown, but all coxae and femora brown. Tibiae and tarsi yellowish, 4th and 5th tarsomeres of all legs dark brown.

LI: Length of femur, tibia and tarsomeres (in mm): 0.35 : 0.35 : 0.19 : 0.07 : 0.06 : 0.04 : 0.06.

LII: Length of femur, tibia and tarsomeres (in mm): 0.38 : 0.42 : 0.21 : 0.10 : 0.07 : 0.04 : 0.06.

LIII: Length of femur, tibia and tarsomeres (in mm): 0.42 : 0.42 : 0.12 : 0.15 : 0.07 : 0.06 : 0.06.



Figs. 11-12. *Paramedetera digitata*, new species: 11, hypopygium ventral view; 12, hypopygium lateral view.

Hypopygium (Figs. 11-12) rather elongate. Aedeagus orange, with a downwards pointed tip. Hypandrium triangular, a little sunk between the rounded lobes of the epandrium that bears the basal epandrial seta. Epandrial setae all short, none on a tubercle. Lateral to the epandrial setae is a black finger-like projection of the epandrium. Dorsal surstylus with a curved tip, large and wide in lateral view (not straight and stalk-like as in the other species).

Female unknown.

Etymology. – The name *digitata* refers to the finger-like projections on the epandrium dorsad of the epandrial setae. This is so far a unique character in *Paramedetera*.

Differential diagnosis. – A finger-like projection lateral to the epandrial setae is not present in other *Paramedetera* species.

Key to male *Paramedetera* from the Oriental and Australasian fauna

Since there are very little non-genital characters of diagnostic value, the key is largely based on the shape of male genital appendages. It is conceived as such that when the hypopygium is detached from the abdomen, most species can be identified. For unambiguous identification, the hypopygium should be removed, macerated and mounted for microscopic study. I suggest using mainly the composite Figs. 13-26.

1. Aedeagus with large pointed, black prongs directed inwards (Fig. 13) (Thailand) *P. horrorifera*
- Aedeagus usually without prongs; when prongs present, then small and pale 2
2. Tips of wings of aedeagus rounded in lateral view (Figs. 14-20) 3
- Tip of aedeagal wings sharply pointed in lateral view (Figs. 21-26) 9
3. Inner edge of at least one aedeagal wing (Fig. 15) with one or two tooth-like projections (Figs. 14, 15, 16) 4
- Inner edge of aedeagal wings smooth, without tooth-like projection (Figs. 17-20) 6
4. Hypandrium distinct; inner rim of aedeagal wings with small, tooth-like projections 5
- Hypandrium not distinct; inner rim of aedeagal wings with two, large, well separated tooth-like projections (Figs. 8, 14) (Singapore) *P. chelata*
5. In ventral view: inner rim (border) of aedeagal wings each with a single tooth close to tip; median epandrial seta on a long tubercle (Fig. 15) (China, Henan) *P. medialis*
- In ventral view: inner rim (border) of aedeagal wings with pointed tip and a tooth-like projection close to the tip; hypandrium large triangular, with truncate tip (Fig. 16) (Indonesia, Sumatra) *P. sumatrensis*
6. Lateral epandrial setae on distinct tubercle 7
- Lateral epandrial setae not on a tubercle /or on a small elevation only 8
7. No hypandrium (Fig. 17) (Borneo, Brunei) *P. bruneiensis*
- Hypandrium very short, triangular (Fig. 18) (Thailand) *P. turschi*

8. Hypandrium absent (Fig. 20). Median epandrial setae on a short tubercle (Papua New Guinea) *P. papuensis*
- Hypandrium indistinct (triangular) (Fig. 19). Median epandrial seta not on a tubercle; tip of wings on aedeagus pointed downwards (Sumatra) *P. orientalis*
9. Tip of aedeagus in lateral view like a bird's head: rounded above and with a beak-like projection below, either directed up or down (Figs. 21, 22, 23, 24) 10
- Tip of aedeagus simply pointed (Figs. 25, 26), not like a bird's head in lateral view 13
10. Tip of beak-like projection turned up (Fig. 21, 24) 11
- Beak-like projection pointing down (Figs. 22, 23) 12
11. Lateral epandrial setae not tuberculate (Fig. 21) (China, Guangxi) *P. jinxiuensis*
- Lateral epandrial setae tuberculate (Figs. 1, 24) (Singapore) .. *P. micropyga*
12. Median epandrial seta not on a tubercle (Fig. 22) (Thailand, Singapore) *P. ankarum*
- Median epandrial seta on a short tubercle. Inner border of aedeagal wings with a tooth-like projection (Fig. 23) (Borneo, Brunei) *P. borneensis*
13. Aedeagus orange, tip of aedeagal wings sharply pointed, directed downwards; hypandrium triangular, pointed; basal epandrial seta on a rounded lobe; a finger-like projection at each side of the base of epandrium (Figs. 11, 12, 25) (Singapore) *P. digitata*
- Aedeagus black (Figs. 6, 26); hypandrium indistinct, broadly rounded, no finger-like projection at base of epandrium (Singapore) *P. obscura*

GENERAL DISCUSSION

Most of the genera of the subfamily Medeterinae are arboreal. *Paramedetera* however is soil dwelling and found near aquatic habitats. It is observed near riverbanks of streams with solid substrates such as pebbles, boulders or rocks. That is probably why *Paramedetera* is found in the open concrete drains cutting through parks in Singapore. We assume that the larvae are semi-aquatic, or live in the mosses and algae splashed by the streaming water. The record of a few *P. papuensis* specimens near a water hole is the only exception of *Paramedetera* found near stagnant water, though the other *P. papuensis* were collected on pebbles in a streambed.

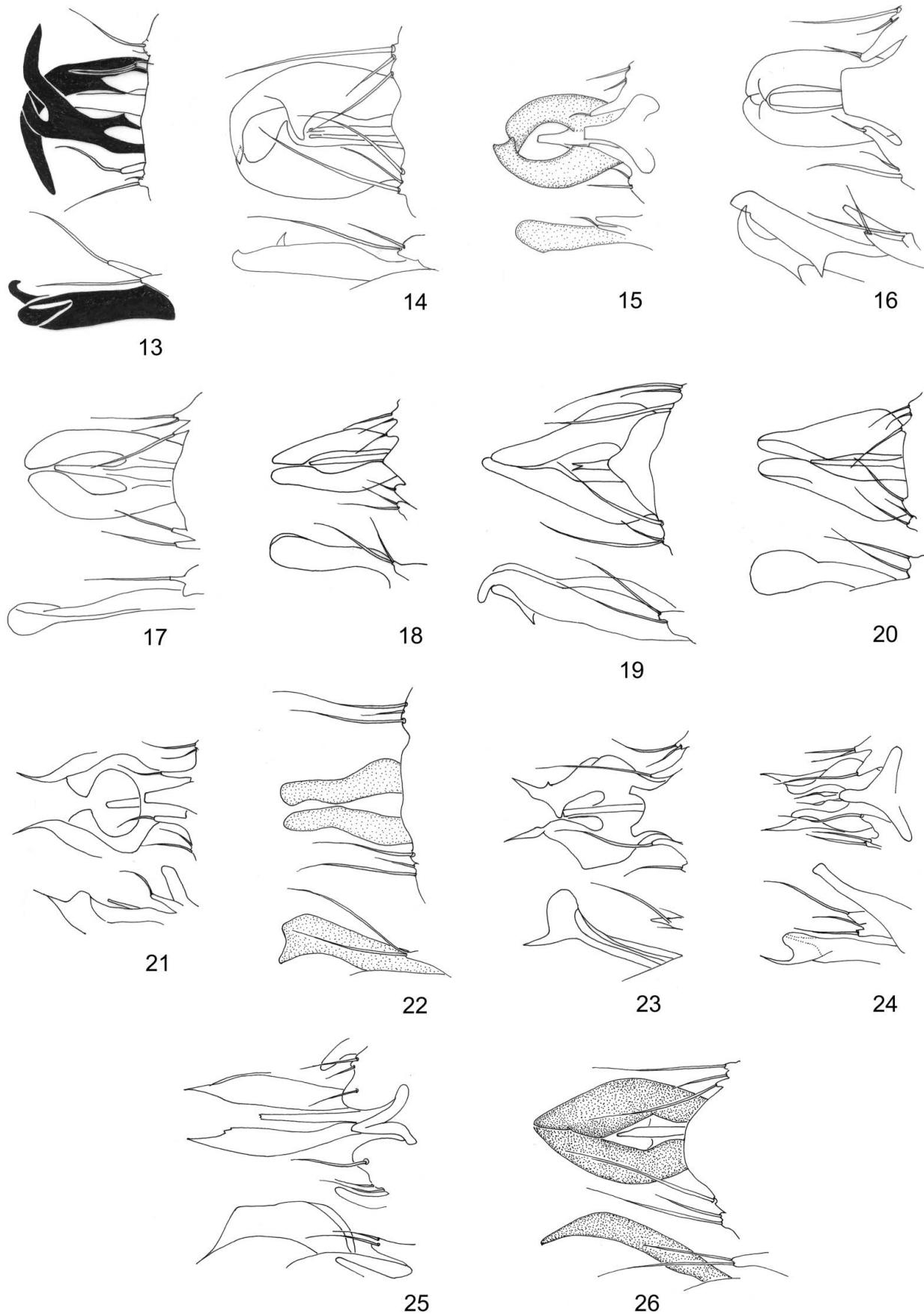
Paramedetera is tropical in distribution. It is not reported from Australia, though it is likely to be present in the northern rain forest since it is present in the northern coastal lowland of Papua New Guinea (Grootaert & Meuffels, 1997). It is also not known from the Neotropical Realm. A single species is recorded from the Afrotropical Realm indicating a Gondwana link. When looking to the distribution of *Paramedetera* in the world, it seems that the centre of radiation is situated in Southeast Asia with eleven species, not taking into account the two South China species. Currently five species are recorded in Singapore. Only one species was previously known (Thailand), the others are new for science. The species accumulation curve and the number of singletons and doubletons (seven species on 11, or 60% of the Southeast Asian species) suggest that a large number of species remains to be described. Malaysia, Indonesia and the Philippines are largely unexplored and are therefore likely to have the bulk of the undescribed species.

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- Paramedetera ankarum* Grootaert & Meuffels, 1998: *Bull. Annls. Soc. r. belge Ent.* 133 [1997]: 385. Type locality: Thailand, Ranong prov., Bok Kai waterfalls (HT in RBINS). Distribution: Thailand, Singapore.
- Paramedetera borneensis* Grootaert & Meuffels, 1998: *Bull. Annls. Soc. r. belge Ent.* 133 [1997]: 376. Type locality: Brunei, Kuala Belalong (HT in RBINS). Distribution: Borneo, Brunei.
- Paramedetera bruneiensis* Grootaert & Meuffels, 1998: *Bull. Annls. Soc. r. belge Ent.* 133 [1997]: 378. Type locality: Brunei, Kuala Belalong (HT in RBINS). Distribution: Borneo, Brunei.
- Paramedetera chelata*, new species. Type locality: Singapore (HT in ZRC). Distribution: Singapore.
- Paramedetera digitata*, new species. Type locality: Singapore (HT in ZRC). Distribution: Singapore.
- Paramedetera horrorifera* Grootaert & Meuffels, 1998: *Bull. Annls. Soc. r. belge Ent.* 133 [1997]: 383. Type locality: Thailand, Phang-Nga (HT in RBINS). Distribution: Thailand.
- Paramedetera jinxiuensis* Yang & Saigusa, 2001: *Bull. Inst. r. Sci. nat. Belg., Entom.* 71: 160. Type locality: China, Guanxi province, Jinxiu (HT in CAU). Distribution: South China.
- Paramedetera medialis* Yang & Saigusa, 2000: *Insects of the Mountains Funiu and Dabie regions*: 200. Type locality: China, Henan prov., Luoshan (HT in CAU). Distribution: South China.
- Paramedetera micropyga*, new species. Type locality: Singapore (HT in ZRC). Distribution: Singapore.
- Paramedetera orientalis* (Hollis, 1964) [Cyrturella] (Grootaert & Meuffels, 1997: *Invert.Taxon*. 11: 315). Type locality: Indonesia, Sumatra, Bukit Tingi (Fort de Kock) (HT in ITZ). Distribution: Indonesia, Sumatra.
- Paramedetera obscura*, new species. Type locality: Singapore (HT in ZRC). Distribution: Singapore.
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- Paramedetera sumatrensis* Grootaert & Meuffels, 1997: *Invert.Taxon*. 11: 312. Type locality: Indonesia, Sumatra, Padang, Air terjun tiga tingkat lubuk hitam (HT in RBINS). Distribution: Indonesia, Sumatra.
- Paramedetera turschi* Grootaert & Meuffels, 1998: *Bull. Annls. Soc. r. belge Ent.* 133 [1997]: 380. Type locality: Thailand, Phang-Nga (HT in RBINS). Distribution: Thailand.



Figs. 13-26. Ventral (upper) and lateral view (lower) of aedeagal wings and hypandrium of Oriental and Australasian *Paramedetera*. 13, *horrorifera*; 14, *chelata*; 15, *medialis*; 16, *sumatrensis*; 17, *bruneiensis*; 18, *turschi*; 19, *orientalis*; 20, *papuensis*; 21, *jinxuensis*; 22, *ankarum*; 23, *borneensis*; 24, *micropyga*; 25, *digitata*; 26, *obscura*.